IBM Db2 Web Query for i Designer Creating Charts Part 2

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Creating Charts

Charts communicate overall trends quickly with eye-catching and intuitive graphics. Charts come in many different varieties that allow you to communicate information with varying degrees of complexity and specificity. You can use simple charts to effectively communicate simple metrics, and more complex charts to clearly display relationships between different aspects of your data, making it easy to identify less obvious trends.

Different chart types utilize different kinds of data and enable different styling options. You can easily change chart types by selecting a different option from the Content picker, making it easy to ensure that you choose the chart type that best represents your data.

When creating your visualization, you can use tooltips and on-chart filtering to get the necessary information from your chart, and you can also enhance the chart with run-time capabilities such as drill-downs and In-Document Analytics to make even more information available from a single chart.

In this chapter:

❏ Displaying Measure Values in Charts

❏ Formatting Charts

❏ Creating Maps to Illustrate Trends

❏ Using Your Extension in a Request

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Displaying Measure Values in Charts

In most chart types, measure values for different categories are communicated based on visual cues. For example, the height of a riser in a bar chart, the size of a slice in a pie chart, or the color or an area of a heatmap all communicate the measure value of the dimension value that they represent. By comparing different areas of the chart, and by using the legend and tooltips, you can quickly identify overall trends in your data.

To display measure values in a chart, you add them to a measure bucket. The names of these buckets differ, depending on the type of chart, and many chart types include multiple measure buckets, so you can evaluate the relationships between different metrics. For example, in a bar chart, you can display measure values using the Vertical, Size, and Color buckets. The Vertical bucket expresses values of the selected measure field using the height of each bar, the Size bucket expresses values using the width of each bar, and the Color bucket expresses values using the color of each bar, based on a color scale. The Color bucket can accept either a measure field or a dimension field. If you use a dimension instead of a measure, the color of each bar or bar segment is based on dimensional series values.

Each chart type has a default measure bucket. When you double-click a measure field or drag it onto the canvas, it is automatically added to that bucket. In the case of a bar chart, the default measure bucket is the Vertical bucket. For more information about the buckets available for each chart type, see the topics under *Creating Charts*.

By default, when a measure field is added to a measure bucket, the values are aggregated as a sum. The aggregation is performed for each dimensional sort value. To change the type of aggregation for a single field from sum to another option, such as count or average, right-click the measure field and point to *Aggregate*. A list of available aggregation options displays. For more information about aggregations, see *Using Prefix Operator Aggregation Functions*.

Alternatively, you can change the evaluation of all measure fields in your chart at once. From the Calculation Options menu Σ ▾ , you can change the evaluation in all measure buckets from a summary aggregation to a count aggregation or to detail values, in which case measure values are not aggregated at all, instead displaying the value of each record in your data set. When you select one of these options, the icon displays above the chart buckets.

The count evaluation method displays the number of records within each sort value. This allows you to see the distribution of your data, such as in a histogram. To create a histogram, create a new bar chart and create a set of bins for the measure field distribution you want to evaluate. Add the newly created bins to the Horizontal bucket, then add the original, associated measure field to the Vertical bucket. Finally, change the evaluation method from Summaries to Counts. The chart now shows the number of records that fall into each bin range, as shown in the following image.
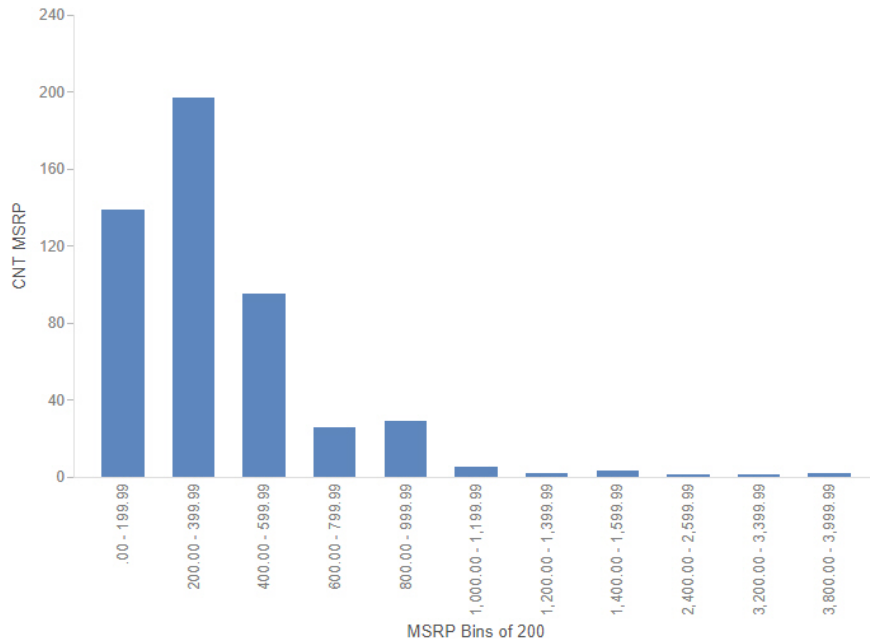

When using the Counts evaluation option, you can still change the aggregation option for each individual measure field, just like when you are using the Summaries option.

The Details evaluation option allows you to see the value of each individual record in your data set. Since every record is displayed, the Details option is best used for chart types that can display lots of values effectively. For example, the following image shows a scatter plot where each point represents a different record. The Revenue and Cost of Goods values represented by each axis are the non-aggregated revenue and cost of goods for each individual record.
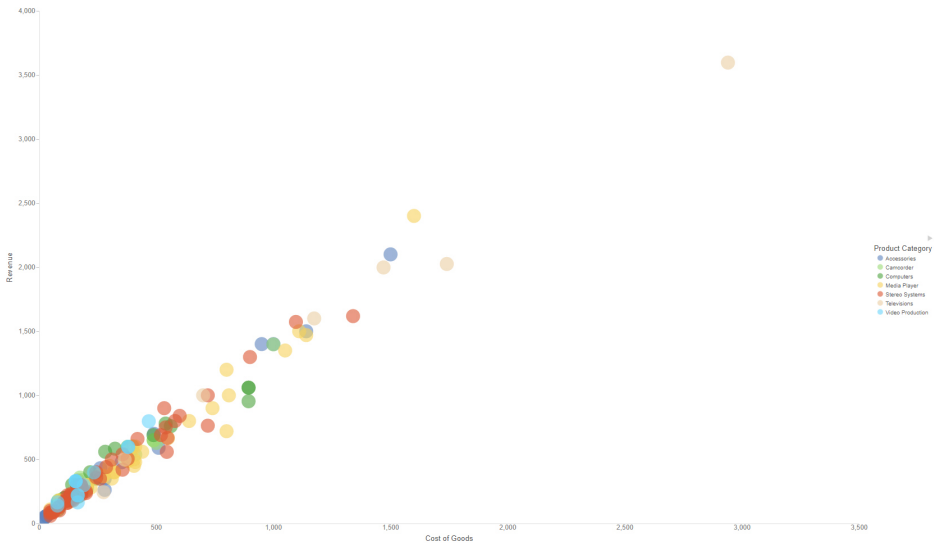
If we had used the Summaries option, the chart would have displayed one point for each sort value, as shown in the following image. In this example, the sort value was the dimension in the Color bucket, Product Category.
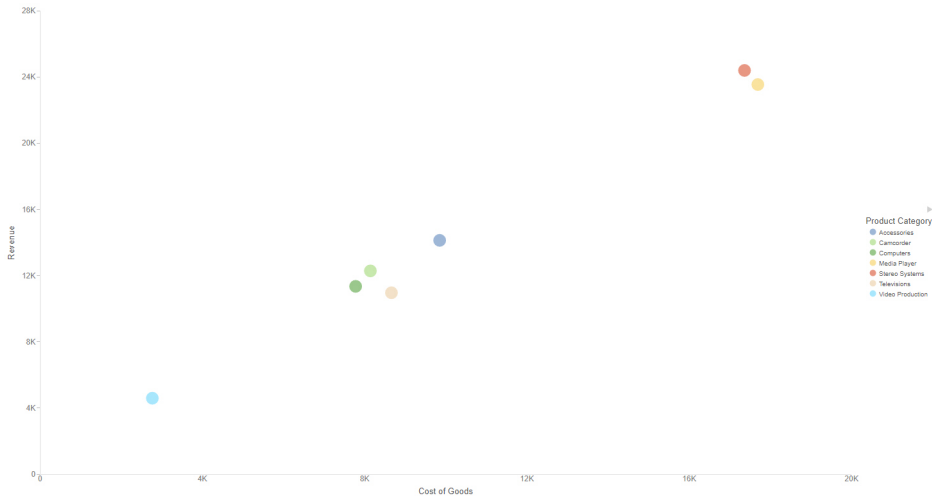
Note: If you are using a very large data source, you may wish to filter your chart before displaying detail values in order to reduce the resources required to display all records.

Formatting Charts

Charts allow you to present information graphically, using such visual cues as color, size, and position to convey relationships between measures (numeric fields to be aggregated) and dimensions (categories) and to identify trends and outliers. You can create a wide variety of charts. For example, you can review your data (Gross Profit and Product Category) using different chart types (for example, bar chart, area chart, or line chart). The chart options give you an edge in deciding which chart to use to highlight certain information or trends.

Once you have created a chart, you can apply various styling and formatting changes to it. For example, bolding text in a legend or header, changing the color of a series, or changing the appearance of axis lines. The chart formatting options allow you to specify how components display, enabling you to format your chart to suit your needs.

The formatting capabilities of Db2 Web Query Designer let you indicate which aspects will display, how fonts are utilized, and which additional options will enable you to create an effective, styled chart. This allows you to control the display of your chart information, giving you every opportunity to create a chart that you can share, distribute, and reuse on pages.

Customizing Charts

As you work with your chart, you can make modifications that improve the display of your chart, highlighting the layout and presentation of the chart components. Some of the formatting options include:

❏ Controlling font display

❏ Customizing headers and footers

❏ Changing the format of your legend

❏ Formatting the axes of your chart

❏ Formatting the series of your chart

❏ Customizing the format of your matrix chart

❏ Enhancing a box plot

❏ Enhancing your grid

❏ Enhancing a gauge

❏ Adding a theme

❑ Adding color to your chart
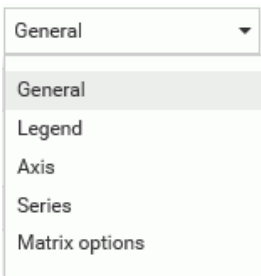
You can access the formatting options from the Format tab, as shown in the following image.
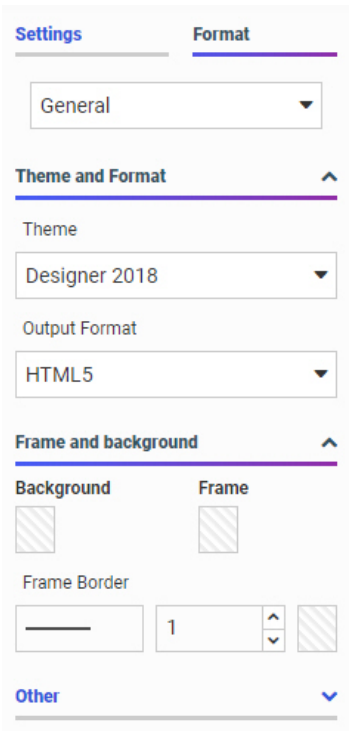
General options display, by default, but you can use the Quick Access menu to select a different aspect of your chart, for example, Legend, Axis, Series, or Matrix options, as shown in the following image.

Different options are available, depending on the chart type.

Once you select an area of your chart to modify (for example, Axis), you can use the intuitive options and menus to make selections, as shown in the following image.


You can also access styling options by right-clicking an area of your chart, such as a riser or axis label, and clicking *Style*.

Note: If you are working with a map, reference lines, or data grids, additional tabs will display, enabling you to make formatting changes to these components. These tabs do not display, by default.

By streamlining formatting options in one place, you can quickly format charts to enhance the display of your data. Whether it be color-coding a series in a chart or changing the font size of your data labels, a customized, formatted chart is just a click away.

Controlling Font Display in a Chart

You can use the font formatter in Db2 Web Query Designer to control how fonts are displayed in your chart. This is a quick way to apply styling, colors, or a specific font type for any text within your chart. The font formatter displays in different areas of the Format tab (for example, Legend, Axis, Series, and Matrix options). Depending on the chart type and what you want to format, you can use these options to enhance the fonts in your charts. The font formatter is shown in the following image.
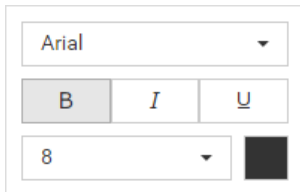
You can also change the font of a header or footer in your chart. This allows you to control how a chart is labeled or highlighted, which is useful when the chart will be distributed. For headers and footers, you can:

❏ Change the font type and font size.

❏ Add bold, italic, and underline emphasis to your text.

❏ Set the justification of text in your header or footer. For example, left-aligned, centered, or right-aligned.

❏ Change the font color or background color.

The styling toolbar for header and footer text is available along the top of the canvas, as shown in the following image.

When reviewing text that displays in your chart, you might want to increase the font size of the header text to enhance its visibility. Editing the font types and styles in your chart gives you more control over how information is displayed and presented.

Procedure: How to Change the Font Type in Your Chart

Changing the type, size, and emphasis of a font improves the impact for the user that is analyzing this chart. To change the font of a chart header:

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

   Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

   Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. Add one or more measures and dimensions to your chart.

4. Double-click *Chart Heading* to enable it for formatting, and change this text to *Discount by Product Category*.

   The styling toolbar displays along the top of the screen, as shown in the following image.
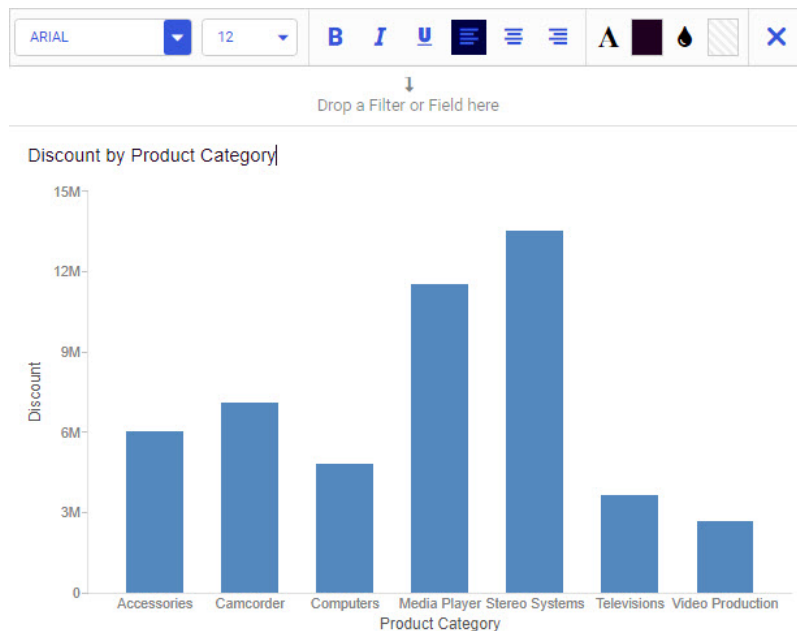
5. Ensure that the header *Discount by Product Category* is selected or highlighted.

6. From the styling toolbar, change the font type to Cambria, size 24, Bold.

The revised chart header displays and reflects the new font type and styling, as shown in the following image.
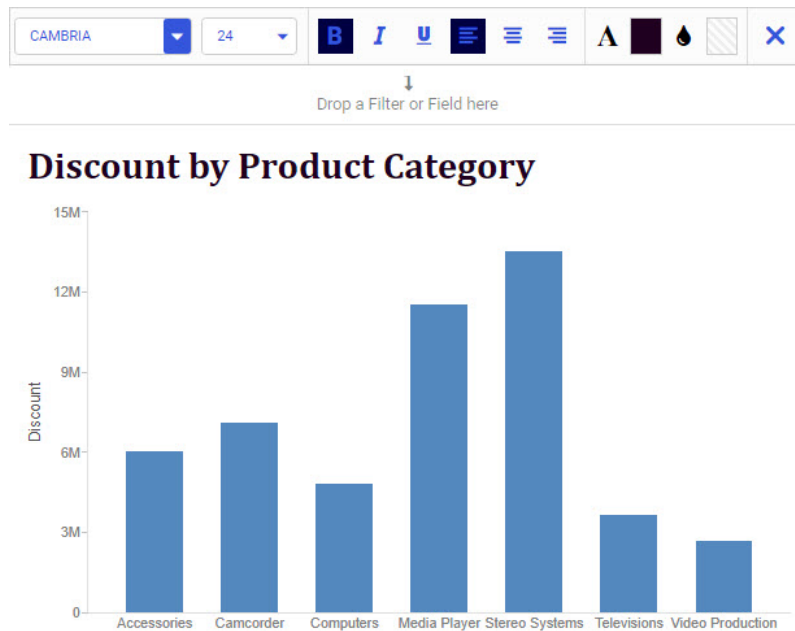
Note: You must select the text you want to modify in your header or footer before you apply any changes to the font.

Adding Headings and Footings to a Chart

You can use headers and footers to add key information, such as the purpose of the chart and the audience. For example, if you have gross profit for different product categories, you can add a header to highlight this information in your chart.

You can add multiple lines of information into the heading and footing areas in a chart. This accommodates thorough explanations and additional information while offering the most readable presentation.

You add a new line in the heading and footing by pressing the Enter key. The number of lines of heading and footing you can add to a chart is only limited by the available real estate on the chart. The chart body will adjust to fit within the available space with the heading/footing lines inserted. You can change the font size or other presentation aspects using the editing toolbar that displays. When you are finished editing the heading and footing and edit mode is closed, the chart canvas adjusts to ensure that all lines of the heading or footing are visible, as shown in the following image.
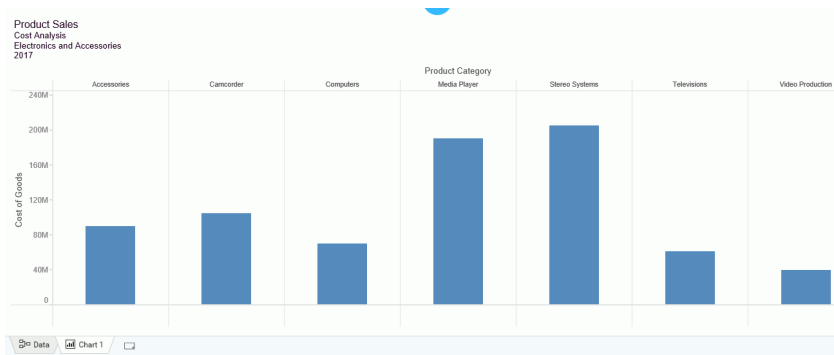
Headers and footers can contain the same type of information. Footers are not enabled, by default, but can be enabled from the Content area on the Settings tab, as shown in the following image.
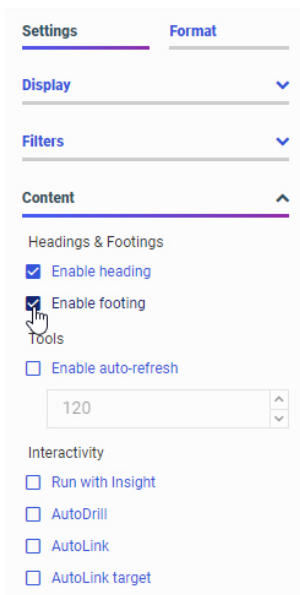
You can make styling changes to the information in your headers and footers, which allows you to interactively style the text according to your preferences. Using a WYSIWYG canvas, it delivers formatting changes instantly, allowing you to see the results of your selections as you make them. When editing your header or footer, you can find the options at the top of the canvas, as shown in the following image.

You can change the font and font size using the drop-down lists. You can add bold, italic, and underline accents to your text. In addition, you can change the positioning of your text (left, center, and right). You can also customize the color of the text, as well as the background of the header or footer text area. When your formatting is complete, you can close the toolbar and continue working with your chart.

Note: You can double-click the heading or footing to resume modifications at any time.

Procedure: How to Add Headings and Footings to a Chart

You can add and style headings and footings in a chart.

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

    Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

    Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. Add one or more measures and dimensions.

4. On the Settings tab, expand the Content area and select *Enable footing*.

The headers and footers display, as shown in the following image.
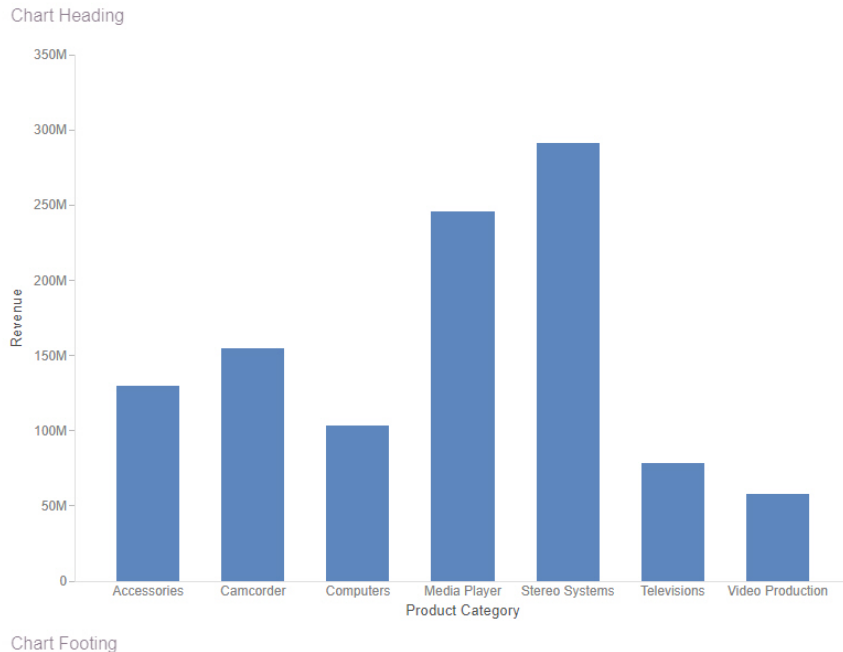
5. Double-click the heading and change it to *Sales by Category*.

   The styling options to edit the header and footer text are shown in the following image.

6. Change the font color to grey and change the font size to 20, as shown in the following image.
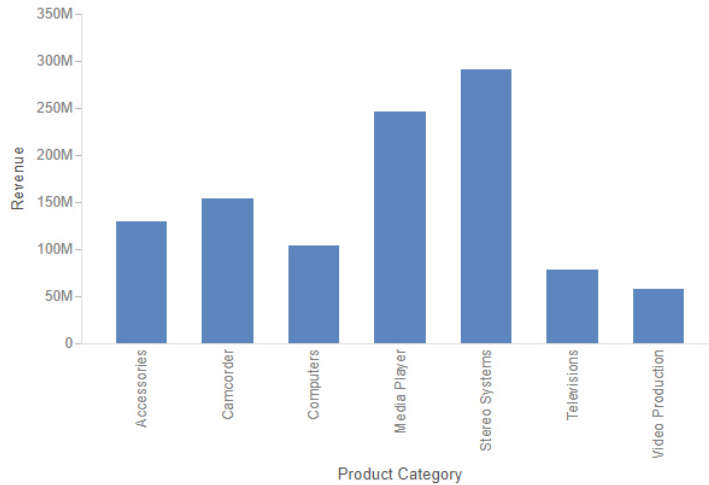
Sales by Category

7. Change the footer to read *October, 2019*.

8. Change the font size to 8 and right-justify it, as shown in the following image.

Sales by Category
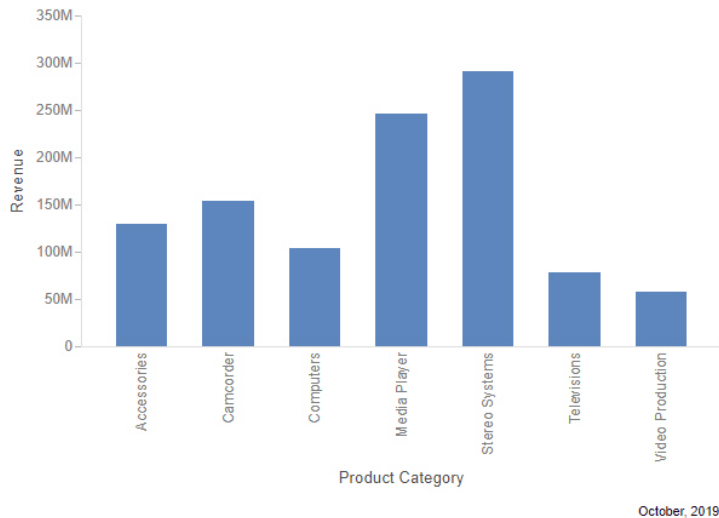
Using headers and footers, you can add the finishing touches on your charts, identifying them with useful information for your audience. For example, when sharing and distributing your charts, headers and footers can help identify and streamline your communication.

Formatting Legends in a Chart

In a chart, the legend identifies values according to the color-coded data values that display. The legend typically displays on the right side of the chart, but you can change the location using the formatting options. You can format a legend in any of the following ways:

❏ Turn the Legend On, Off, or set it to Auto.

❏ Change the font features of the legend (for example, bold or a larger font size).

❏ Change the format of the title of the legend.

❏ Access options to change background options, including setting the background color and setting the border line width, size, and color.

❏ Set the display options for the legend.

To access the legend formatting options, click the Format tab. From the quick access list at the top of the tab, select *Legend*. The Legend formatting options display in the following image.

Use the On, Off, and Auto buttons to control how the Legend appears on your chart. You can optionally select On or Off, depending on whether you want to display the legend in your chart. The legend display setting is set to Auto, by default, which displays the legend only if there are multiple series in the chart.

Note: Occasionally, charts are large and require additional real estate. Hiding the legend, or turning it off, enables you to preserve additional room as required by the chart.

Under Labels, you can format the font used for the label text in your legend. These options include Font type, Style, Size, and Color.

Depending on the type of chart you use, adding data to a specific field automatically generates a title for the chart legend. For example, the following image displays a matrix marker chart that allows you to compare the differences between values by circle size. Since the measure Gross Profit has been added to the Size bucket, the legend title for this chart shows as Gross Profit, which is highlighted in the following image.
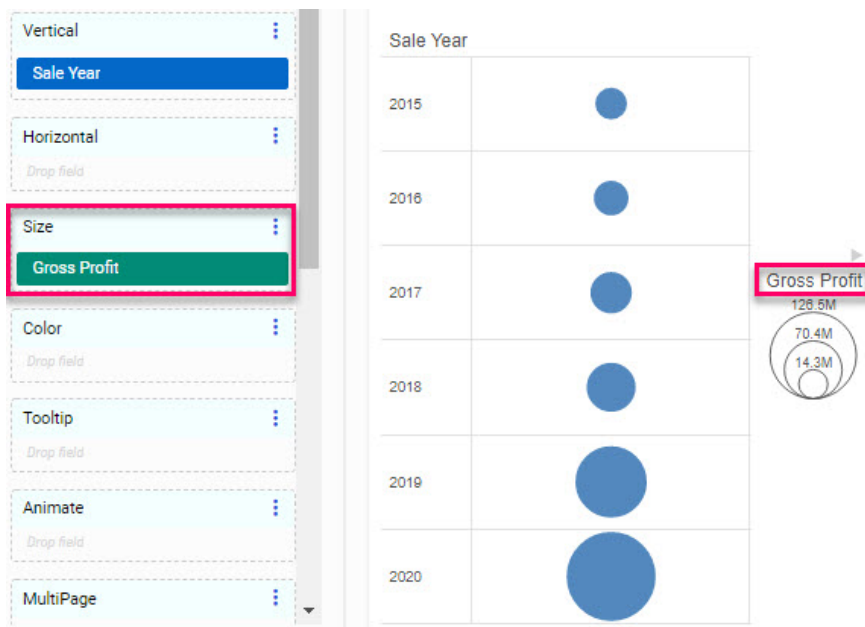
Under Titles on the Format tab, you can choose to show or hide the legend title with the *Show Titles* check box. You can also choose the font style and formatting of the legend title.

Under Other on the Format tab, you can perform tasks such as changing the position, setting the background color, and setting the border line width, size, and color. You also have options to display the legend options in reverse order and set it as collapsible.

Using Axis Options in a Chart

Depending on the chart type (for example, bar chart), you can format the axes to customize the display of the information. This includes items such as labels, titles, and font formatting. For example, you can choose to hide the labels in your chart or format the font to add clarity to your chart. You can easily customize the X and Y axis with options that suit your needs. To access these options, select *Axis* from the quick access menu on the Format tab. Other options, such as dual-axis, bi-polar axis, and split axis behavior, and a continuous time axis, are available by right-clicking a field once it has been added to your chart or using the menu next to the Vertical bucket.

You can rotate the labels in your axes as well as stagger them. This allows you to shift the display of information, which is particularly useful when your chart is very dense. You can modify the lines for individual axes, enhancing the frame of the axis on the chart. You can also show ticks, which allows you to view milestones in your data. You can also change the position of an axis, enabling you to dictate where your axis information will display (for example, right). The options on the Format tab for formatting an axis are shown in the following image.

Settings	Format

Axis ▾

X Axis ▾

Labels ︿

☑ Show label

Position

| Bottom | ▾ |

Font

| SANS-SERIF | ▾ |

| B | I |

| 9 | ▾ | pt | ▾ | ▮ |

Rotation

| Automatic | ▾ |

Stagger

| Off | ▾ |

Skip

| Automatic | ▾ |

Title ︾

Lines ︿

Axis lines

| ──── | 1 | ⌃⌄ | ▮ |

Major gridlines

| None | 1 | ⌃⌄ | ▮ |

☐ Show ticks

Color banding

☐ Show alternate

▨

In bar, line, and area charts, you can control x axis scrolling behavior from the Scroll menu. By default, the Scroll option is set to *On* and the scrollbar is enabled. When a large number of values are displayed on the x axis, a scrollbar generates so that they all have enough space to fit comfortably in the visible area of the chart. To disable the scrollbar, set the Scroll option to *Off*. When the scrollbar is not enabled, points and labels are compressed to fill the area occupied by the chart. As an alternative to the basic scrollbar, set the Scroll option to *MiniChart*. Instead of using a basic, default scrollbar setting, the minichart option provides a simplified image of the chart, with a transparent scrollbar, as shown in the following image.
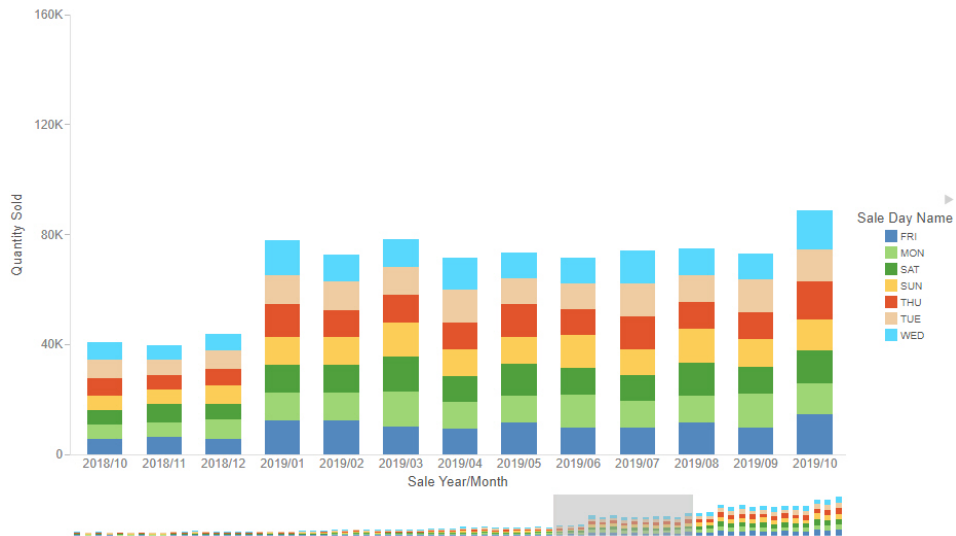
You can point to the edge of the minichart scrollbar and use the double-headed arrow cursor to change the visible area of the chart by expanding or contracting the scrollbar. To set the default minichart scrollbar size, use the Count property that appears on the Format tab when you select the *MiniChart* option. The count represents the number of values initially visible on the x axis. For example, the default Count value of 10 means that a maximum of 10 values display in the chart at all times, regardless of the physical width of the chart area.

In bar, line, and area charts, you can also choose whether the y axis, or vertical axis, should be shared between all measures, or split so that each measure is separated and generates separate bars, lines, or areas. By default, the axis is blended, so all measures share the same y axis. To split the y axis, on the Settings tab, click the menu next to the Vertical bucket (or Horizontal bucket if the axes have been swapped), and click *Split axis*, as shown in the following image.
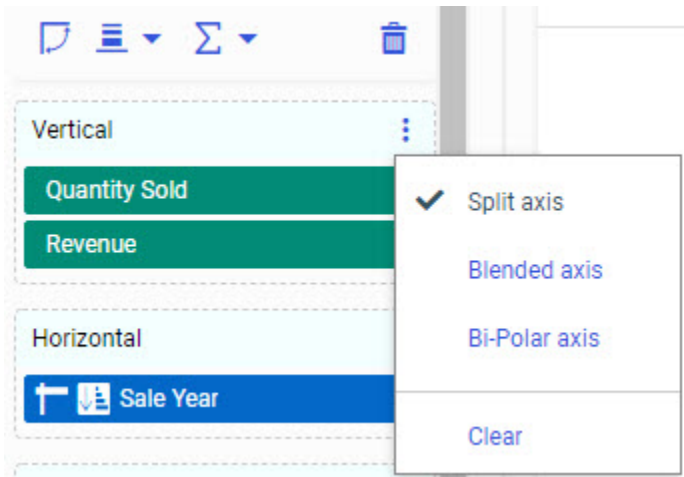
This option is especially useful if there are large disparities between the values of different measure fields. For example, the revenue values in a data source may be many times greater than the quantity sold values. To merge the axes back together, click the same menu, and then click *Blended axis*.

Alternatively, if you want to split the measure fields in a bar, line, or area chart into groups on separate axes, you can use the bi-polar axis option. The bi-polar axis option creates a second set of axes to which you can add some of your measure fields, instead of splitting each measure onto a separate axis. To enable this option, click the menu next to the Vertical bucket and then click *Bi-Polar axis*. To switch the y-axis that a measure field uses in bi-polar axis mode, click the axis icon next to the field in the measure bucket, or right-click a measure field and click *Top Axis (Y1)* or *Bottom Axis (Y2)*.

When creating a bi-polar axis chart, it may be useful to change the chart type of the risers for one of the measures on an axis to differentiate it. Right-click the measure field in the Vertical bucket (or the Horizontal bucket if the axes have been swapped), point to *Shape,* and choose whether the chart type for that measure should be bar, line, or area. The following image shows a bi-polar axis chart in which the Cost of Goods field is represented by a line chart.
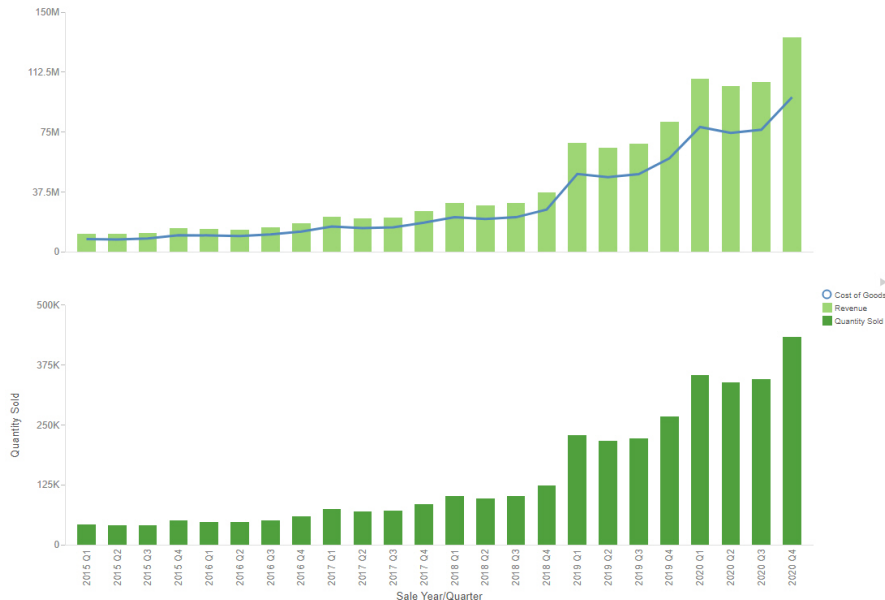
Another way to show multiple measure fields on separate axes is to use dual axes. Instead of splitting the chart into horizontal sections, one or more measure field is plotted against the y1 axis on the left, and the other uses the y2 axis on the right. To specify which axis a measure

field should use, when the *Blended axis* option is selected, click the axis icon next to the field in the measure bucket, or right-click the field and click *Left Axis (Y1)* or *Right Axis (Y2).* Each of these axes can be styled separately from the Axis options on the Format tab. When using dual axes, take note of which axis is used for each measure, as the values displayed in the chart may visually appear to be closer than they are in reality.

The same options are available for horizontal bar, area, and line charts, but affect the x axis, or horizontal axis, instead.

Procedure: **How to Format Axes**

You can format the axes of your chart to customize the display of information, including labels (rotated and staggered), titles, and axis-specific fonts.

1. Create a chart using Db2 Web Query Designer, or open an existing Db2 Web Query Designer chart.

   Axes are used in bar, line, area, scatter, bubble, and circle plot charts.

2. On the Format tab, click *General* to open the quick access menu, and then click *Axis*.

   The options for editing your axes display.

   You can select the Y-axis or edit the X-axis. The axis selection determines where changes are applied.

3. On the X-axis, perform the following formatting tasks:

   a. In the Labels section, change the font format of the labels to bold.

   b. Expand the Title section and change the size of the font for the axis title to 16. Change this to bold as well.

4. Select the Y-axis option and perform the following formatting tasks:

   a. Change the font format of the label to italic.

   b. Change the size of the font for the Title to 16. Change this to bold as well.

   When you preview the chart, you can see that styling on the axes has been modified, giving you a custom look and feel for your chart, as shown in the following image.

5. You can rotate the labels on the X-axis. In the Labels group, use the Rotation option to rotate the labels by 45 degrees, as shown in the following image.
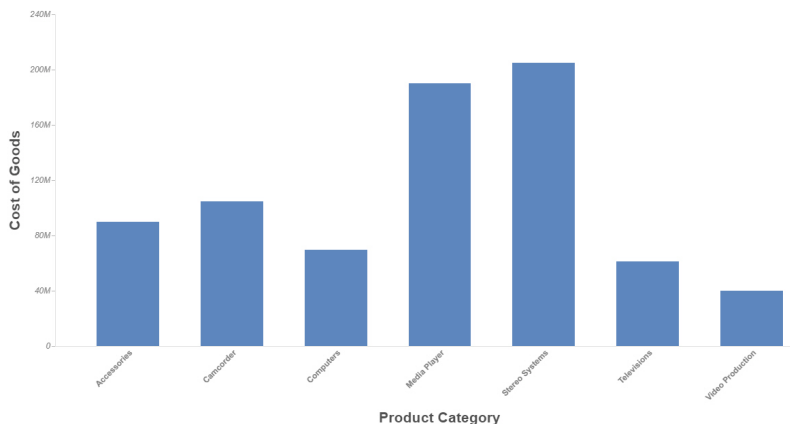
6. You can also modify the line size of the axes. In the Lines group, use the Axis lines option to change the line size for both axes to 5. Making the axes lines bigger creates a more definitive frame, as shown in the following image.
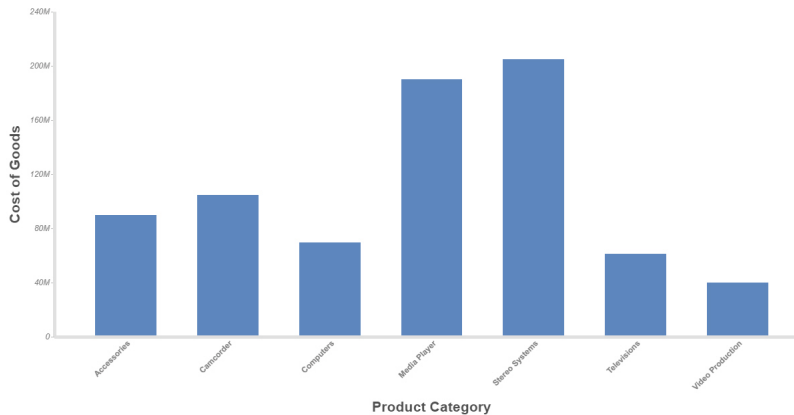
With the axes of your chart formatted, you can continue making modifications or apply similar formatting to the axes in other chart types.

Controlling the Display of Time-Based Axes

By default, when you create a chart that has a dimension on an axis, missing values are not displayed on that axis. For example, if you create a bar chart showing revenue by product category, but there are no revenue values, including zero, for televisions, then televisions will not appear on the horizontal axis in the bar chart.

However, when you create a line or area chart using a date or date-time field as one of the axes, this is not the case. In these chart types, when a date or date-time field is used, the time axis option is enabled by default. This option allows you to show the entire, continuous range of time encompassed by your data, even if there are missing values in between. Missing values are extrapolated based on the nearest values. The time axis option allows you to see changes in your data over time on a continuous scale, displaying date values more intuitively and making it easier to recognize gaps in your data.

When the time axis option is enabled, the values in the chart are plotted along a continuous date axis, as shown in the following image.
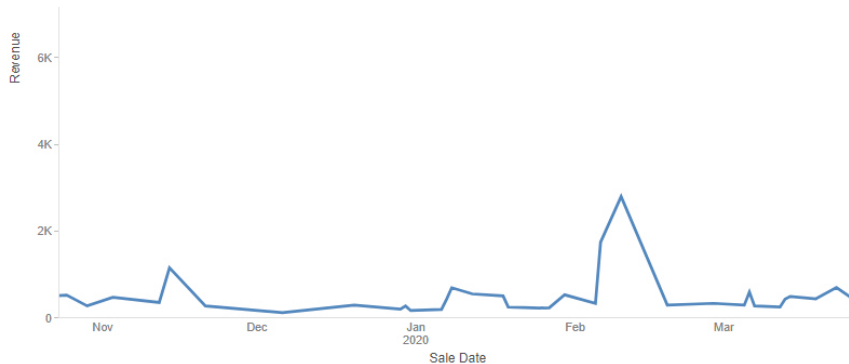
Although there were no sales between December 6 and December 20 in the image shown above, those days occupy the same amount of space on the x-axis as the days in which there were sales, and the line is extrapolated for them. The same chart with the time axis option disabled is shown in the following image. Only dates with values in the data set of the chart display. Since not all dates appear in the chart, each existing date value is labeled on the axis.
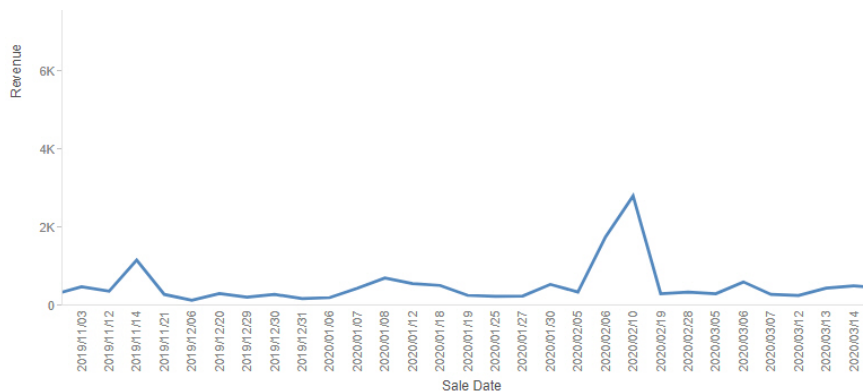
To disable the time axis option and show only the date values in your data source, right-click the date or date-time field in the Horizontal or Vertical bucket of your chart and deselect *Time axis*, as shown in the following image.
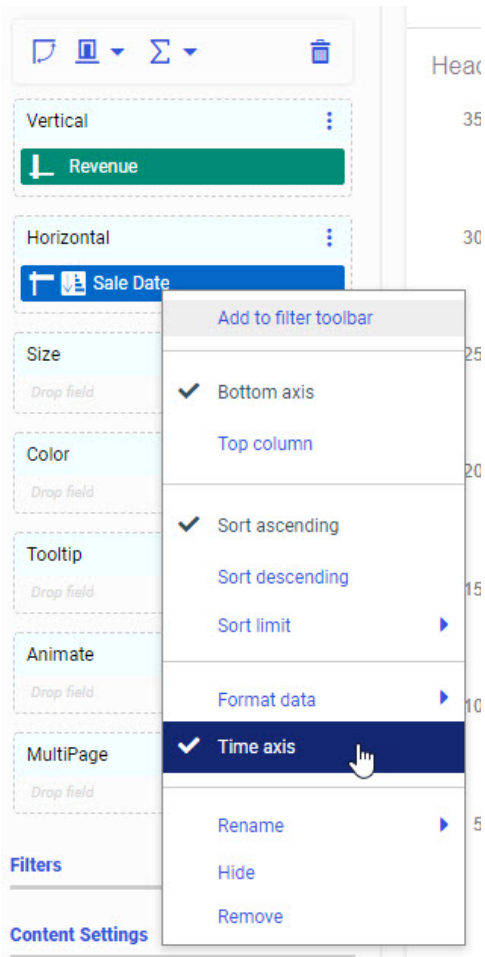
To re-enable the time axis option, right-click the date or date-time field and click *Time axis* again.

Formatting Series in a Chart

A series represents a set of related values in a chart. These could be different measure fields in a chart, or different dimension field values in a chart. You can format all series together, or format each separately, including color, shape, display options for labels, and other options, including the ability to hide overlapping labels. You can select a specific series in a chart to which to apply changes, or you can select *All Series*, which applies changes to all series in the chart.

Having the ability to format by series gives you control over your content and allows you to customize display options at the series level. For example, you might want to color code a chart based on a range of values. You can also specify options for the data labels of the series. By default, these are enabled or hidden automatically depending on the chart type, but can be turned on or off. You also have the standard suite of font options, as shown in the following image.

Different kinds of charts allow you to make different series-level style changes. For example, in a bar, area, or line chart you can set the width of all bars, or change a series to display as a line or area instead of a bar or bar segment. In a ring pie chart, you can change the size of the hole in the middle when viewing the options for all series, and on a scatter plot or bar, area, or line chart, you can add and style a trend line with different formulas for all series or an individual series. Other chart types allow different styling changes.

Additionally, some series styling options are only available when modifying all series in a chart, or only available when editing a single series. For example, when creating a bar chart, you can set the bar width for all series, but not for a single series. On the other hand, you can change the fill color for a single series, but not for all series in the chart.

When working with series in a chart, you can also set an option to control the display of data labels in your chart. The default is Auto. This gives you the ability to specify how your data will be presented (for example, by Value or Percentage), which is particularly useful in cases where you want to save real estate when using data labels in your chart, or show additional information. You can click the drop down to access a full list of content options, as shown in the following image.

You can use the following terms to decide the best way to display the content of your data labels.

❏ **Auto.** The chart engine decides what data label information to show. This is usually the value.

❏ **Label.** Shows the series label of the riser, marker, or slice (same as legend label)

❏ **Value.** Shows the value of the riser, marker, or slice, using the numeric format of the field. For example, if the field defined in the master file is US Currency with two decimal places of precision, then that is what the dataLabel will be ($123.45).

❏ **Percentage.** Shows the percentage of the riser/slice based on the group to which it belongs.

❏ **Value,Percentage.** Shows the value of the riser, marker, or slice, with numeric formatting and the percentage of the riser/slice based on the group to which it belongs.

❏ **Label,Value.** Shows the series label of the riser, marker, or slice (same as legend label) and the value of the riser, marker, or slice, with numeric formatting.

❏ **Label,Percentage.** Shows the series label of the riser, marker, or slice (same as legend label) and the percentage of the riser/slice based on the group to which it belongs.

❏ **Label,Value,Percentage.** Shows the series label of the riser, marker, or slice (same as legend label), as well as the value of the riser, marker, or slice, with numeric formatting. It also shows the percentage of the riser/slice based on the group to which it belongs.

When creating a stacked bar, stacked area, or stacked line chart, you can also select the *Show stacked totals* option to show the summed total of all series at the top of each bar or sort-value point.

You can also Wrap Data labels, which allows you to truncate available chart space or show your data on multiple lines. The following examples show how the wrapping option works.

Example of WrapDataLabel=True:

"France

$123.4

23.4%"

Example of WrapDataLabel=False:

"France, $123.4, 23.4%"

Specifically, the data label options allow you to determine what is shown when Show label is ON. For example, Label,Value,Percentage. If the option is set to Auto, the chart engine decides what it thinks is the best content to show. Typically, this is the value of the riser or slice. For example, on a basic pie chart, the Auto setting produces the following result.
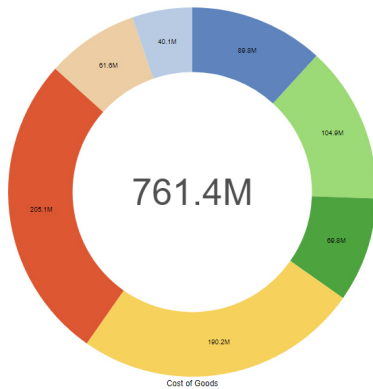
You have additional content choices. For example, you can choose Label, which corresponds to the series label that is shown in the legend. When you select the Label option, you also have the option of turning the legend off, so as not to duplicate the information that is displaying in your chart. The Label option is shown in the following image.
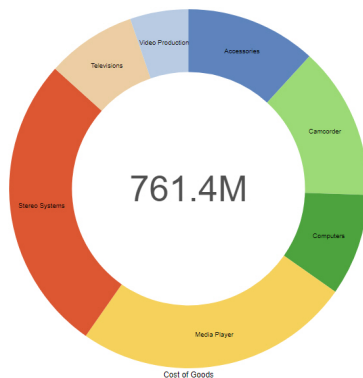
You can also choose Percent, which shows the percentage of the whole for each riser or slice. This is very useful for a pie or stacked bar chart, as these are the charts that are best used to visualize the concept of percentage-related content, as shown in the following image.
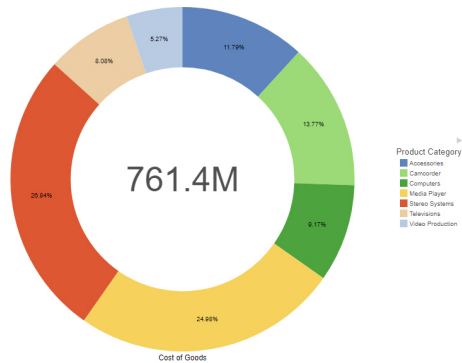
You can also display the Value, which is the riser/slice value. This is often the same thing you will get if you choose Auto.
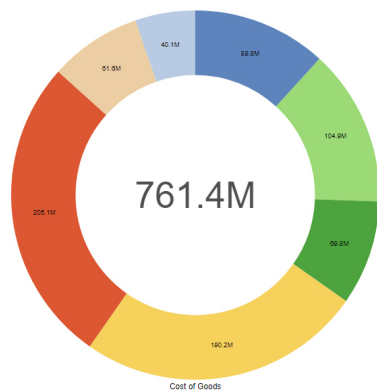
There are also options for you to combine three choices, such as Value, Label, and Percent. This allows you to display all three items, as shown in the following image.
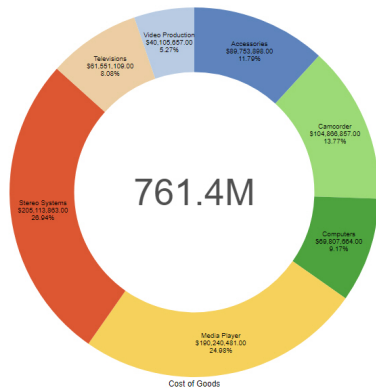
Click *Wrap Data labels* to display the content on three separate, unique lines, or clear the *Wrap Data labels* check box to display all label information on a single line.

Procedure: **How to Format a Series**

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

    Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

    Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. Create a Vertical Stacked Area chart.

4. Add a measure to the Vertical bucket, a dimension (for example, a time based dimension with month or year values) to the Horizontal bucket, and another dimension to the Color bucket, as shown in the following image.
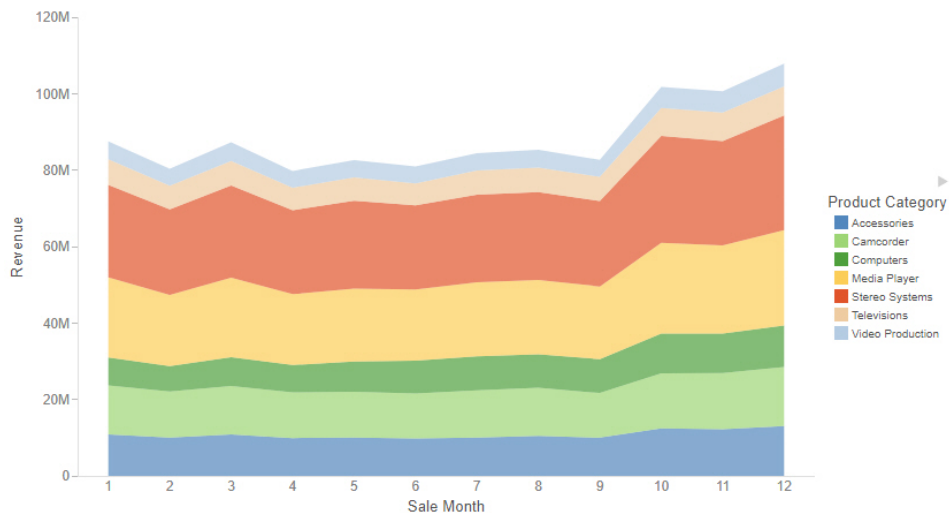
5. On the Format tab, open the quick access menu and then click *Series*.

6. In the Data labels section, in the Show label group, turn data labels on by changing the setting from Automatic to On.

   Since *All series* is selected by default, labels are displayed for every series in your chart.

7. Format the labels with 10 point, red font using the font options.

The values in the chart reflect your custom formatting, giving you a better view of your data, as shown in the following image.
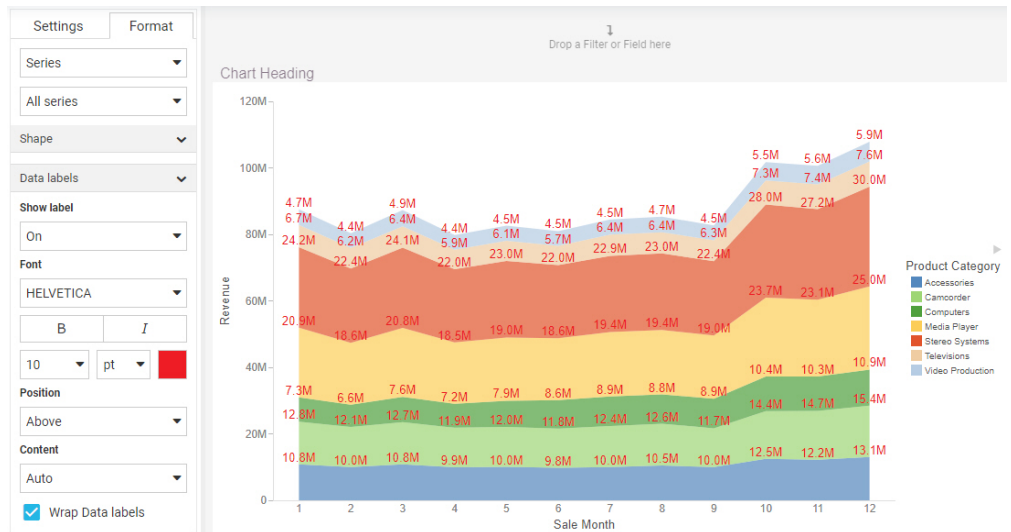
8. Change the color of one of the risers.

   a. From the series selection drop-down menu, on the Format tab, directly below the quick access menu, select a single series. Each series represents a value from the field in the Color bucket.

   If your chart contains multiple measure fields, then each series represents a measure field in addition to or instead of a dimension value.

   b. In the Shape section, change the color selected for the Fill option to a color of your choice.

The selected series riser updates to show the new color, as shown in the following image.
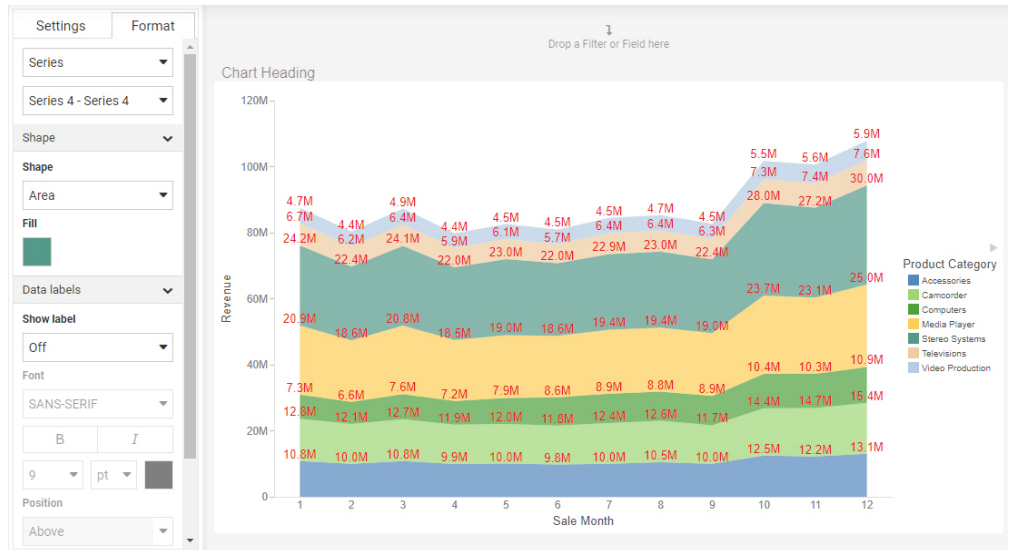
Formatting Matrix Charts

If you are working with a chart type that supports a matrix format (for example, Matrix Marker, or another chart type utilizing matrix rows and columns), Db2 Web Query Designer provides a selection of formatting options that you can use to customize and enhance the styling of your chart. A matrix format is a grid that contains values based on the intersecting data points, which is useful for reviewing changes and trends over time. Available formatting options for matrix charts include *Headers and labels*, and *Lines*, as shown in the following image.

You can customize the row and column headers and their corresponding values in a matrix chart. Specifically, you can change the font type, font size, and color. You can also change the emphasis of the font using bold or italic styling. You can also change the alignment of row values text.

When working with lines in your matrix chart, you can change the line style (for example, solid or dotted) and the thickness. These formatting options allow you to make visible enhancements that will improve the appearance and presentation of your matrix charts.

Procedure: How to Format a Matrix Chart

To format a matrix chart:

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

    Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

    Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. From the Content picker, select the *Matrix Marker* chart type.

4. Add two dimensions and two measures to the chart. These data fields should be placed in the Vertical, Horizontal, Size, and Color buckets.

5. On the Format tab, click *General* and then click *Matrix options* from the drop-down list.

6. Apply formatting changes for the matrix chart, including:

    a. Headers and labels, which allow you to customize the font options for row and column headers and values. Font options include font type, bold, italic, font size, and font color.

    b. Line style, which allows you to adjust the type, size, and color of the lines for the matrix chart.

7. Change the font being used for row and column headers to bold, red, and size 16 font.

    The updated matrix chart now displays customized row and column headers, as shown in the following image.
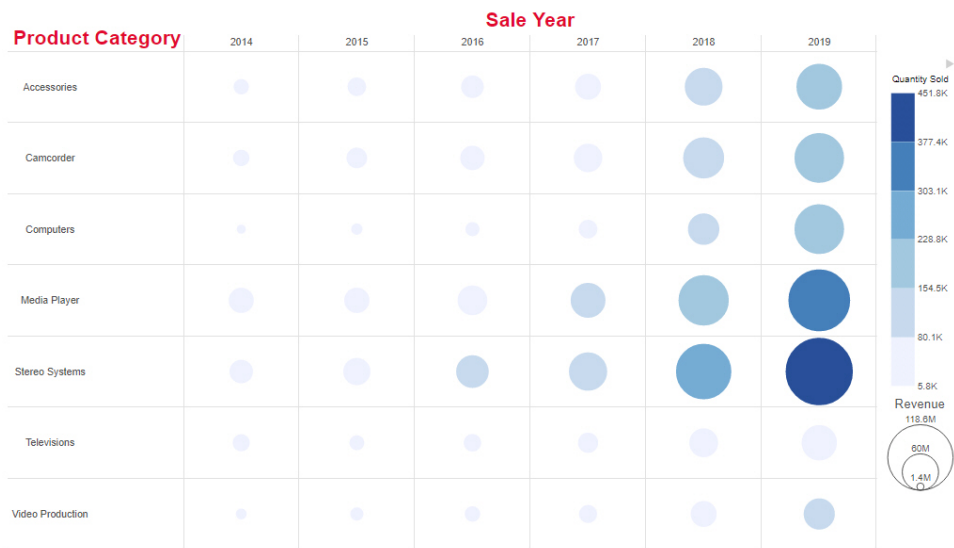
8. Using the options in the Lines section, change the line style to blue, dashed lines.

   The resulting matrix marker chart resembles the one shown in the following image.
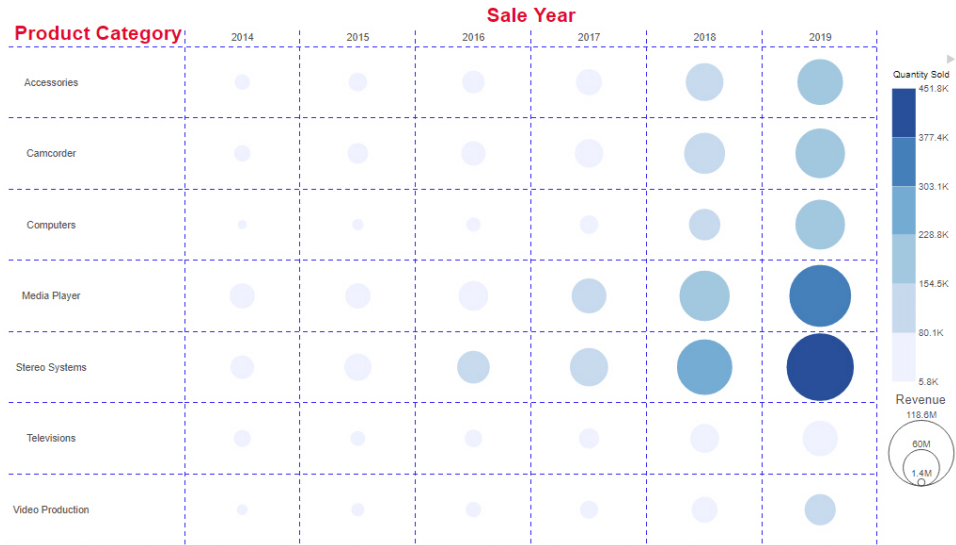
Formatting Box Plots

A box plot is a common chart type used to show key distribution information for a set of data points. A box plot displays outliers, the median, the upper and lower quartile, and the maximum and minimum with outliers excluded, by default. However, you can use the Box Plot options on the *Format* tab to show the mean, or average, as well. Additionally, you can change the display of the whiskers from lines to boxes, and change the style of the median and whisker lines.

To access the Box Plot properties when creating a box plot, click the *Format* tab and select *Box Plot options* from the Quick Access menu. The following options are available:

❏ **Show Mean.** Displays a marker at the mean point, which you can compare with the median to get an idea of the skewness of your data.

An example of a box plot with mean markers enabled is shown in the following image.
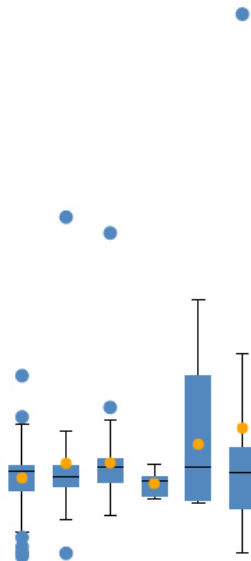
❑ **Show Hat as Box.** Changes the appearance of the whiskers in the box plot from lines to boxes.

An example of a box plot with the Show Hat as Box option enabled is shown in the following image.
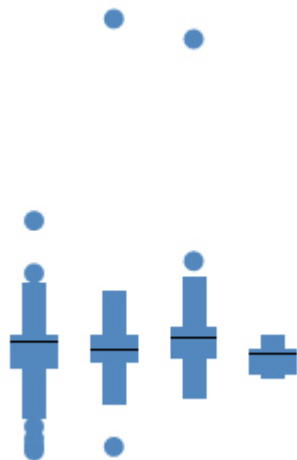
❏ **Line style.** You can change the pattern of the median and whisker lines from a solid line to a dotted or dashed line, and change the width and color of the lines.
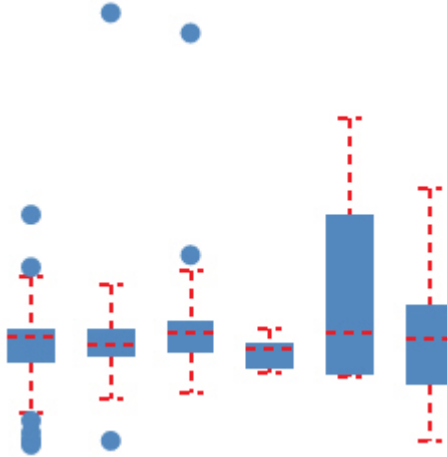
Procedure: **How to Format a Box Plot**

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

   Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

   Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. From the Content picker, select the *Statistical Boxplot* chart type.

4. Add a measure to the Vertical bucket and a dimension to the Horizontal bucket.

   A single measure value displays as a line in each column.

5. Use one of the following methods to generate a set of data for each column:

   ❏ Add a dimension field to the Detail bucket. This field should provide multiple records for Horizontal bucket value.

   ❏ Change the calculation option from Summaries to Details 🖶 . If you have a very large data source, this may generate too many records to evaluate in the box plot.

   A set of box plots appears on the canvas, showing indicators for outliers, maximum and minimum, median, and upper and lower quartiles.

6. On the *Format* tab, click *General* and select *Box Plot options* from the quick access menu.

7. Optionally, select the *Show Mean* check box to display a marker in each box plot indicating the location of the mean.

8. Optionally, select the *Show Hat as Box* check box to display the whiskers as narrow boxes on either side of the box showing the interquartile range.

9. Optionally, change the style of the median lines and whisker lines.

   Click the box showing an image of the line to change the line pattern to one of a variety of dashed and dotted lines. Use the spinner to change the width of the lines, in pixels. Click the color swatch to change the color of the lines.

   The box plot updates on the canvas as you make your changes.

10. Once you finish creating and formatting your box plot, save it, or convert it to a page to develop more content.

Formatting Data Grid Charts

A data grid is a type of chart that displays a tabular representation of your data, similar in structure to a tabular report. A data grid allows you to review data in a row and column format, similar to a printed report. Data grids are easy to create, and provide features such as a tooltip for each cell of the grid. Db2 Web Query Designer provides numerous options to style and format a data grid.

Values in a data grid can be sorted, and data grids can be shared or saved for use on a page. A data grid is shown in the following image.

Product Category	Product Subcategory	Cost of Goods	Discount
Media Player	Blu Ray	$181,112,921.00	$10,895,633.29
Stereo Systems	Speaker Kits	$81,396,140.00	$4,954,243.27
	Home Theater Systems	$56,428,589.00	$3,943,920.23
Accessories	Headphones	$51,663,564.00	$3,516,913.33
Televisions	Flat Panel TV	$59,077,345.00	$3,478,828.52
Camcorder	Standard	$49,071,633.00	$3,214,786.74
Computers	Smartphone	$44,035,774.00	$2,790,775.51
Video Production	Video Editing	$40,105,657.00	$2,695,890.76
Stereo Systems	Receivers	$40,329,668.00	$2,643,045.39
Accessories	Universal Remote Controls	$36,037,623.00	$2,310,446.31
Computers	Tablet	$25,771,890.00	$2,018,134.59
Camcorder	Handheld	$20,576,916.00	$1,959,624.28
	Professional	$35,218,308.00	$1,933,997.25
Stereo Systems	iPod Docking Station	$26,119,093.00	$1,926,925.29
Media Player	Streaming	$5,064,730.00	$338,559.94
	DVD Players	$3,756,254.00	$258,593.13
Accessories	Charger	$2,052,711.00	$187,485.88
Televisions	CRT TV	$1,928,416.00	$118,654.68
Stereo Systems	Boom Box	$840,373.00	$62,739.39
Televisions	Portable TV	$545,348.00	$38,210.18
Media Player	DVD Players - Portable	$306,576.00	$26,356.05

You can format a data grid using the options on the Format tab. The Format tab contains two sets of options, General and Datagrid options, which you can access using the quick access menu, as shown in the following image.
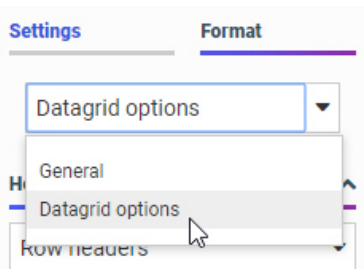
The General section provides a set of options that are common to all chart types. These options are divided into three sections: Theme, Frame and background, and Other.

The Theme section provides a menu that allows you to select a StyleSheet to automatically format the data grid. You can select from a list of themes available with Db2 Web Query, or click *Custom* to select a StyleSheet from the legacy templates or your repository.

The Frame and background section includes the following options:

❏ **Background.** Allows you to select a color for the background area behind the data grid.

❏ **Frame.** Allows you to select a color for the chart frame. This option allows you to change the data cell fill color in the data grid.

❏ **Frame Border.** The Frame Border settings are not applied to data grids. To style the borders in the data grid, use the Border style settings under Headers and values in Datagrid options.

The Other section includes the following options:

❏ **Fit to container.** This option does not apply to data grids. It is used for bar, line, area, and scatter plot chart types.

❏ **Hide null groups.** When selected, if any rows or columns in the grid do not contain any data, they are hidden at run time.

❏ **Show null as zeroes.** When selected, cells for which no data is returned show a value of zero (0). When not selected, cells with no data appear blank, which is the default.

You can also select styling options that are specific to data grids. These are listed when Datagrid options is selected from the quick access menu on the Format tab. You can also access these options by right-clicking an area of the data grid and clicking *Style*.

The Datagrid options are divided into three sections: Headers and values, Background and padding, and Other.

The Headers and values section allows you to define the styling properties of the item selected from the Headers and values menu. You can set these properties for the row headers, column headers, cell values, and column totals. The Headers and values section contains the following options for each area of the data grid.

❏ **Format.** Allows you to select the font, text formatting, font size and units, and text color.

❏ **Alignment.** Allows you to set the text alignment to the left, center, or right side of the cells.

❏ **Border style.** Allows you select the line style (for example, solid, dashed, or dotted), thickness, and color of the cell borders.

The Background and padding section allows you to style the cells in the data grid by adding bands and increasing the cell padding. Options in this section include the following:

❏ **Row color.** Allows you to add bands to the data grid to make the rows easier to distinguish. Select the *Alternate row color* check box to add alternating bands to the data grid and select a color from the Color picker to style them.

❏ **Vertical padding.** Allows you to set the vertical padding, in pixels, between the text and borders of each cell.

❏ **Horizontal padding.** Allows you to set the horizontal padding, in pixels, between the text and borders of each cell.

The Other section allows you to add column totals to the data grid and freeze column and row headers. The options in this section are as follows:

❏ **Show column total.** When selected, adds a column total row to the data grid. This row can be styled by selecting *Totals* in the Headers and values section. Show column total is not selected, by default.

❏ **Freeze column headers.** When the data grid uses a vertical scrollbar, selecting *Freeze column headers* keeps the column headers in place while scrolling so that you can see which column each cell belongs to. When not selected, the column headers are not frozen when scrolling. Column headers are frozen, by default.

❏ **Freeze row headers.** When the data grid uses a horizontal scrollbar, selecting *Freeze row headers* keeps the row headers in place while scrolling so that you can see which row each cell belongs to. When deselected, the row headers are not frozen when scrolling. Row headers are frozen by default.

❏ **Fit to container width.** When this check box is selected, the grid spans the entire width of its container. When this check box is not selected, the grid width is only as wide as is needed to show each column header fully.

Procedure: **How to Format a Data Grid**

You use the options on the Format tab to customize a data grid. These options allow you to style the data grid to match your preferences while maintaining the simplicity and clarity of the data grid chart format.

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

    Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

    Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. From the Content picker, select the data grid chart type .

4. Add fields to the data grid.

   a. In the Resources panel, with *Fields* selected from the sidebar, in the Dimensions area, expand *Product* and drag *Product,Category* to the Row field container.

   b. In the Measures area, expand *Sales* and drag *Cost of Goods* and *Revenue* to the Measure field container.

   c. In the Dimensions area, expand *Customer* and drag *Customer,Business,Region* to the Column field container.

   A basic data grid has been created, showing Cost of Goods and Revenue sorted by Product Category across Customer Business Region.

5. Add a header to the grid.

   a. Double-click the Chart Heading text.

      The text is highlighted and Rich Text Editor displays.

   b. Type *Regional Sales* into the chart heading area and click the X on the styling toolbar.

      The chart header is changed to *Regional Sales*.

6. Open the Format tab.

7. Change the background color of the cells to seafoam green.

   a. In the Frame and background section of the Format tab, click the color sample under Frame.

      The color picker opens.

   b. Click *More* to access the color wheel. Select seafoam green by clicking on the wheel in a location between cyan and green, and then using the brightness slider to select a light seafoam green color. Alternatively, type a hex code value into the text box. For example, #adebcc.

   c. Click *OK*.

      The data cells in the data grid now have a seafoam green fill.

8. Access additional styling options for the data grid. Open the quick access menu and select *Datagrid options*.

9. Make the across column headers bold.

   a. From the Headers and values drop-down menu, select *Column headers*.

   b. Click the *Bold* button to make the text bold.

10. Add pink bands to the grid.

    a. Expand the Background and padding section.

    b. Select the *Alternate row color* check box.

The rows now alternate between the seafoam green background and the default gray bands.

   c.   Click the color sample under the Alternate row color check box.

The color picker opens.

   d.   Select the pink color from the palette.

Now the data grid shows alternating seafoam green and pink rows.

11.   Add column totals to the grid.

   a.   Expand the Other section.

   b.   Select the *Show column total* check box.

The column total row appears on the data grid.

12.   Style the column row total by changing the text and border color to purple.

   a.   From the Headers and values drop-down menu, select *Totals*.

   b.   In the Format subsection, click the color sample to change the text color for the column totals.

   c.   Click *More* to access the color wheel, then select a shade of purple.

   d.   Click *OK*.

The column totals now show in purple text.

   e.   Add a purple border to the columns total row.

In the Border style subsection, click the color sample to open the color picker. From the Custom Colors palette, select the same purple color that you used for the text. This color was automatically saved and added to the Custom Colors palette.

   f.   Click *OK*.

The text and border for the column totals now use the same shade of purple.

An example of what the resulting grid may look like is shown in the following image.

Regional Sales

Customer Business Region	EMEA		North America		Oceania		South America	
Product Category	Cost of Goods	Revenue	Cost of Goods	Revenue	Cost of Goo...	Revenue	Cost of Goods	Revenue
Accessories	$47,667,849.00	$68,812,972.66	$37,497,499.00	$54,160,885.45	$210,350.00	$307,271.64	$4,378,200.00	$6,327,208.78
Camcorder	$55,719,355.00	$82,072,171.39	$43,674,921.00	$64,321,724.39	$220,053.00	$335,357.69	$5,252,528.00	$7,736,448.77
Computers	$34,948,949.00	$52,021,126.36	$31,290,768.00	$46,016,670.36	$209,404.00	$303,155.55	$3,358,543.00	$4,975,529.85
Media Player	$101,282,350.00	$131,149,716.01	$79,074,473.00	$102,126,619.99	$475,372.00	$614,525.95	$9,408,286.00	$12,182,197.41
Stereo Systems	$109,228,523.00	$155,135,141.39	$85,362,237.00	$121,223,155.58	$481,962.00	$681,320.76	$10,041,141.00	$14,255,315.79
Televisions	$33,216,062.00	$42,288,326.80	$25,181,792.00	$32,072,458.16	$149,789.00	$190,177.46	$3,003,466.00	$3,830,170.39
Video Production	$21,304,481.00	$30,836,679.29	$16,726,755.00	$24,225,768.90	$90,544.00	$130,744.67	$1,983,877.00	$2,860,083.76
TOTAL	$403,367,569.00	$562,316,133.90	$318,808,445.00	$444,147,282.83	$1,837,474.00	$2,562,553.72	$37,426,041.00	$52,166,954.75

Customizing a Gauge Chart

A gauge is a simple chart that allows you to display basic KPI values. You can choose to display these values with a standard or simplified dial graphic, or alone, as text only. The default, simple, gauge type is shown in the following image.

You can change the gauge type from the display options, above the buckets on the *Settings* tab. Use the default, Simple option to show a simple gauge dial, use the Circular option to show a gauge dial with a pointer and tick marks, or use the KPI option to show text only.

When you create a gauge, the Gauge Properties option becomes available on the *Format* tab. You can change the following properties of the gauge label and value text:

❏ Label

    ❏ **Show label.** Select this check box to show the name of the measure field represented by the gauge. This text only displays when using the Circular or KPI display options. For example, the following image shows a KPI gauge with the label position set to *Top*.

    The following image shows a KPI gauge with the label position set to *Bottom*.

    ❏ **Position.** You can choose to place the measure label above or below a circular or KPI gauge.

    ❏ **Font.** Change the typeface, font style, size, and color of the label text as it displays in a circular or KPI gauge.

❏ Value

    ❏ **Show value.** When creating a circular gauge, select this check box to show the gauge value as text, or clear it to hide the text and only show the value graphically. The simple and KPI gauge types always show the value text.

❑ **Font.** Change the typeface, font style, size, and color of the value text as it displays in the gauge. When using the simple gauge type, you can also leave the *Enable font autosize* check box selected to have the value text automatically resize to fill the inside of the gauge, or clear the *Enable font autosize* check box to set a consistent font size for the value text.

Adding a Theme to a Chart

A theme is used to determine the coloring and hues that display in the charts you configure using Db2 Web Query Designer. For example, the default border color and chart colors are determined by the theme.

When creating stand-alone content, the default theme is Designer 2018. When you turn the visualization into a page by adding a second new content item, the theme used for the chart is applied to the page. When you add items to the page, either by creating them or adding them as external content, the page theme is used as the default for all content items. You can then change the theme for each individual item.

You can use one of the themes included with Db2 Web Query, or you can create your own theme. For example, you may want to apply a corporate standard theme to your chart. You can add and change themes to suit your requirements (for example, branding).

Available themes that are called by Db2 Web Query Designer are located in the Themes folder in the Global Resources area, accessible from the Workspaces tab of the Db2 Web Query Hub or Home Page, as shown in the following image. Custom themes can be added to folders within the Custom folder.
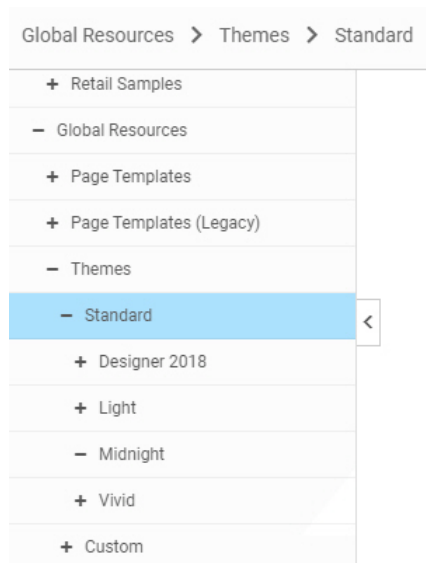
Supported formats for themes include .css and .sty. A .css theme file is used to style a page, while .sty file is used to style content such as charts and reports. When files called theme.css and theme.sty are placed into the same folder in the custom themes folder of the Global Resources area, they are available for selection in Db2 Web Query when editing page components and content items. The two files are associated, so when the .css theme file is applied to a page, the associated .sty theme file is applied to new content in that page, by default. Similarly, if you select a theme for a chart, which uses the .sty file, then when you convert to a page, the associated .css file is used as the default page theme.

You can develop your own theme using the Db2 Web Query text editor and then access it in Db2 Web Query Designer. You can customize the .sty theme file used for charts and reports by specifying a set of default property values in it.

Tip: You can use the code from an existing theme as a model when creating a new theme.

Note: Charts and reports created for use on pages can use a transparent background to allow the defined background color of the page containers to show through. Since the themes used for charts and reports (.sty files) can be associated with themes for pages (.css files), you can coordinate the background, text, and element colors used in both themes to create content with unified styling. At design time, the page theme associated with the chart or report theme is used for the canvas background. This is for visibility purposes only, and shows how the chart or report will appear when added to a page with the associated theme. The stand-alone chart or report does not include this background.

If a chart or report is run stand-alone instead of being added to a page, the run-time view displays a white background only. This means that if, in order to display on a dark colored page, the font color in the selected theme is defined as white and uses a transparent chart background, then the text will not be visible on the white preview background. An example of such a theme is the Midnight theme, provided as one of the default themes in the Global Resources. To view the white text, build your chart or report on the canvas, add it to a page container with a dark background, or change the chart background color from the Format tab. Note that a non-transparent chart background is layered in front of the panel background when the chart is part of a page.

Procedure: **How to Add a Theme to a Chart**

You can add a theme to a chart to color the background and components of your chart. If the chart is in a page, the default theme is the one used in the page. If the content is stand-alone, so that there is no page from which to inherit the theme, the default theme is called Designer 2018.

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

    Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

    Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

If you start creating content without changing the theme, the default theme is used, as shown in the following image.
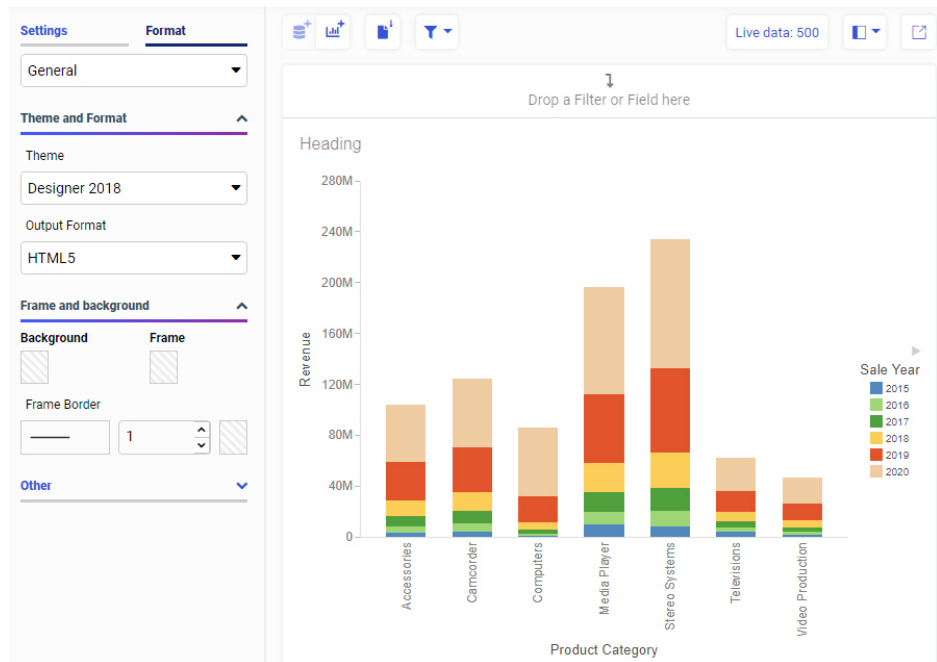
3. On the Format tab, with the General option selected from the quick access menu, in the Theme and Format section, open the Theme drop-down menu.

A list of available themes is displayed. As shown in the following image, you can choose from the Designer 2018, Light, Midnight, and Vivid themes that are included with Db2 Web Query, a custom theme added to the Global Resources area, such as the themes Alex's Theme, Custom Theme, or MyTheme shown in the image, or click *Custom* to select a legacy theme or a theme saved to a workspace folder.
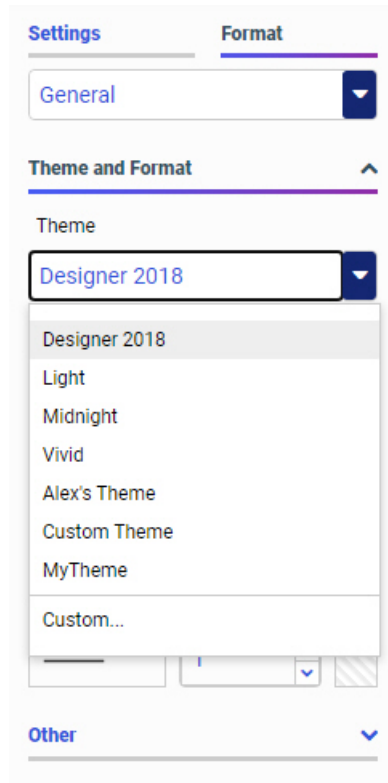
4. Select another theme from the list (for example, Light) to change the theme.

The color of the background and chart components changes based on the selected theme, as shown in the following image.
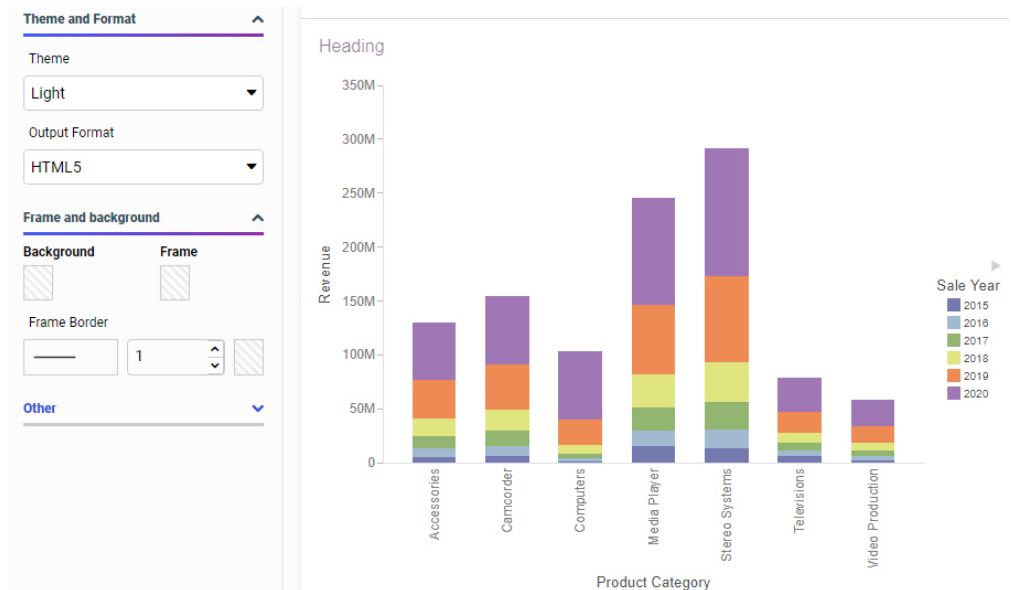
5. Click *Convert to page* on the Visualization toolbar to transform the chart into a page and move it into a container.

   The visualization transforms from a single content item into a page. Notice that the page adopts the theme that was used for the original content item. Additionally, the content item now has a theme of *Inherit Page Theme*, so that if you change the theme of the page, the theme of the content item changes along with it.

6. Add fields to the new chart to create a second content item. Notice that it also initially uses the same theme as the page.

7. Click the page toolbar or select the Visualization item from the outline to select the entire visualization.

8. Click the *Format* tab select a different theme from the Theme drop-down menu, for example, *Midnight*.

   Notice that the theme of both content items have also changed to match the page, since they have a theme setting of *Inherit Page Theme*.

9. Select one of the items on the page and, on the *Format* tab, with the *General* area selected, change the theme.

The content item whose theme you explicitly set has changed, while the second item, for which a theme was not explicitly selected, still uses the theme used for the page, as shown in the following image.
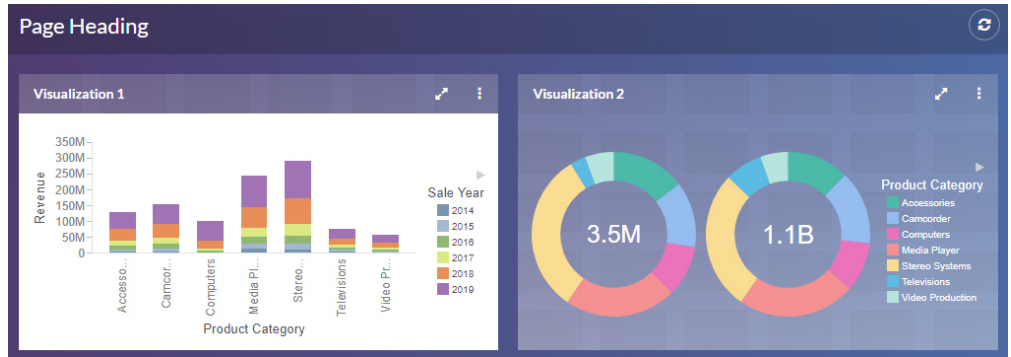
Adding Colors to Charts

By adding color to your chart components, you can change the way information is perceived and plays a large role in the effectiveness of your chart.

Color adds contrast to your charts, giving you an advantage in presenting unique, well-balanced content. You can use color to highlight a specific aspect or outcome on your chart. Db2 Web Query Designer provides a color picker to add color and style your chart.

You can access the color picker in two primary ways: on the Format tab and at the top of the canvas when formatting headers and footers. Using these options, you can change the color of different components to style your chart. You can indicate color values and ranges to highlight data. You can color a chart component (for example, a header or axis), text, or even add colored lines to accentuate the background grid of your data. You can also change the theme, which changes the color palette and background of your chart.

The following image shows an example of color options that display on the Format tab (with the palette exposed), which you will also see in other areas where color formatting is supported:
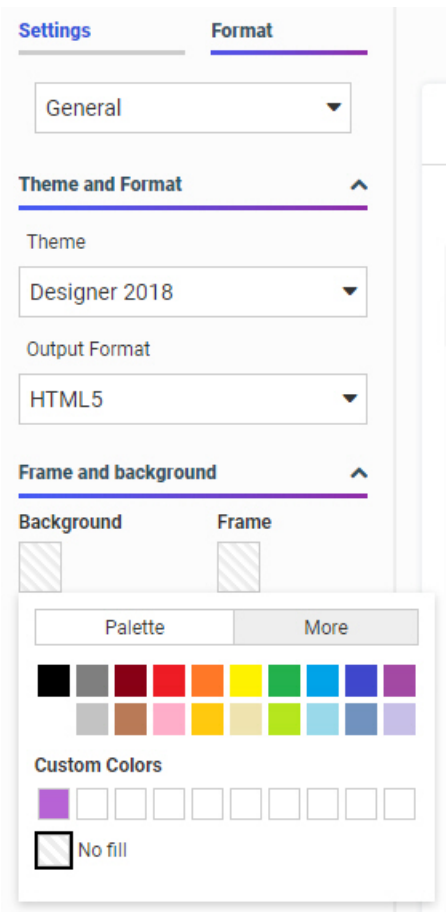
The following image shows the options that display at the top of the canvas (with the palette exposed) when working with headers and footers.
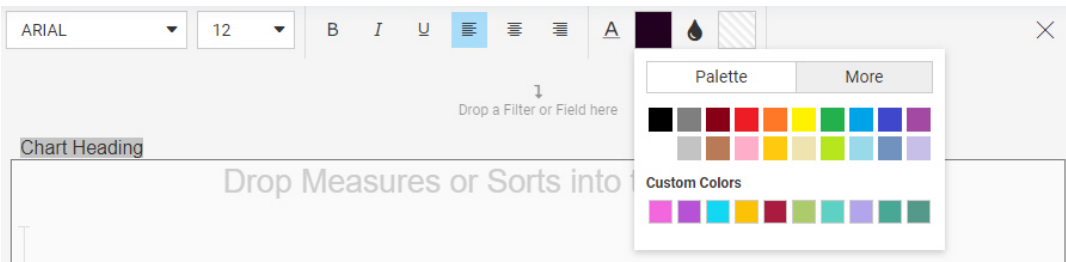
Note: When specifying a theme, you can use the default or specify another one. The colors stored for the theme are part of the underlying .css or .sty file, which contains the color schemes.

In Db2 Web Query Designer, the color picker supports a colorspace and a palette-based approach, as shown in the following image.
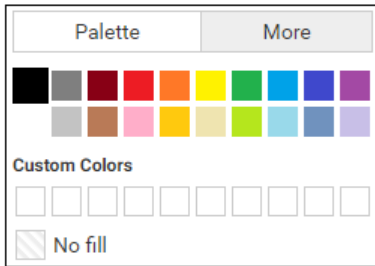
You can access the color picker from any of the sections on the Format tab. You can also access the color picker when working with headers and footers. When you access the color picker, the color picker displays the Palette tab, by default. From this tab, you can select from up to 20 pre-defined color options. You can also select the *No Fill* option, which displays the selected content as transparent. This is particularly useful in cases where you might want to prevent (or hide) the display of information.

The More tab allows you to choose a custom color by interacting with a hue wheel and the color value field, as shown in the following image.
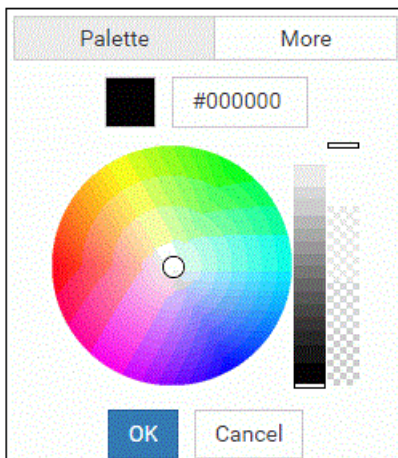
You can specify an exact color code (hexadecimal or HTML) by entering it in the color value field located at the top of this tab, and also specify transparency by using the transparency slider.

Note: When a custom color is selected and you click *OK*, the color is automatically added to the Custom Colors section in the Palette tab.

You can also set a color range for a measure in your chart. This allows you to specify hues or ranges of color for use in your chart. In cases where Theme is not selected, the color specification overrides what is available in the theme. The color that you select dictates the legend, which in turn displays the various chart components, based on the colors and measurements specified.

To change the color scale options, right-click a measure in the Color bucket and select *Set color ranges*, as shown in the following image.
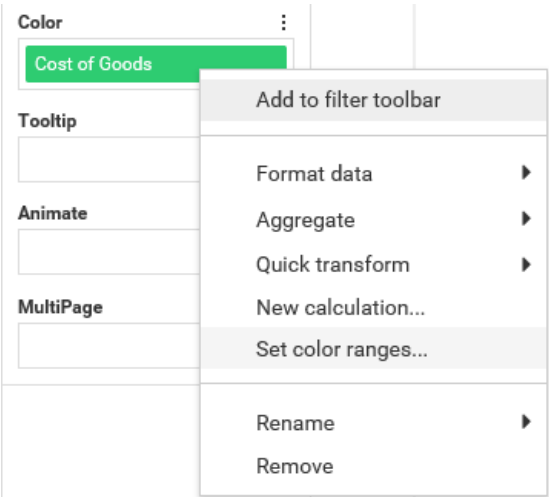
This invokes a new dialog box, Set Color Ranges, where you can select a color range for your chart, as shown in the following image.
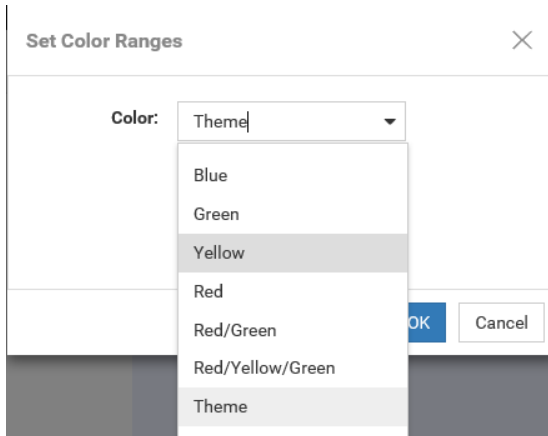
When you make a selection, you can override the color schemes that are available from the theme of your chart. Theme is selected, by default. You can select a different color range, such as Green or Red/Orange, from the list of options, which gives you more control over how color is used in your chart to create contrasts between various aspects. For example, if your chart displays different temperature values using a measure in the Color bucket, you may wish to use the Red/White/Blue option to intuitively show higher temperature values in red and lower ones in blue

If you change the color range to something other than Theme, it is written as inline styling in the .fex file. Inline styling always overrides what is in the StyleSheet because it is listed after it in the .fex file. In this case, the last setting indicates which styling takes precedence. When the color range is set back to Theme, the inline styling is removed so the behavior returns to the theme's settings.

This behavior does not affect your ability to change themes on the Format tab. However, if you change the theme with an inline setting in place, the settings of the Theme will still be overridden by the inline settings and the color scale in the legend will not be affected. The current procedure only respects the current theme's settings if the color range setting is set to Theme.

In the Set Color Ranges dialog box, you can also select *Continuous* or *Discrete* to determine how the color scale is generated. When Continuous is selected, the color scale is a gradient, and each color in the color scale represents a different value. When Discrete is selected, the color scale is divided into segments. Each color in the color scale represents a range of values.

The following image shows a matrix marker chart that uses the Red/Yellow/Green color scale with the Continuous option selected.
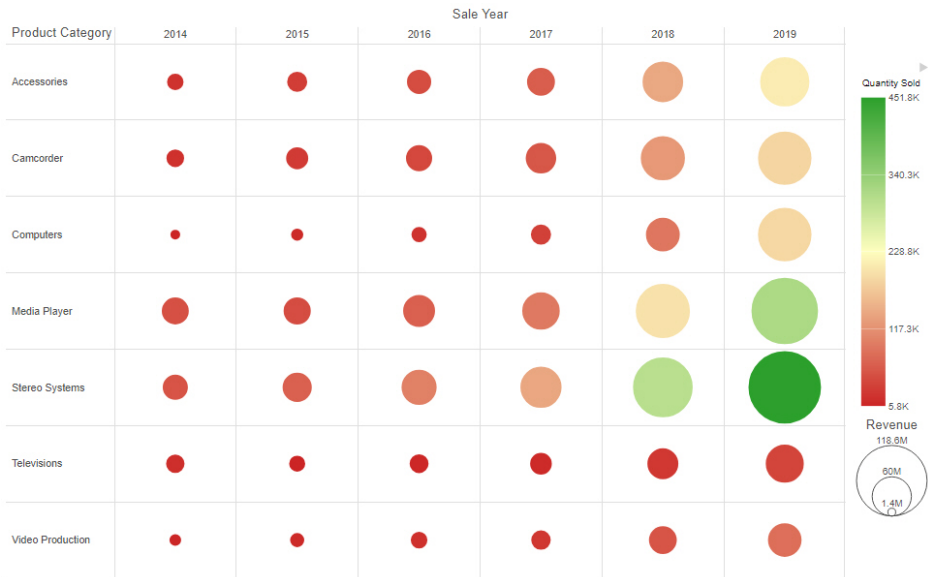
The Continuous option creates a more granular color scale, allowing you to see slight differences between similarly colored chart components.

The following image shows the same chart, with the Discrete option selected.
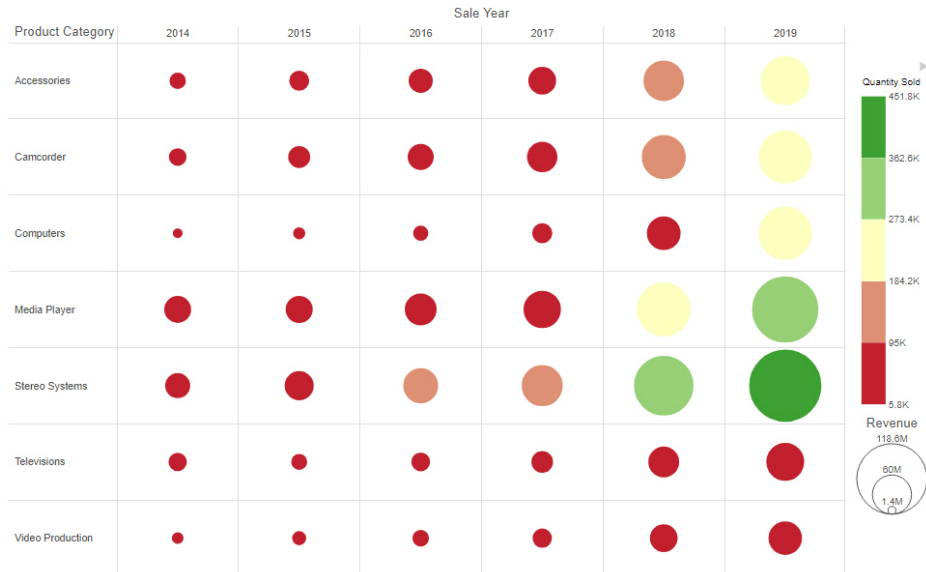
The Discrete option creates identifiable groups based on sections of the color scale.

When using the Theme color scale option, the default color scale type and number of segments in discrete mode are dependent on the values of the colorScale property in the theme that you are using. For example, if 5 colors are listed for the colorScale property in StyleSheet being used as your theme, then 5 colors display in the color scale when the discrete option is used.

Procedure: How to Add Color to Your Chart

To add color to your chart:

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

   Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

   Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. Add one or more measures and dimensions to your chart.

4. On the Format tab, expand the quick access menu and then click *Axis* from the drop-down list, as shown in the following image.
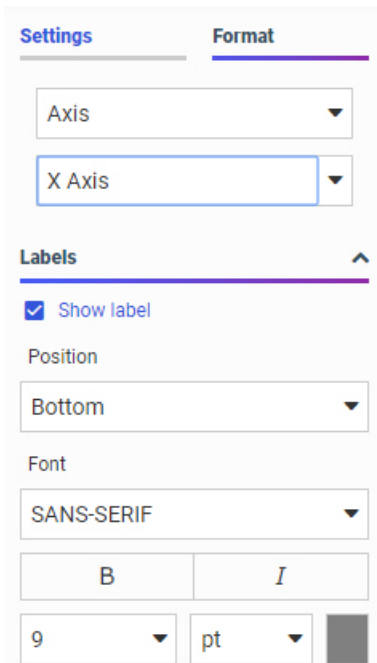
5. In the Font section, click the color sample.

   The color picker displays, as shown in the following image.
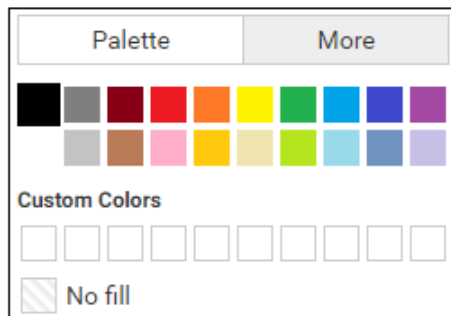
The text color you select is displayed for the values on the specified axis (for example, x-axis), as shown in the following image.
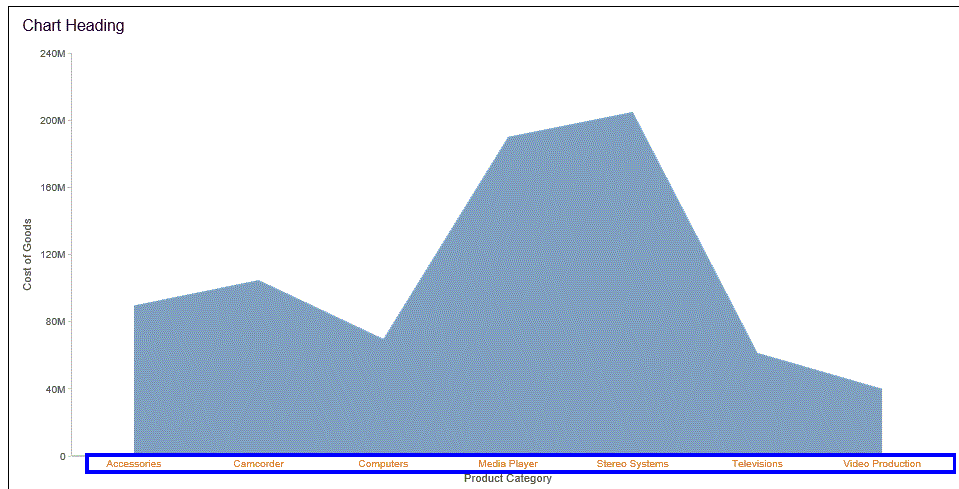
Procedure: How to Change the Color Scale in a Chart

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*..

   Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

   Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. Add one or more measures and dimensions to your chart.

4. Add a measure to the Color bucket.

   Many different chart types generate a color scale from the Color bucket. Exceptions include the ring pie and data grid chart types.

5. Right-click the measure field in the Color bucket and click *Set color ranges*.

The Set Color Ranges dialog box displays, as shown in the following image.
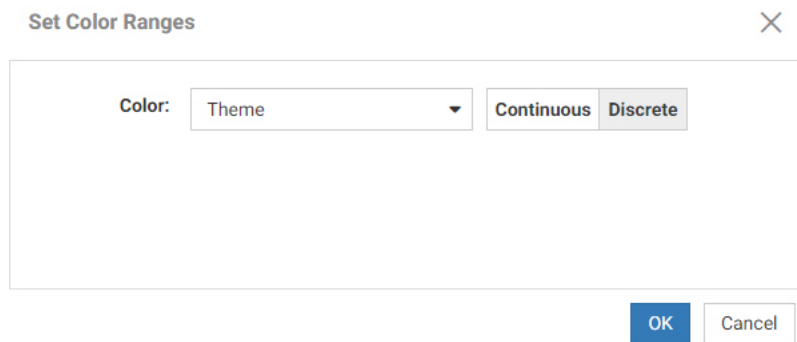
6. From the list of colors, select a color range, as shown in the following image.
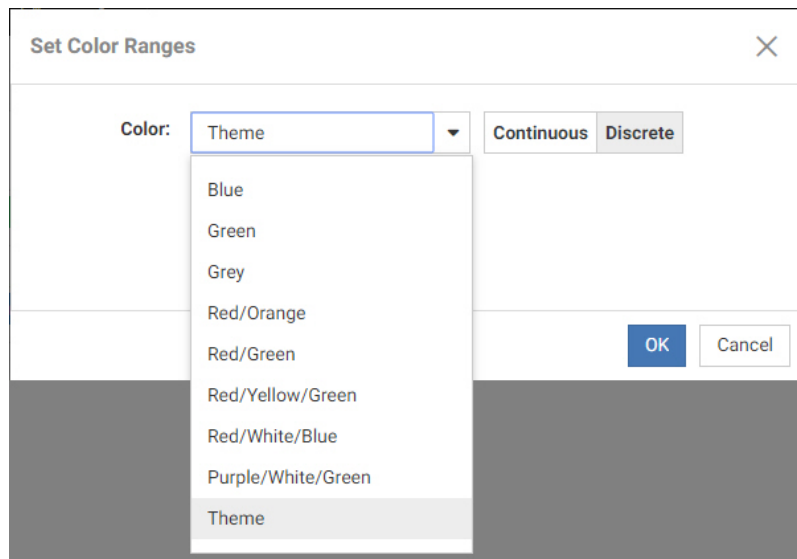
7. Optionally, select *Continuous* or *Discrete* to determine how the color scale is generated.

   When Continuous is selected, the color scale is a gradient, and each color in the color scale represents a different value.

   When Discrete is selected, the color scale is divided into segments. Each color in the color scale represents a range of values.

8. Click *OK*.
   Note the change in the color and hues in your chart.

Changing the Size of Charts and Risers

By default, when you create a chart, it fills the frame in which it is run, and risers and other sections within the chart are sized accordingly. This makes the chart flexible, allowing it to run in large and small containers alike without sacrificing the appearance and legibility of the chart. This automatic sizing also means that you do not need to manually set any size properties for the chart.

However, you also have the option to set a consistent size for the chart, if you prefer. You can also determine the width of bars in a bar chart as a percentage of the riser area, and set the width of risers in a bar, area, or line chart, based on the font size of the ordinal axis, or on an exact value that you specify.

You can set a static height and width for a chart, so that it remains the same size no matter where it is loaded. This can be useful, for example, if you want to add the chart to a PowerPoint presentation or PDF, and want to leave room for other content on each slide or page. To set the size of your chart, on the *Format* tab, select *General* from the quick access menu. In the Other section, notice that the Fit to container option is set to *Automatic*, by default, so that the chart automatically resizes to fill its container. To specify a size for the chart, change this setting to *Manual*, and then provide a width and height for the chart, in pixels. As you set these dimensions, you can select the *Lock Aspect Ratio* check box so that as you change the width or height, the other dimension changes as well, to maintain the same aspect ratio.

In bar, area, and line charts, values are represented by the height of a bar, area, or line at different points along the ordinal axis, which displays different dimension value labels. These points are generically called risers. You can set the width of these risers to fill the width of the chart, resize them based on the font size of the ordinal axis labels, or resize them manually by specifying a number of pixels.

To access these options, on the *Format* tab, select *Series*, and leave *All series* selected. By default, the riser width automatically adjusts based on the width of the chart to fill it evenly. In the Shape section, change the Riser Width property to *Tie to ordinal font size* to have the riser width increase with the size of the dimension labels on the ordinal axis of the chart. This is most useful in charts that are oriented horizontally, so the risers and labels occupy roughly the same amount of vertical space. To change the font size, on the *Format* tab, select *Axis* from the quick access menu and then select *X Axis* from the axis drop-down menu. The Labels section includes the options to change the font size of the axis labels. In the following image, the font size was increased to 18, and, since the Riser Width property was set to *Tie to ordinal font size*, the width of each riser has also increased accordingly.
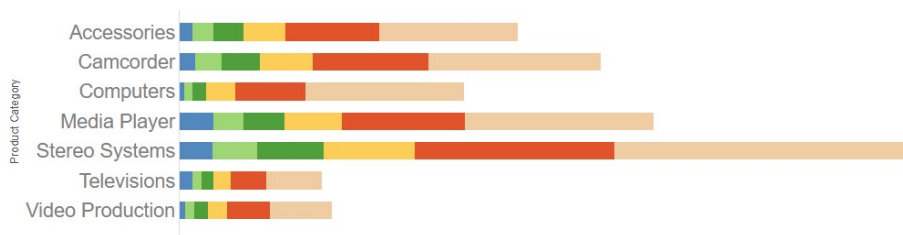
You can also set the width of each riser in pixels. Set the Riser Width property to *Manual* and then use the slider to set the riser width. If the riser width is too wide to fit all risers in the chart frame, a scrollbar is added.

In bar charts, you can also set the percentage of the riser area that each bar or set of side-by-side bars occupies, using the slider for the Riser Spacing property. Reducing this value increases the amount of space between bars.

Creating Maps to Illustrate Trends

You can create maps to identify patterns or trends in your data. By converting data into values that can be displayed on a map, you are able to visualize scenarios, illustrate hot spots, and identify potential problem areas. For example, a law enforcement agency may use mapping functionality to identify areas of higher crime within the locations they cover. You can also use maps to determine how places are related, understand where things are located, and identify the best actions to take. By illustrating trends on a map, a decision maker can identify patterns easily, and reach conclusions sooner.

You can access Map options from the Format tab, as a special tab is activated when a map is initiated. This tab is shown in the following image:
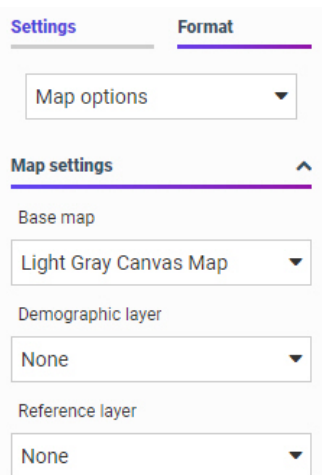
You can format maps to display areas of emphasis through the use of demographic and reference layers.

A Brief History of Mapping

An early example of how maps can be used to illustrate trends is the case of Dr. John Snow, an epidemiologist who was one of the first to use data to map occurrences of cholera to find the cause of infection. By plotting the cholera data on a map of a town, Dr. Snow was able to visualize a trend that showed higher incidences of cholera closest to water pumps. This example is shown in the following image.
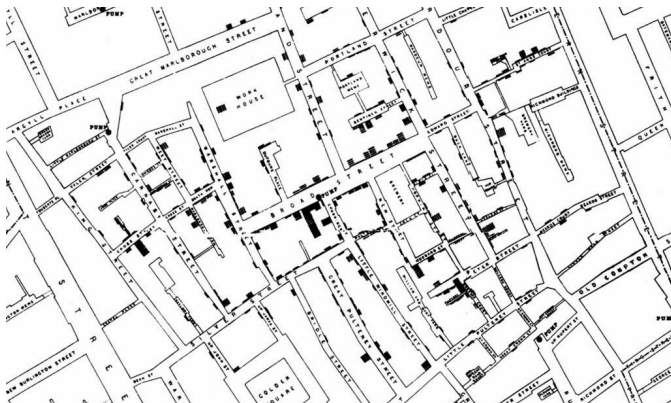
Maps also allow you to measure size, shape, and distribution to detect and quantify patterns, and even perform predictive analytics. An example of how maps can help detect and quantify patterns is the scenario in which a state agency used a mapping application to solve a problem with their food stamp system. Using this application, odd food stamp redemptions, such as rounded numbers transactions, were discovered. By plotting those transactions on a map, the agency discovered that the redemptions appeared in the same geographic location. Upon further investigation, the agency identified that individuals were selling their food stamps at reduced prices, $50 worth of food stamps for $40 in cash, to others instead using them as intended. This map example is shown in the following image.

Citizen	Date	Amount
Jane Smith	01/03/2015	35.26
Jane Smith	01/05/2015	44.12
Jane Smith	01/10/2015	12.42
John Wilson	01/02/2015	100.00
John Wilson	01/08/2015	50.00
John Wilson	01/11/2015	75.00
Mary Johnson	01/03/2015	23.24
Mary Johnson	01/06/2015	14.32
Mary Johnson	01/11/2015	34.88
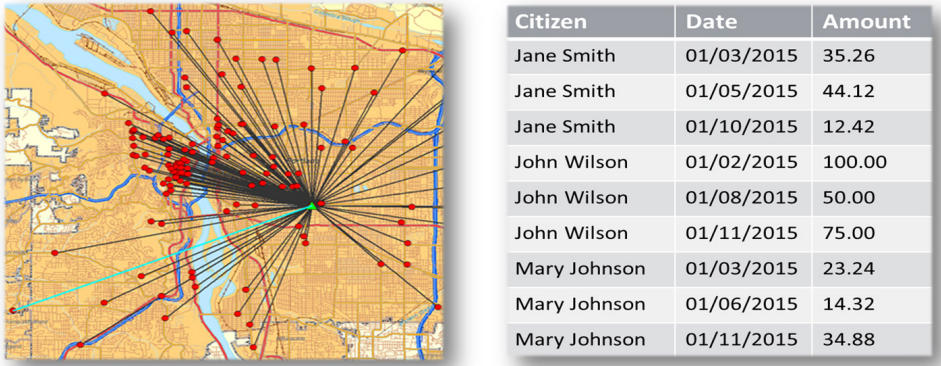
When working with maps, the concepts of location intelligence and business intelligence are important to understand. A Geographic Information System (GIS) captures, stores, analyzes, manages, and presents data linked to a location, while Business Intelligence (BI) relies on the conversion of raw data into meaningful information. Location intelligence is the process of analyzing data to make better business decisions. It combines GIS and BI/Analytics to allow the recognition of patterns in your data, including the visualization and discovery of geospatial outliers, which would not be easily discovered if you use the technology independently and separately.

More specifically, maps use non-intrusive GIS workflows with existing data. You can view symbol layers for data-bound to a geo-location, such as state, country, and ZIP code, in an integrated map viewer. Using metrics from your data, you can also visualize geographic roles or dimensions. Geographic roles, or dimensions, can be built directly into your Metadata or assigned to a data field when you create a map.

Db2 Web Query for i Designer and Esri Integration

Using Db2 Web Query Designer with the Esri integration, you can create maps that help you illustrate or identify trends so you can take action quickly. Db2 Web Query architecture provides the framework in which this system operates. Using a JavaScript map viewer, you can navigate the interface easily, as shown in the following image.
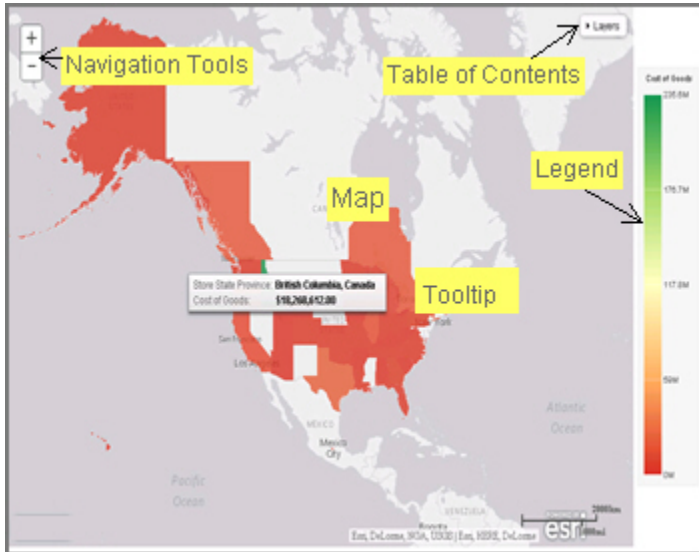
In addition, this integration utilizes the capabilities of Esri by leveraging the ArcGIS JavaScript API and content. Specifically, you can integrate data into maps with published content in ArcGIS Online platform. For more information, see *http://www.esri.com/software/arcgis/arcgisonline*. Additionally, by using this integration, you can include information about demographics, spending habits, crime, and lifestyle to maps that contain your data. These maps include layers with extensive demographic or reference detail and topography and allow you to view information about people, businesses, climate, and much more.

You can create the following maps in Db2 Web Query Designer:

❏ **Choropleth.** A common thematic map that uses geographical measures (for example, states and countries), representing the values aerially while employing a varying intensity of colors. It is useful for visualizing location-based data, trends, and distributions across a geographic area. The color hues for Choropleth maps are dictated by the legend, based on the selected measure, enabling you to determine data concentration across your map.

❏ **Proportional Symbol (Bubble).** A map that represents coordinates, such as an address or intersection, using symbols of different sizes to represent any measure. These maps focus on specific areas, for which data concentrations may vary. When the data concentration is larger, the bubble will be bigger.

In addition, built-in zooming capabilities allow you to drill down to a specific geographic area of focus easily. This allows you to get a closer look at regional or local data, draw inferences, and make recommendations, without changing the initial view of your data.

Using the Esri integration in Db2 Web Query Designer, you can also add the following layers to your map:

❏ **Backgrounds.** Display a layer that positions data as it is located, in context to other geographical features, such as streets, terrain, and imagery. Some standard Background options may combine road, aerial, and topographic data using a variety of symbols. Hosted on ArcGIS, you can change your background at any time, to review your data in a different context.

When you apply a Background to your map, its appearance changes. You can then adjust the view of your data, showing different terrain or geographical views. Backgrounds provide at least 17 levels of zoom. For more information, see *https://developers.arcgis.com/javascript/jsapi/esri.basemaps-amd.html*.

The basemap options include:

❏ Light Gray Canvas Map

❏ Dark Gray Canvas Map

❏ World Imagery with Labels

❏ National Geographic World Map

❏ Oceans Map

❏ Open Street Map

❏ World Imagery

❏ World Street Map

❏ Terrain with Labels

❏ World Topographical Map

❏ **Reference Layers.** Display a layer of boundaries and locations that range from a continental scale to country, state, and even local neighborhood. For example, if you are viewing World data on electricity usage, you may want to add a Reference Layer that displays the borders and concentration of your data within each country.

❏ **Demographic Layers.** Display a layer of information about people and businesses in a specific demographic area. This includes the United States and 120 other countries. Demographic Layers are thematic maps that provide additional information about the location, such as spending habits, population, and lifestyles. You can add Demographic Layers to a map about sales data, to identify new locations for stores, based on the spending habits for a specific area.

Both mapextent and the Layers menu functionality are applied to your map when you select a Background, Reference Layer, or Demographic Layer. Mapextent is an automatic view of the map. Layers is a menu that appears on the map and provides access to options that allow you to adjust the information that is being displayed.

The map example in the following image shows the use of layers.
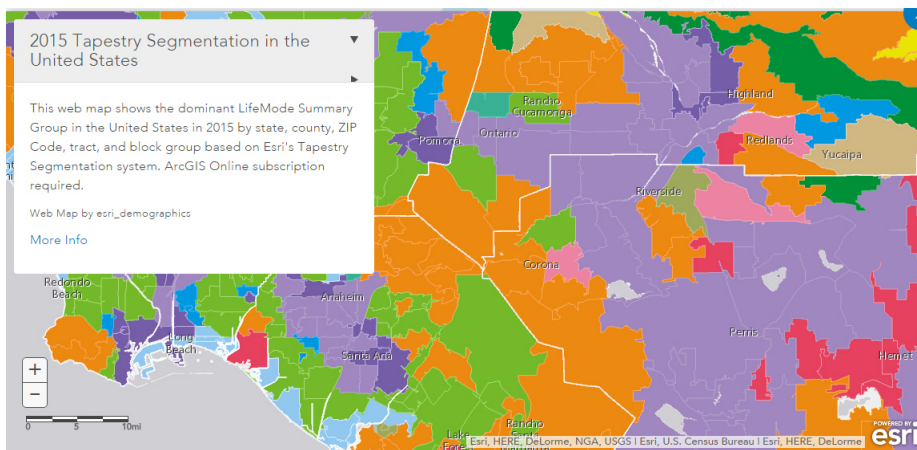
Note: Backgrounds, Demographic Layers, and Reference Layers can be accessed from the Format tab. These layers are static, standard options that Esri provides for use with Db2 Web Query Designer, and do not change based on the data source that you select.

Adapter for Esri ArcGIS Configuration for Demographic Layers

In order for demographic layers to draw, you must configure the Db2 Web Query Server to enable them. Some features, such as demographic and reference layers that require authentication and certain simplified geography functions, may additionally require a refresh token. You can acquire the refresh token using your Esri ArcGIS credentials.

Procedure: **How to Configure the Adapter for Esri ArcGIS to Enable Demographic Layers to Draw**

1. From the plus menu of the Db2 Web Query Hub, or from the Db2 Web Query Home Page, click *Get Data*.

2. On the Get Data page, double-click *New Data Source*.

3. From the list of adapters, double-click *ESRI ArcGIS*.

   The Add Connection for Esri ArcGIS panel opens.

   Note: To find the Esri ArcGIS adapter option more easily, select *GIS* from the Available drop-down list, or use the search box.

4. Basic connection parameters for this adapter are supplied automatically. To access secured Esri ArcGIS features that require named authentication, configure the Adapter for Esri ArcGIS with a refresh token.

   Click *Get Refresh Token*. The Esri ArcGIS Sign In page opens. Type your username and password and then click *Sign In*.

   You are returned to the Configure Connections window.

5. In the Add Connection for Esri ArcGIS panel, click *Configure*, as shown in the following image.

Once this is configured, ESRI ArcGIS is added to the Get Data page in the Upload Files category.

Configuring an Esri On Premise Environment

The Esri On Premise functionality enables you to download and access mapping files through the use of a local Application Programming Interface (API). Once you download and configure the API, you do not need an internet connection to utilize the robust mapping features that Esri provides. For information on downloading and configuring the API that controls this feature, see *How to Download and Configure the ArcGIS JavaScript API* on page 78.

The Esri On Premise functionality provides you with local access to Esri mapping files. This is particularly useful if you are away from your office or without an internet connection. You may also be using a mobile device, such as an iPad or smartphone with a large screen, without an internet connection. The following mapping components are supported when using the Esri On Premise functionality:

❏ **Offline Basemaps**. Basemaps are an offering from ArcGIS. Standard basemaps are provided for your use offline. For example, there is an Oceans basemap and a Terrain with Labels basemap. These basemaps are also known as backgrounds. In an online setting, there are 10 basemaps available. In order to use offline basemaps you need to use a tiled mapservice published in the ArcGIS Server.

❏ **Offline Geographic Roles**. Geographic Roles are used to visualize measures with commonly known dimensions (for example, Country, State, Cities, and so on). These provide the location information often in the form of (x/y) needed to plot on a map. Geographic roles are pre-defined for online users through ArcGIS Online. A geographic role defines the geographic component that you can select when creating a map (for example, State or Continent). For an offline user, the options that display can be customized in the geoservices.xml file. For more information, see *Adding a Custom Geographic Role* on page 111.

Note: Demographic Layers are not supported in an Esri On Premise environment.

Procedure: **How to Download and Configure the ArcGIS JavaScript API**

You can use this procedure to download and configure the API that controls the Esri On Premise environment.

1.   Sign in to Esri ArcGIS.

2.   In your browser, navigate to the following URL to download the API: *https:// developers.arcgis.com/downloads/#javascript*

3.   Navigate to Version 3.28 of the ArcGIS API for JavaScript, as shown in the following image.
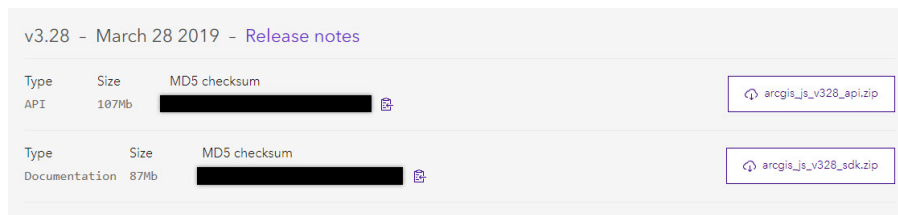
4.   Click *arcgis_js_v328_api.zip* to download the API.

5.   In /qibm/userdata/qwebqry/base80/config/web_resource, create a folder named arcgis_api.

6. Open the arcgis_js_v328_api.zip file downloaded in step 4 and navigate to arcgis_js_v328_api\arcgis_js_api\library\3.28\3.28.

7. Extract the files in that folder to the /qibm/userdata/qwebqry/base80/config/web_resource/arcgis_api folder.

8. Next, verify the path to the API in the Administration Console, as shown in the following image.

   Note: This is the path to which you extracted the API files. For example, */web_resource/arcgis_api*.

   This field identifies the path to the internal ArcGIS Javascript API Source that develops ESRI-based maps. This setting is blank, by default, indicating that the use of the internal API source to develop ESRI maps is not activated. The API that is referenced is *https://js.arcgis.com/3.28/*, by default. To direct Db2 Web Query Designer to use the internal ArcGIS Javascript API to develop ESRI maps, enter the path to the local API files that you extracted into this setting.

   Note: This path should be a relative path that is accessible within the local install.

9. Click *Save*.

10. Next, open the following two local API files in a text editor:

    ❏ /qibm/userdata/qwebqry/base80/config/web_resource/arcgis_api\init.js

    ❏ /qibm/userdata/qwebqry/base80/config/web_resource/arcgis_api\dojo\dojo.js

    In both files, search for HOSTNAME_AND_PATH_TO_JSAPI to locate the baseUrl property. Replace the string *[HOSTNAME_AND_PATH_TO_JSAPI]* in *baseUrl:"https://[HOSTNAME_AND_PATH_TO_JSAPI]dojo"* with the path to your on-premise ArcGIS server. For example:

    ```
    baseUrl:"https://localhost/arcgis/jsapi/jsapi/dojo"
    ```

11. In the Administration Console, click *Clear Cache* to clear the browser cache. Your configuration is complete.

Creating and Customizing Maps in Db2 Web Query Designer

The following procedures provide step-by-step instructions on how to create and customize maps.

As you create your maps, you can use the following built-in map viewer features:

❏ You can use the plus (+) and minus (-) symbols, $\boxed{\begin{array}{c}+\\-\end{array}}$, within the map to zoom in and out of different areas of the map. You can also click your left mouse button to zoom in to a specific location.

❏ Like all HTML5 visualizations, the highlighted markers and regions on a map support drill, multi-drill, auto-linking, and informational tooltip features.

❏ You can use the Pan / Selection button to alternate between the Pan and Selection controls. This option is in the upper-right corner of the map.

❏ Creating a map chart using the US Zipcode 5 Georole with more than 2000 polygons will fail to draw.

Procedure: **How to Create an Esri Choropleth Map**

Note: The default option of creating a map utilizes the ArcGIS JavaScript API that Esri provides.

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

    Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

    Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.

3. On the Content picker, select the Choropleth map chart type.

A blank map displays and the Location bucket is enabled, as shown in the following image.
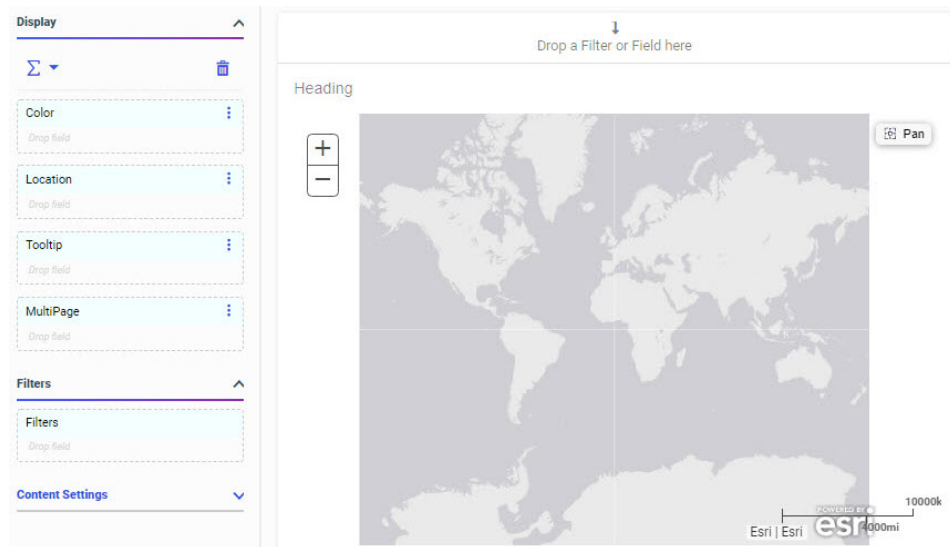
4. Add a Geolocation field to the Location bucket.

   This field, which already has a geographic role assigned, is denoted with a Geo icon, , in the Resources panel.

   The canvas refreshes, and your map displays.

5. Before saving your map, to add insight, you can also do the following:

   ❑ Click *Run in new window*, to see a run-time view of your map.

   ❑ Add a measure or dimension to the Color bucket, to color your chart by that underlying data value. When you add a dimension field to the Color bucket, a legend displays for the values in that field. Note that each area in a choropleth map can only display one color at a time, so it may be preferable to use a dimension for which each geographic area will return a single value. If you specify a measure in the Color bucket, a color scale is generated.

   ❑ Add a field to the Tooltip bucket, which will display tooltip information when you place your mouse over an area of the map.

   ❑ Add a Background, Demographic Layer, or Reference Layer from the Format tab, under Map options.

6. Click *Save* to save your map.

Procedure: How to Create an Esri Proportional Symbol (Bubble) Map

1. Open Db2 Web Query Designer. On the Db2 Web Query Hub, click the plus menu and then click *Create Visualizations*, or, on the Db2 Web Query Home Page, click *Visualize Data*.

   Db2 Web Query Designer opens in a new browser tab.

2. Select a workspace and a data source available from that workspace.

   Once you select a data source, Db2 Web Query Designer loads with options to create a single content item.
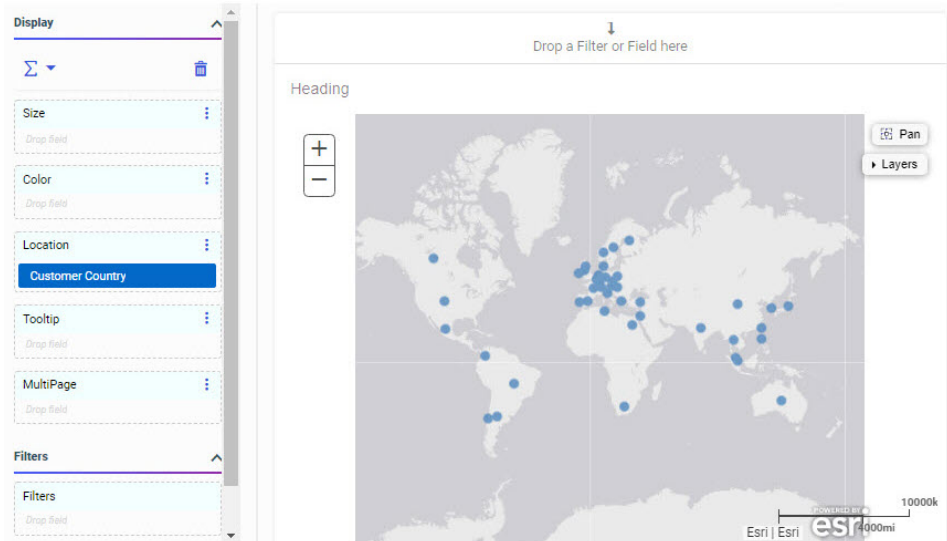
3. On the Chart picker, select Proportional Symbol for the map type.

   A blank map displays and the Location bucket is enabled.

4. Place a data field with a defined geographic role in the Location bucket.

   This field, which already has a geographic role assigned, is denoted with a Geo icon, , in the Data panel.

   A basic bubble map displays, as shown in the following image.

5. Before saving your map, to add insight, you can also do the following:

   ❏ Click *Run in new window*, to see a run-time view of your map.

❏ Add a measure or dimension to the Color bucket to color your chart by that underlying data value. Adding a dimension creates a legend with a different color assigned to each value. Adding a measure generates a color scale.

❏ Add a measure to the Size bucket, to control the size of the bubbles on your map.

❏ Add a field to the Tooltip bucket, to display tooltip information when you place your mouse over an area of the map at run time.

❏ Add a Background, Demographic Layer, or Reference Layer from the Format tab, under Map options.

6. Click *Save* to save your map.

Procedure: **How to Change the Default Background of a Map**

1. Create a new map or open an existing map.

2. On the Format tab, on the Map options tab, select Base map and choose from the available options, as shown in the following image.
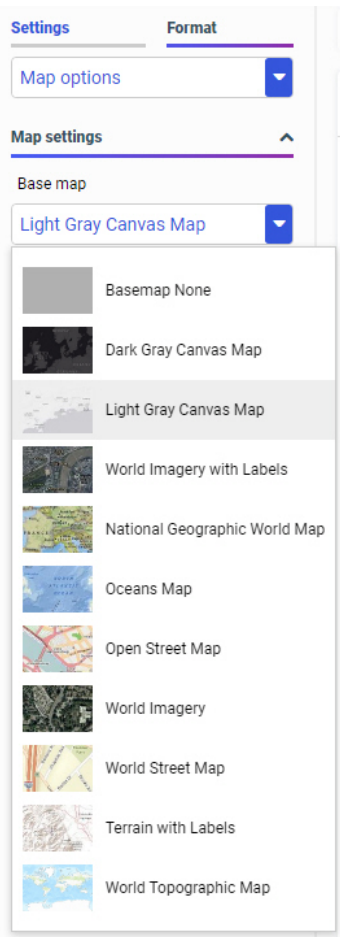
3. Select one of the following options:

    ❏ World Street Map

    ❏ Terrain with Labels

    ❏ Oceans Basemap

    ❏ OpenStreetMap

    ❏ World Imagery

❏ Imagery with Labels

❏ Light Gray Canvas

❏ National Geographic World Map

❏ Dark Gray Canvas

❏ None

Note: The Imagery with Labels Background provides the terrain for your map, ranging from land contours to city streets.

Once you make a selection, the background of the map refreshes. You can continue to change your background until it displays the desired information.

Procedure: **How to Add Demographic Layers to a Map**

1. Create a new map or open an existing map.

2. On the Format tab, in the Map options group, click the Demographic layer drop-down and click *Demographic Layers*.

3. Select from various population and lifestyle groups, as shown in the following image.
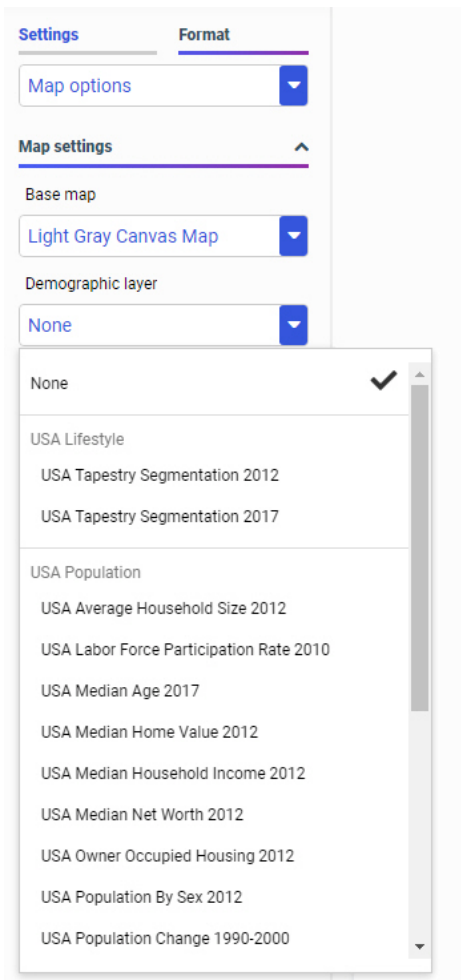
Note: These are pre-defined demographic profiles, provided by Esri ArcGIS. Esri periodically retires older demographic layers.

You can select multiple options in either category to gain additional insight into your data. Specifically, each Demographic Layer has its own profile and provides a layering option, when comparing values across different layers or profiles.

4. Click *OK*.

The Demographic Layers that you select are applied to your map. The map engine displays the different groups with unique hues and coloring. You can use the Table of Contents or Layers option, to toggle between the different layers that you have specified. The Layers option is shown in the following image.


Note: You can select and clear the check boxes to enable the display of one or more Demographic Layers to compare and contrast the different demographic scenarios.

*Procedure:* **How to Add Reference Layers to a Map**

1. Create a new map or open an existing map.

2. On the Format tab, in the Map options group, click the drop-down for Reference layer.

The list of Reference Layers displays, as shown in the following image.
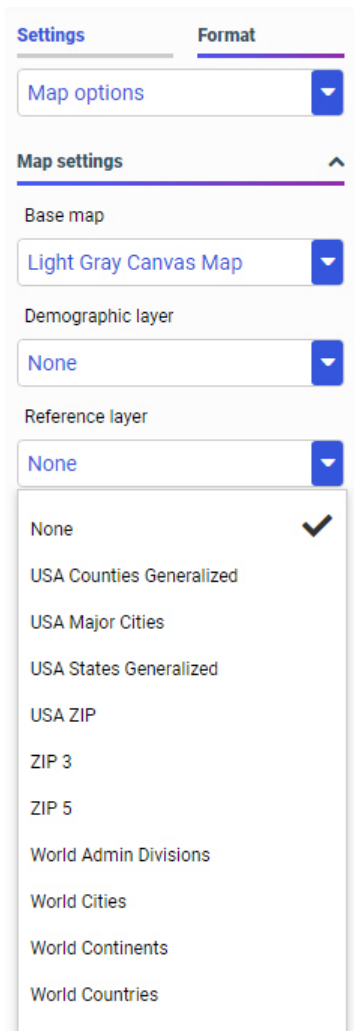
3. Select one or more Reference Layers, such as World Countries, to add to your map, and then click *OK*.

Your map refreshes, and the definitions and borders of the References Layers display on the canvas. You can use the Table of Contents or Layers option, to toggle different Reference Layers in your map. These options are shown in the following image.
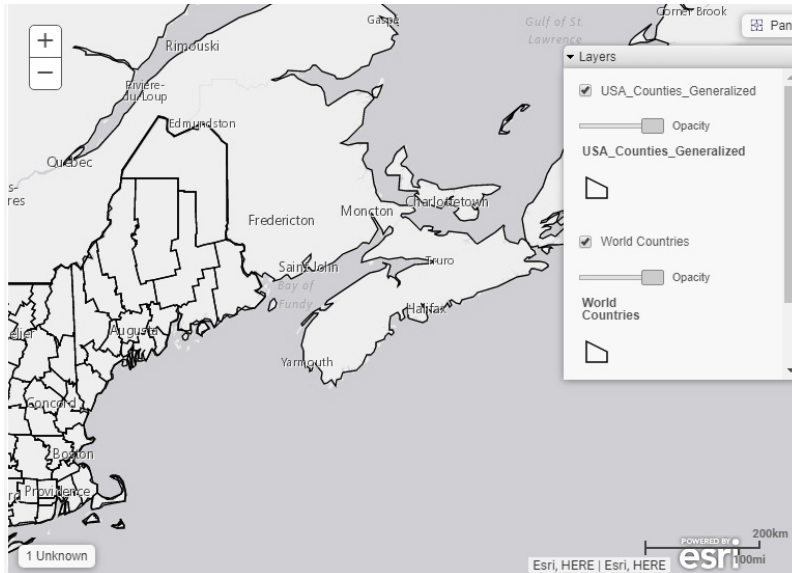
Reference: Query Buckets by Map Type

This section presents the Query buckets that display, by map type.

Query bucket	Choropleth Map	Proportional Symbol Map
Geo. One data field, specifically a field containing location data (for example, State).	✔	✔
Color. One data field.	✔	✔
Tooltip. One or more data fields (not required).	✔	✔
Multi-page. Up to one data field (not required).	✔	✔

Query bucket	Choropleth Map	Proportional Symbol Map
Size. One data field.	✘	✔

Reference: **Geographic Roles**

Geographic roles have been unified to access 58 world administrative boundaries down to the postal code level, out of the box. You can access administrative boundaries for approximately 250 countries with a second level license, which is a paid service from Esri. Enter your second level license code by clicking the License button on the ribbon.

Note: Geographic roles are only available with Esri maps.

This section contains information on the geographic roles that are supported for Esri maps.

Geographic Role	Description	Maps Supported
CONTINENT	World Continents	Choropleth, Proportional Symbol
COUNTRY	World Countries	Choropleth, Proportional Symbol
STATE	World Admin Divisions	Choropleth, Proportional Symbol
CITY	World Cities	Proportional Symbol
COUNTY	World Counties	Choropleth, Proportional Symbol
POSTAL-CODE	Postal Code	Choropleth, Proportional Symbol

Note: This is a new, simplified list of geographic roles (dimensions) that you can utilize when creating a map chart. This unified list of roles provides worldwide mapping of administrative boundaries down to the postal code level. In Db2 Web Query Designer, the new roles display, by default, when assigning a geographic role.

The following table illustrates the geographic roles and their dependencies. Level 1 indicates the highest level of hierarchy and level 5 is the lowest level of hierarchy.

Region	Hierarchy Level	Geographic Role
World	1	CONTINENT
	2	COUNTRY
	3	STATE
	4	CITY
	5	POSTAL CODE

Procedure: **How to Access Second Level Licensed Geographies for Esri Maps**

1. Click *Workspace* on the Reporting Server Web Console sidebar.

2. Click *License* on the ribbon.

   The License Management pane opens, as shown in the following image.

3. Enter your Esri second level license code in the *license_2nd_level_maps* field.

4. Click *Save and Restart Server*.

Once the second level license is enabled, you can use the standard administrative and postal geographic roles to access these additional geographic boundaries.

Note: The server must be configured for Unicode if Unicode characters exist in the data.

Reference: **List of Geographic Locations**

The Db2 Web Query Server Console provides a list of first and second level map administrative regions. You can open the list by clicking the *Settings* menu on the Workspace page ribbon, pointing to *Geo Services* and selecting *General maps info*. This opens the list of administrative regions and postal levels, as shown in the following image.

The regions that say *Paid* in the Maps license column are the additional regions you can access with a second level license.

❏ The source for the country administrative level is provided by the Esri World map. Country is administrative level 0.

❏ The source for the State georole can be provided by the Esri World map or by shape files. When there is a second level license, the state administrative level can be level 1 or level 2.

❏ The source for the County georole can be provided by the Esri World map or by shape files. When there is a second level license, the county administrative level can be level 3 or level 4.

❏ The source for the City georole can be provided by the Esri World map or by shape files. When there is a second level license, the city administrative level is level 5.

❏ The source for the Postal Code georole can be provided by the Esri World map or by shape files. When there is a second level license, the postal code administrative level can be 3, 4, or 5.

Some georoles may not be applicable to specific countries. You can see the details of each country and its administrative levels by right-clicking the country name and clicking *Drill to administrative levels* or *Drill to postal levels*, as shown in the following image.

Clicking *Drill to administrative levels* opens the list of States for the country, as shown in the following image.

Clicking any link opens information about the next level georole.

Clicking Drill to postal levels opens the list of postal levels for the country, as shown in the following image.

Data Services Agents ✕	General maps info ✕	Result ✕

List of postal codes for country 'Albania'

(Source: MB postal layer 3 Extended)

POSTAL-CODE (POSTCODE3)
10
15
20
25
30
33
34
35
40
43

Right-clicking a link in any georole column other than the Country column opens a summary of the values for that georole, as shown in the following image.

Statistics of states for country 'Albania'

(Source: MB admin layer 1 Extended)

Number of names	First name	Last name
12	Berat	Vlorë

Administrative Boundaries for Level 1 Countries

Administrative boundaries for the United States are automatically included by Esri.

The following table lists the Level 1 countries and their Level 1 and Level 2 administrative levels for available world countries and territories. For some countries, no additional administrative levels are added with a second level license.

Country	Postal Code	Level 1 Administrative Level (Number of Values)	Level 2 Administrative Level (Number of Values)
Albania	2 - digit	Qarke (12)	Bashkia (61)
Andorra	5 - digit	Parroquies (7)	
Argentina	5 - digit	Departamentos (525)	
Australia	4 - digit	Local Government Areas (569)	
Austria	4 - digit	Gemeinden (2120)	
Belarus	6 - digit	Woblaszi (7)	Raioni (129)
Belgium	4 - digit	Communes (589)	
Bosnia and Herzegovina	5 - digit	Kantone (18)	Opstine (142)
Brazil	5 - digit	Municipios (5565)	
Canada	3 - digit	Census Divisions (293)	Census Subdivisions (5243)
Chile	2 - digit	Provincias (54)	
China	2 - digit	Counties City Districts (2855)	
Costa Rica	2 - digit	Cantones (81)	Distritos (473)
Croatia	2 - digit 5-digit for 2nd level license	Zupanije (21)	Opcine (556)
Cyprus	2 - digit 4-digit for 2nd level license	Eparchia (6)	Dimoi (615)

Country	Postal Code	Level 1 Administrative Level (Number of Values)	Level 2 Administrative Level (Number of Values)
Czech Republic	2 - digit 6-digit for 2nd level license	Orp (206)	Obce (6253)
Denmark	4 - digit	Kommuner (99)	
Estonia	5 - digit	Maakonnad (15)	Vallad (213)
Finland	5 - digit	Seutukunnat (70)	Kunnat (317)
France	5 - digit	Cantons (1972)	Communes (36571)
Germany	5 - digit	Municipilaties	
Gibraltar	3/4/5 - digit		
Greece	5 - digit	Nomoi (75)	Dimoi (326)
Holy See (Vatican City State)	5 - digit		
Hong Kong	6 - digit	Shih Zizhiqu (18)	
Hungary	2 - digit 4-digit for 2nd level license	Kistersegek (175)	Telepulesek (3177)
Iceland	2 - digit 3-digit for 2nd level license	Landsvaedi (8)	Sveitarfelog (74)
India	6 - digit	Districts (640)	Subdistricts (5783)
Italy	5 - digit	Provincias (110)	Comuni (8047)
Japan	3 - digit	Prefectures (47)	Municipalities (1901)

Country	Postal Code	Level 1 Administrative Level (Number of Values)	Level 2 Administrative Level (Number of Values)
Kenya	1 - digit	Wilaya (47)	Districts (158)
Korea, Republic of	3 - digit	Si Gun (230)	
Latvia	2 - digit 4-digit for 2nd level license	Rajons (33)	Novadi (119)
Liechtenstein	4 - digit	Landschaften (2)	Gemeinden (11)
Lithuania	2 - digit 5-digit for 2nd level license	Apskritys (10)	Savivaldybes (60)
Luxembourg	4 - digit	Cantons (12)	Communes (105)
Macedonia, the former Yugoslav Republic of	2 - digit 4-digit for 2nd level license	Statisticki Regioni (8)	Opstini (80)
Malta	3 - digit	Districts (6)	Local Councils (68)
Mexico	3 - digit	Estados (32)	
Monaco	5 - digit	Quartiers (9)	
Montenegro	2 - digit 5-digit for 2nd level license	Opstina (21)	
Netherlands	4 - digit	Gemeenten (380)	
New Zealand	4 - digit	Territorial Authorities (68)	Area Units (1911)
Norway	4 - digit	Okonomisk regioner (89)	Kommuner (428)

Country	Postal Code	Level 1 Administrative Level (Number of Values)	Level 2 Administrative Level (Number of Values)
Poland	5 - digit	Gminy (2479)	Gminy Miasta (3119)
Portugal	4 - digit	Concelhos (308)	Freguesias (3092)
San Marino	5 - digit	Castelli (9)	
Serbia	5 - digit 5-digit (1156) for 2nd level license	National (1)	
Singapore	2 - digit	Regions (5)	Planning Areas (55)
Slovakia	2 - digit 6-digit for 2nd level license	Okresy (79)	Obce (2927)
Slovenia	2 - digit 4-digit for 2nd level license	Statisticne Regije (12)	Obcina (212)
South Africa	2-digit 4-digit for 2nd level license	Municipalities (234)	
Spain	5 - digit	Provincias (52)	Municipios (8122)
Sweden	5 - digit	Kommuner (290)	
Switzerland	4 - digit	Gemeinden (2225)	
Taiwan	3 - digit	Township Districts (368)	
Turkey	5 - digit	Iller (81)	Ilceler (970)
United Kingdom	4 - digit	Districts (391)	

Administrative Boundaries for Level 2 Countries

The following table lists countries that are accessible only with a second level license.

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Afghanistan	4-digit	Velayat (34)	Woluswali (398)
Algeria	2-digit	Wilayat (48)	
American Samoa	5-digit	Counties (77)	
Angola		Provincias (18)	Municipios (161)
Anguilla	7-digit	Districts (14)	
Antigua and Barbuda		Parishes (8)	
Armenia	2-digit	Marzer (11)	
Aruba		Districts (8)	
Azerbaijan	2-digit	Regions (10)	Rayonlar (74)
Bahamas		Islands (19)	Districts (32)
Bahrain	2-digit	Muhafazat (5)	
Bangladesh	2-digit	Zila (64)	Upazila (553)
Barbados		Parishes (11)	
Belize		Districts (6)	Constituencies (31)
Benin		Departements (12)	Communes (77)
Bermuda	4-digit	Parishes (11)	
Bhutan	2-digit	Dzongkhags (20)	
Bolivia, Plurinational State of		Departamentos (9)	Provincias (112)

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Botswana		Districts (9)	Sub-Districts (28)
British Virgin Islands		National (1)	Electoral Districts (9)
Brunei Darussalam	2-digit	Daerah (4)	Mukim (38)
Burkina Faso		Regions (13)	Provinces (45)
Burundi		Provinces (17)	Communes (129)
Cambodia		Khaet (25)	
Cameroon		Regions (10)	Departements (58)
Cape Verde	2-digit	Concelhos (22)	Freguesias (32)
Cayman Islands	8-digit	Districts (6)	
Central African Republic		Prefectures (17)	Sous-Prefectures (51)
Chad		National (1)	
Colombia	2-digit	Departamentos (33)	Municipios (1122)
Comoros		Islands (3)	
Congo		Departements (12)	
Congo, the Democratic Republic of the		Districts (48)	Territoires (188)
Côte d'Ivoire		Regions (32)	Departements (95)
Cuba		Provincias (16)	Municipios (168)
Djibouti		Regions (6)	

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Dominica		Parishes (10)	
Dominican Republic	5-digit	Provincias (32)	Municipios (155)
Ecuador	6 - digit	Cantones (224)	Parroquias (1040)
Egypt	2-digit	States (27)	
El Salvador	7-digit	Departamentos (14)	Municipios (262)
Equatorial Guinea		Regions (2)	Provinces (7)
Eritrea		Zobas (6)	Subzobas (52)
Ethiopia		Kililoch (11)	Awrajja (85)
Faroe Islands	3 - digit	Syslur (6)	Kommunur (30)
Fiji		Provinces (15)	
French Guiana	5-digit	Cantons (14)	Communes (22)
French Polynesia	5-digit	Iles (5)	Communes (48)
French Southern Territories		Districts (4)	
Gabon		Provinces (9)	
Gambia		Local Government Areas (8)	
Georgia		Regions (12)	Rajone (77)
Ghana		Regions (10)	Districts (216)
Greenland	4-digit	Kommuner (6)	
Grenada		Parishes (7)	

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Guadeloupe	5-digit	Cantons (28)	Communes (32)
Guam	5-digit	County Subdivisions (19)	
Guatemala	5-digit	Departamentos (22)	Municipios (334)
Guernsey	5-digit	Parishes (15)	
Guinea		Regions (8)	Prefectures (34)
Guinea-Bissau	4-digit	Regioes (9)	Sectores (38)
Guyana		Regions (10)	
Haiti		Arrondissements (42)	Communes (140)
Honduras	2-digit	Departamentos (18)	Municipios (298)
Indonesia	3-digit	States (34)	
Iran, Islamic Republic of	1-digit	Provinces (31)	Subprovinces (397)
Iraq		Muhafazat (18)	Kaza (109)
Ireland		Counties (34)	Electoral Divisions (3441)
Isle of Man	5-digit	Sheadings (6)	Districts (24)
Israel	2-digit	States (6)	
Jamaica		Parishes (14)	Constituencies (62)
Jersey	5-digit	Parishes (12)	
Jordan	5-digit	Muhafazat (12)	Nahia (51)

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Kazakhstan	4-digit	Oblystar (16)	Audandar (209)
Korea, Democratic People's Republic of		Do (14)	
Kosovo	2-digit	Obstina (38)	
Kuwait	2-digit	Muhafazat (6)	Localities (137)
Kyrgyzstan	4-digit	Oblasttar (9)	Rajondor (46)
Lao People's Democratic Republic		Khoueng (17)	Muang (142)
Lebanon		Muhafazat (6)	Caza (26)
Lesotho		Districts (10)	
Liberia		Counties (15)	
Libyan Arab Jamahiriya		Schabiyat (22)	
Macao	6-digit	Parishes (8)	
Madagascar	3-digit	Regions (22)	Districts (114)
Malawi		Regions (3)	Districts (30)
Malaysia	2-digit	Negeri (16)	Daerah (144)
Maldives	2-digit	Atolls (20)	
Mali		Regions (9)	Cercles (50)
Marshall Islands	3-digit	Municipalities (34)	
Martinique	5-digit	Arrondissements (4)	Communes (34)
Mauritania		Wilayas (13)	Moughataas (53)

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Mauritius		Districts (10)	
Mayotte		Communes (17)	
Micronesia, Federated States of	5-digit	States (4)	
Moldova, Republic of	4-digit	Raioane (37)	
Mongolia	4-digit	Aimags (22)	Sums (338)
Montserrat		Parishes (3)	
Morocco	2-digit	Regions (16)	Provinces (75)
Mozambique	2-digit	Provincias (11)	Distritos (142)
Myanmar		States and Divisions (15)	
Namibia		Regions (13)	Constituencies (119)
Nauru		Districts (14)	
Nepal		Zones (14)	Districts (75)
New Caledonia	5-digit	Provinces (3)	Communes (34)
Nicaragua		Departamentos (17)	Municipios (153)
Niger		Regions (8)	
Nigeria		States (37)	Local Government Areas (774)
Northern Mariana Islands	5-digit	Municipalities (4)	

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Oman	1-digit	Muhafazat (11)	Wilayat (61)
Pakistan	2-digit	Provinces (8)	Districts (146)
Palau	5-digit	States (16)	
Palestinian Territory, Occupied		Territories (2)	Muhafazat (16)
Panama		Provincias (12)	Distritos (76)
Papua New Guinea		Provinces (22)	Districts (87)
Paraguay		Departamentos (18)	Distritos (251)
Peru	2 - digit	Provincias (195)	Distritos (1834)
Philippines	4-digit	Provinces (87)	Municipalities and Cities (1634)
Pitcairn	8-digit	Islands (4)	
Puerto Rico	5-digit	Municipios (78)	County Subdivisions (902)
Qatar		Municipalities (7)	Zones (90)
Republic of South Sudan		States (10)	
Réunion	5-digit	Arrondissements (4)	Communes (24)
Romania	6 - digit	Judete (42)	Comune (3181)
Russian Federation	4-digit	Federal Subjects (80)	Raioni (2345)
Rwanda		Provinces (5)	Districts (30)

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Saint Kitts and Nevis		States (2)	Parishes (14)
Saint Lucia		Quarters (10)	
Saint Vincent and the Grenadines	4-digit	Parishes (6)	
Samoa	3-digit	Regions (4)	Districts (43)
Sao Tome and Principe		Province (2)	Distritos (7)
Saudi Arabia	2-digit	States (13)	
Senegal		Regions (14)	
Seychelles		Districts (25)	
Sierra Leone		Provinces (4)	Districts (14)
Solomon Islands		Provinces (10)	
South Sudan	2-digit	States (10)	
Sri Lanka	2-digit	Districts (25)	DS-Divisions (331)
Sudan	2-digit	States (15)	
Suriname		Districten (10)	Ressorten (62)
Svalbard and Jan Mayen (IE)		Counties (34)	Electoral Divisions (3441)
Svalbard and Jan Mayen (SJ)	4-digit	National (1)	Kommuner (4)
Swaziland	1-digit	Districts (4)	
Syrian Arab Republic		Muhafazat (14)	Manatiq (61)

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Tajikistan		Regions (5)	Raioni (64)
Tanzania, United Republic of		Mkoa (30)	Wilayah (169)
Thailand	2-digit	Changwate (77)	Amphoe (928)
Timor-Leste		Districts (13)	Subdistricts (65)
Togo		Regions (5)	
Tokelau		Atolls (3)	
Tonga		Island Divisions (5)	
Trinidad and Tobago		Municipalities (15)	
Tunisia	4-digit	Wilayat (24)	
Turkmenistan	3-digit	Welayaty (6)	Etraplar (65)
Turks and Caicos Islands	8-digit	Districts (6)	Localities (38)
Tuvalu		Islands (9)	
Uganda		Consolidated Districts (75)	Counties (110)
Ukraine	3-digit	Obstina (38)	
United Arab Emirates		States (7)	
United States Minor Outlying Islands		Islands (5)	
United States Virgin Islands	5-digit	National (1)	Islands (3)

Country	Postal Code	Highest Administrative Level (Number of Values)	Lowest Administrative Level (Number of Values)
Uruguay	5 - digit	Secciones (232)	Segmentos (4301)
Uzbekistan	4-digit	Viloyati (14)	Tuman (171)
Vanuatu		Provinces (6)	
Venezuela, Bolivarian Republic of	2 - digit	Estados (25)	Municipios (367)
Viet Nam	2 - digit	Provinces (63)	Districts (698)
Wallis and Futuna	5 - digit	Kingdoms (3)	
Yemen		Muhafazat (21)	Muderiah (333)
Zambia	5 - digit	Provinces (10)	Districts (103)
Zimbabwe		Provinces (10)	Districts (91)

Example: **Using a Second Level License to Map French Postal Codes**

The request used in this example references data about French state names, city names, and postal codes. This data is readily available online. The data in this example was downloaded from *https://www.aggdata.com/free/france-postal-codes* which is available for free using a Creative Commons Attribution 4.0 license detailed at *https://creativecommons.org/licenses/by/4.0/*. Once you download the data, you can upload it to the server to create the data file and synonym for use in requests. This example assumes that the data and synonym are in the ibisamp application on the server.

Note: We take no responsibility for the accuracy or continued existence of this data on this site. It is being used only as an example of the detailed administrative boundaries available with a second level license.

The Master File for the uploaded data follows. The Master File generated by the upload procedure was edited to change the first field name to COUNTRY and to remove the folder declarations.

```
FILENAME=FR_POSTAL_CODES, SUFFIX=DFIX    ,
 DATASET=ibisamp/fr_postal_codes.ftm (LRECL 1140 RECFM V, BV_NAMESPACE=OFF,
$
  SEGMENT=FR_POSTAL_CODES, SEGTYPE=S0, $
    FIELDNAME=COUNTRY, ALIAS=E01, USAGE=A50V, ACTUAL=A50V,
      TITLE='Country for State',
      GEOGRAPHIC_ROLE=COUNTRY,  $
    FIELDNAME=STATE, ALIAS=E02, USAGE=A21V, ACTUAL=A21V,
      MISSING=ON,
      TITLE='State',
      GEOGRAPHIC_ROLE=STATE,  $
    FIELDNAME=COUNTY, ALIAS=E03, USAGE=A25V, ACTUAL=A25V,
      MISSING=ON,
      TITLE='County',
      GEOGRAPHIC_ROLE=COUNTY,  $
    FIELDNAME=CITY, ALIAS=E04, USAGE=A48V, ACTUAL=A48V,
      MISSING=ON,
      TITLE='City',
      GEOGRAPHIC_ROLE=CITY,  $
    FIELDNAME=POSTAL_CODE, ALIAS=E05, USAGE=A16V, ACTUAL=A16V,
      MISSING=ON,
      TITLE='Postal Code',
      GEOGRAPHIC_ROLE=POSTAL-CODE,  $
    FIELDNAME=PLACE_NAME, ALIAS=E06, USAGE=A56V, ACTUAL=A56V,
      MISSING=ON,
      TITLE='Place Name', $
    FIELDNAME=GEO_POINT, ALIAS=E07, USAGE=A150, ACTUAL=A150,
      TITLE='GIS Point',
      GEOGRAPHIC_ROLE=GEOMETRY_POINT,  $
```

The Access File for the uploaded data follows.

```
SEGNAME=FR_POSTAL_CODES,
  DELIMITER=',',
  CDN=COMMAS_DOT,
  CONNECTION=<local>, $
```

The following Db2 Web Query procedure generates a choropleth map that shows the postal codes from the uploaded data source. The DEFINE field is used to assign different numeric values to each field. When used in the Color bucket, this DEFINE field makes it easier to differentiate the different postal code areas.

```
DEFINE FILE fr_postal_codes
 FOURTH_CHAR/I1 ( TITLE = 'Fourth,Character' ) =
        SUBSTRING(FR_POSTAL_CODES.FR_POSTAL_CODES.POSTAL_CODE, 4, 1);
END

SET COMPONENT=TableChart_1
SET ARVERSION=2
-DEFAULTH &WF_TITLE='Db2 Web Query Report';

GRAPH FILE fr_postal_codes
SUM FOURTH_CHAR
BY FR_POSTAL_CODES.FR_POSTAL_CODES.POSTAL_CODE
ON GRAPH PCHOLD FORMAT JSCHART
ON GRAPH SET VZERO OFF
ON GRAPH SET GRWIDTH 1
ON GRAPH SET HAXIS 1008.0
ON GRAPH SET VAXIS 768.0
ON GRAPH SET LOOKGRAPH CHOROPLETH
ON GRAPH SET EMBEDHEADING ON
ON GRAPH SET AUTOFIT ON
ON GRAPH SET STYLE *
INCLUDE=IBFS:/WFC/Global/Themes/Standard/Default/theme.sty,$
TYPE=REPORT, TITLETEXT='Chart1', ORIENTATION=LANDSCAPE,
ARREPORTSIZE=DIMENSION,
     ARFILTER_TARGET='*', CHART-LOOK=com.esri.map, ARGRAPHENGINE=JSCHART, $
TYPE=DATA, COLUMN=N2, BUCKET=color, $
*GRAPH_SCRIPT

*GRAPH_JS_FINAL
"extensions": {
    "com.esri.map": {
        "overlayLayers":             [
                {
                    "ibiDataLayer": {
                        "map-metadata": {
"map_by_field": "FR_POSTAL_CODES.FR_POSTAL_CODES.POSTAL_CODE"
                        }
                    }
                }
            ],
        "baseMapInfo": {
            "customBaseMaps":              [
                {
                    "ibiBaseLayer": "dark-gray"
                }
            ]
        }
    }
}

*END
ENDSTYLE
END
```
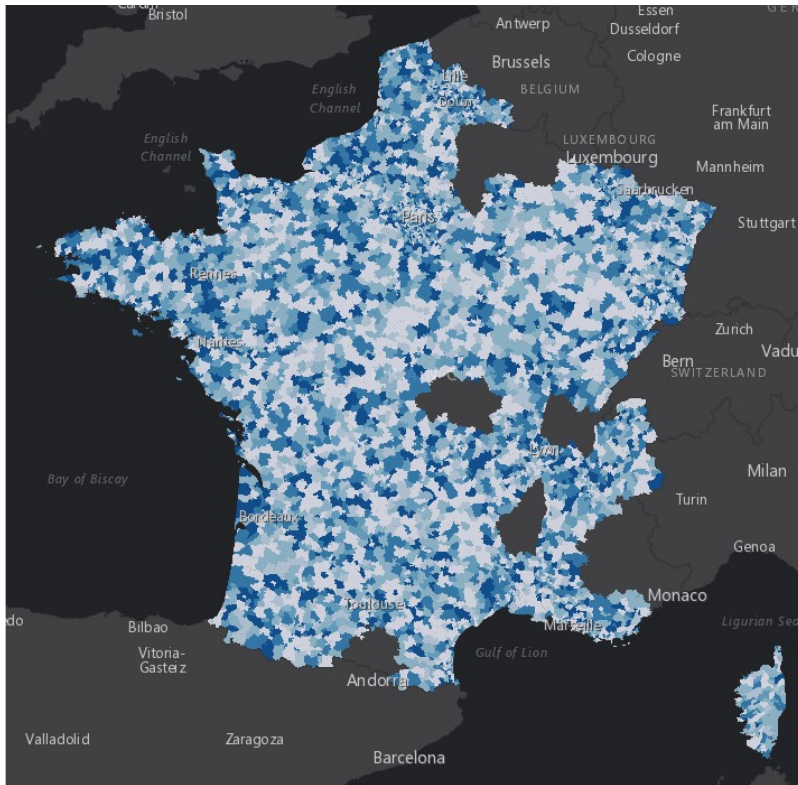
When you run this procedure, the map displays postal codes in France, as shown in the following image.

Adding a Custom Geographic Role

The GEO configuration editor in the Db2 Web Query Reporting Server provides a tool for editing or adding properties for geographic roles.

On the Db2 Web Query Hub, from the Management Center, click *Server Workspaces* to access the Db2 Web Query Reporting Server Workspace area. Alternatively, from the Db2 Web Query Home Page, click the *Settings* menu and click *Db2 Web Query Server*. When the Db2 Web Query Reporting Server browser interface opens, open the *Tools* menu and click *Workspace*. The Workspace area opens.

In the Reporting Server Workspace area click *Settings*, point to *Geo Services*, then click *Edit Configuration*. The *GEO configuration editor* opens displaying the configured geographic roles, as shown in the following image.

GEO configuration editor

| Object: | Role ▾ |

(Edit to check other parameters of a role)   **?** Help   ➕ Add ESRI map   ➕ Add WFRS map   ➕ Add NUTS support   ➕ Add extended postal codes   ⚙ 🔍

name		title	returned geometry	provider
CONTINENT	standard	Continent	GEOMETRY_AREA	WFRS
COUNTRY	standard	Country	GEOMETRY_AREA	WFRS
STATE	standard	State	GEOMETRY_AREA	WFRS
COUNTY	standard	County	GEOMETRY_AREA	WFRS
CITY	standard	City	GEOMETRY_POINT	WFRS
POSTAL-CODE	standard	Postal code	GEOMETRY_AREA	WFRS

Reference: Editing the List of Geographic Roles

The following standard unified geographic roles are configured by default and cannot be changed. These geographic roles create a hierarchy that can be used to drill down or up between levels of administration in maps, reports, or charts.

❏ CONTINENT.

❏ COUNTRY.

❏ STATE.

❏ COUNTY.

❏ CITY.

❏ POSTAL CODE.

To add a geographic role to the configuration, you can add a new Esri map or a shapefile hosted by the Server and associate a geographic role with the new map. You can also implement NUTS geographic roles support.

Note: Some users may not be able to run maps with custom geographic roles when the default reporting server security configuration is in place. To allow a user to run content with custom geographic roles, on the Access Control page of the Reporting Server browser interface, right-click the role that the user privileges are based on and click *Directory/File Privileges*, then enable both the Execute and List privileges for geo_services_user.xml.

Configuring Properties of Geographic Roles

The following describes columns for geographic roles in the configuration editor.

name

> Is the unique name of the geographic role. It cannot have spaces, but it can have underscores (_).
>
> Next to the name is an indicator of whether the role is a standard role or a customized role.

title

> Is the description of the geographic role that is displayed in reports and in drop-down lists in the Db2 Web Query tools.

returned_geometry

> Is the type of geographic data returned from the map service for rendering on the map.
>
> Valid values include:

❑ GEOMETRY_AREA

❑ GEOMETRY_POINT

❑ GEOMETRY_LINE

When you have configured the properties, click *OK* to return to the Geo Configuration Editor.

The new role will display on the list of roles, click *Save* to save it in the geographic configuration.

Adding a New Role for an Esri Map

To add an Esri geographic role, click *Add ESRI map* on the Geographic Configuration Editor.

The *Create a new ESRI map role* dialog box opens, as shown in the following image.

Configure the following map service properties.

name

Is a name for the geographic role.

title

Is a title to display in the Db2 Web Query tools.

returned_geography

Select the type of geometry that is returned from the map service for this role. Valid values are:

❏ **GEOMETRY_AREA.** Returns JSON polygon definitions.

❏ **GEOMETRY_LINE.** Returns JSON line definitions.

❏ **GEOMETRY_POINT.** Returns a JSON point.

url

Is the URL to the map service that provides the geographic data.

Click *Verify* after entering the URL to verify that the map service is available by going to the specified URL.

`Service Parameters`

Add as parameters any additional geographic roles needed to identify the exact location of the new role. For example, a city name needs state and country parameters.

Example: **Adding the Db2 Web Query Regions Geographic Role**

The following properties add the Db2 Web Query Regions role to the configuration.

Note: The *parameter name* corresponds to the field name in the FeatureLayer referenced in the following URL:

`http://services7.arcgis.com/L95Wwv9OjRQ0tjAs/ArcGIS/rest/services/`
`wfretail_sub_regions/FeatureServer/0`

Click *OK* when you have finished configuring the properties.

The new role is added to the configuration as a customized role, as shown in the following image.

Click *Save* to save this role to the configuration.

The following request uses the Db2 Web Query Regions geographic role in a map request.

```
DEFINE FILE WF_RETAIL_LITE

REGION/A50 (GEOGRAPHIC_ROLE=REGION) = BUSINESS_SUB_REGION;
END

GRAPH FILE WF_RETAIL_LITE
SUM COGS_US
BY REGION
WHERE COUNTRY_NAME EQ 'United States'
ON GRAPH PCHOLD FORMAT JSCHART
ON GRAPH SET LOOKGRAPH CHOROPLETH
ON GRAPH SET STYLE *
TYPE=REPORT, CHART-LOOK=com.esri.map, $
TYPE=DATA, COLUMN=N2, BUCKET=color, $
*GRAPH_JS_FINAL
"extensions": {
"com.esri.map": {
"overlayLayers":
[
{
"ibiDataLayer": {
"map-metadata": {
"map_by_field": "
REGION"
}
}
}
],
"baseMapInfo":
{
"customBaseMaps":
[
{
"ibiBaseLayer": "gray"
}
]
}
}
}
*END
ENDSTYLE
END
```

The output is shown in the following image.
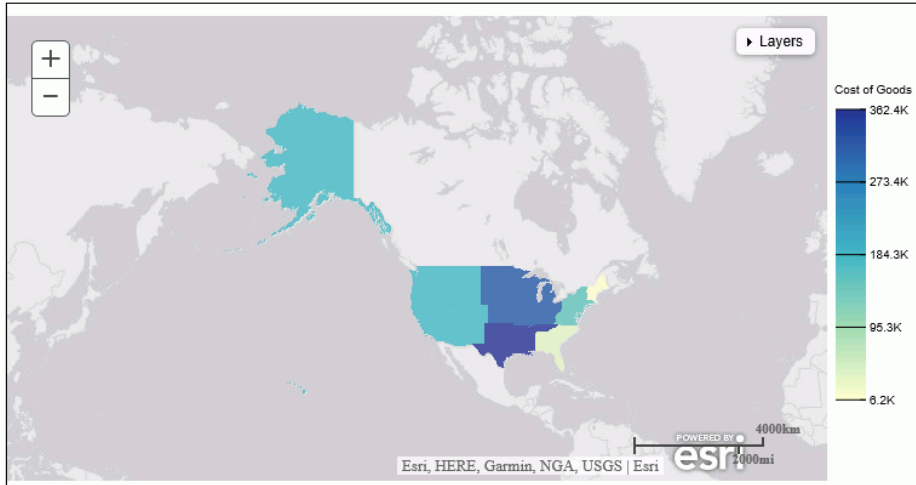
Adding a New Role for a Server-Hosted Map

A server-hosted map is based on a shapefile. You must upload the shapefile (.dbf) to an application folder accessible to the server. The server will transform it to ibijson format.

An ESRI shape file is actually a collection of at least four files:

❏ **.dbf file.** The .dbf file is a standard database file used to store attribute data and object IDs. A .dbf file is mandatory for shape files.

❏ **.shp file.** The .shp file is a mandatory Esri file that gives features their geometry. Every shapefile has its own .shp file that represents spatial vector data.

❏ **.shx file.** The .shx file is a mandatory Esri shape index position file. This type of file is used to search forward and backwards.

❏ **.prj file.** The .prj file is an optional file that contains the metadata associated with the shapefiles coordinate and projection system.
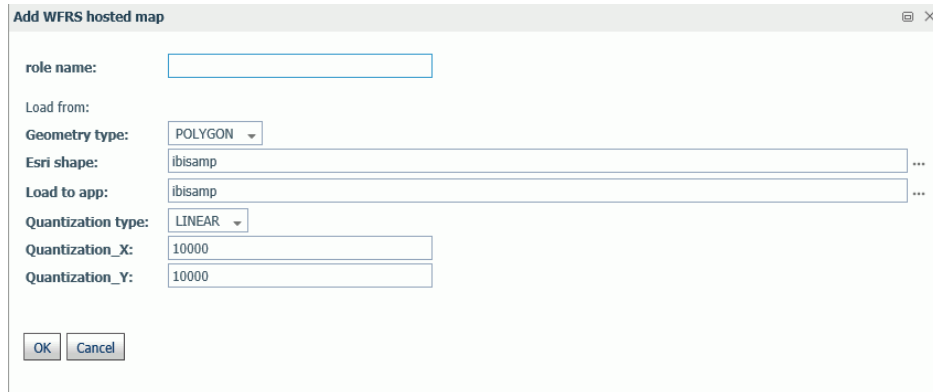
All files must have exactly the same name and to be located in the same directory. If they are not, the shapefile conversion will fail.

When there are several possible keys associated with a geometry, a drop down list of detected key names will be displayed. Select any one of these fields. No selection required when there is a single geometry key.

The shapefile should only be in the GCS_WGS_1984 - World Geodetic System 1984 (decimal degrees) coordinate system.

To add a geographic role for a Server-hosted map, click *Add WFRS map* on the Geographic Configuration Editor.

The *Add WFRS hosted map* dialog box opens, as shown in the following image.

Configure the following properties.

role name

Is a name for the geographic role.

Geometry type

Select either POLYGON or POINT from the drop-down list.

Esri shape

Enter the name of the application directory where the shapefile resides, or click the ellipsis (…) to navigate to the application directory. Then select the .dbf file for the role.

Load to app

Enter the name of the application directory where you want to place the ibijson file, or click the ellipsis (…) to navigate to the application directory.

Quantization type

Quantization is the process of transforming a large set of input values to a smaller set of values. When transforming the shapefile, the server will quantize points that are too close together in order to optimize map rendering performance. Two methods are available for quantization, LINEAR or GRID. The default is LINEAR.

Quantization_X

Is the threshold value for the x-axis.

Quantization_Y

Is the threshold value for the y-axis.

If the map has multiple keys, a drop-down list displays so that you can select one.

Click *OK* when you have finished configuring the properties.

The new role is added to the configuration as a customized role, as shown in the following image.

Click *Save* to save this role to the configuration.

You can test the role by right-clicking the role in the configuration editor and clicking *Test*. A sample map will be generated, as shown in the following image.

Adding NUTS Support

Nomenclature of territorial units for statistics (NUTS) are geographic roles specific to the European Union.

To add NUTS geographic roles to the configuration, click *Add NUTS support* on the Geographic Configuration Editor.

The NUTS geographic roles are added, as shown in the following image.

Click *Save* to save these roles to the configuration.

Adding Support for Extended Postal Codes

Click *Add extended postal codes* to add support for Level 1 and Level 2 postal codes used in certain countries.

Customizing Vocabulary Rules

For each geographic role, a set of vocabulary rules define how to recognize when a field name should automatically be assigned to that role. If you right-click a role, you can click *Customize vocabulary* from the shortcut menu.

Elements in a rule are connected by the Boolean logic operation OR (only one needs to be satisfied). Each vocabulary element contains words enclosed with special characters. Words in the rule element are connected by the Boolean logic operation AND (all need to be satisfied).

A word may be prefixed and/or suffixed with the percent character (%), which is a placeholder for any sequence of characters. If an element contains more than one word, each word has to be prefixed by the character plus (+) or minus (-). Plus indicates that the word must be found in the column name. Minus indicates that word must not be found in the column name.

For example, the following are the vocabulary rules for the role COUNTRY.
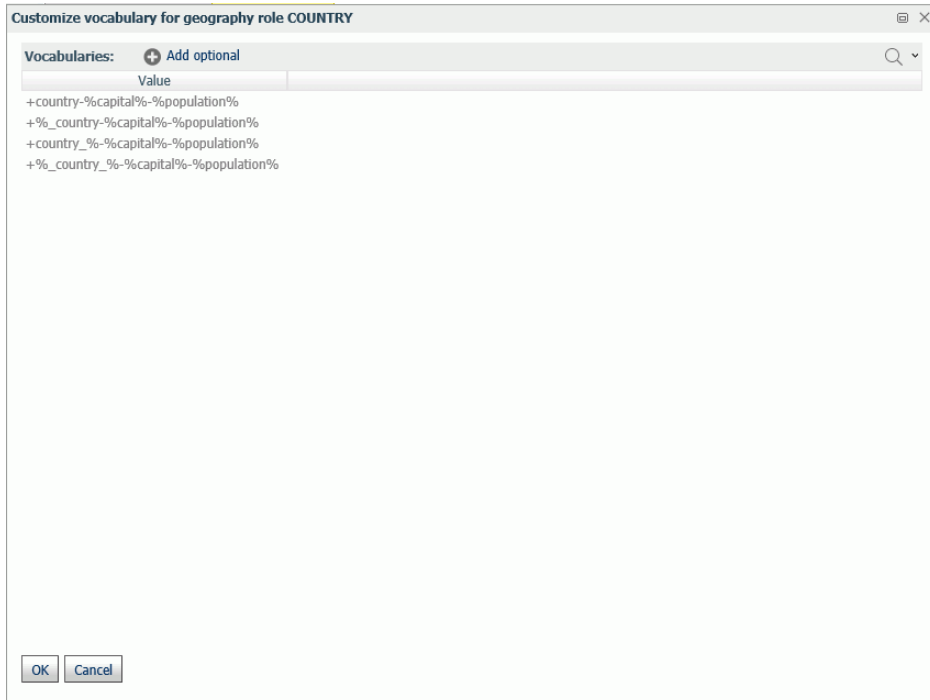
To add another rule, click *Add optional*.

When you are finished, click *OK*.

Click *Save* to save these rules to the configuration.

Reference: Customizing the List of Basemaps

You can edit an existing basemap definition or add a custom basemap.

Using Standard Basemaps

To add a new basemap or customize an existing basemap, select *Basemap* from the Object drop-down list.

Configuring Basemap Properties

The following is a description of the properties used for basemap configuration.

`name`

Is the name of the basemap.

Next to the name is an indicator of whether the basemap is a standard basemap or a customized basemap.

`icon`

Is the name of the thumbnail for the basemap (for a standard basemap) or the URL to the thumbnail (for a customized basemap) that will appear on the Basemap drop-down list in the Db2 Web Query tools (for example, the Base map menu in Db2 Web Query Designer) or the Change Basemap map widget.

`title`

Is a title to display on the Basemap drop-down list in the Db2 Web Query tools or the Change Basemap map widget.

`url`

Is the URL to the map service that provides the basemap, for a customized basemap. The map service URL can be copied from the URL field on the page showing a custom basemap. For a standard basemap, the URL is already stored in the server geographic configuration file and is not displayed.

`type`

Valid values are tiled and vector.

`addon_json`

Specifies additional JSON properties for rendering the map.

Editing the Properties of a Basemap

To customize the properties of an existing basemap, right-click the basemap line and click *Customize BASEMAP*.

The Customize Basemap dialog box opens, as shown in the following image.

Edit the properties you want to change. If you change the URL, you can click *Verify* to make sure the map service is valid and accessible.

When you are finished, click *OK*, then click *Save* on the GEO configuration editor Basemaps page.

Adding a Custom Basemap

To add a new basemap to the configuration, click *Add*.

The *Create a BASEMAP* dialog box opens, as shown in the following image.

Enter a name for the basemap, a URL to the thumbnail, a title to display, and the URL to the map service that provides the basemap, and click *Verify*.

When you have configured the properties, click *OK*, then click *Save* on the GEO configuration editor Basemap page.

Reference: Customizing the List of Context Layers

To add a new context layer or customize an existing context layer, select *ContextLayer* from the Object drop-down list.

The following image shows the GEO configuration editor with the ContextLayer object selected.
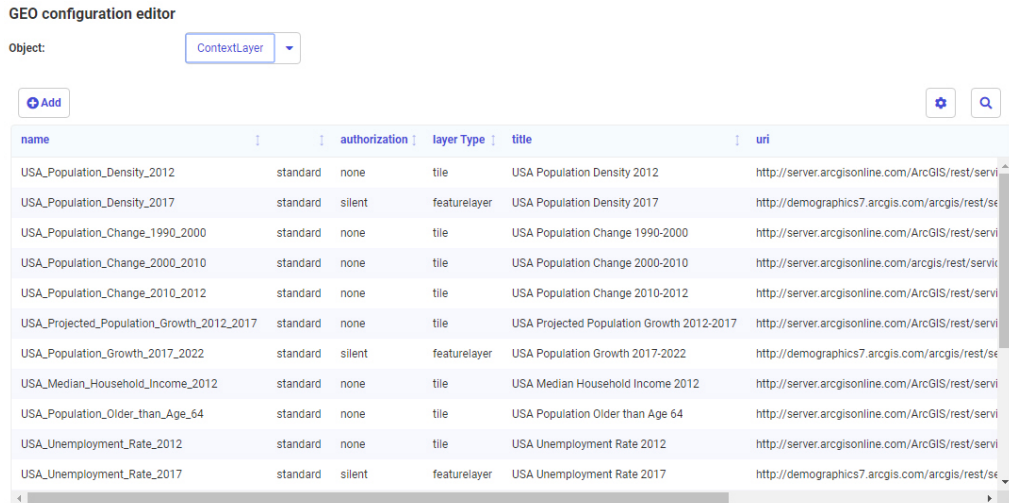
Configuring Context Layer Properties

Following is a description of the properties used for context layer configuration.

`name`

> Is the name of the context layer.
>
> Next to the name is an indicator of whether the context layer is a standard context layer or a customized context layer.

`authorization`

> Is the type of authentication needed to access this context layer. Valid values are:
>
> ❏ **silent.** Credentials for your ArcGIS application are provided in the connection string of the Adapter for Esri ArcGIS.
>
> ❏ **none.** No authorization is needed.
>
> ❏ **named.** User credentials are provided in the connection string of the Adapter for Esri.
>
> ❏ **on premises.** User credentials for a locally hosted ArcGIS server are provided in the connection string of the Adapter for Esri.

`layer type`

> Is the type of context layer. For a cached layer, the layer type is tile. For a layer that is rendered dynamically, the layer type is featurelayer.

title

Is a title to display on the demographic layer drop-down list in the Db2 Web Query tools.

addon_json

Specifies additional JSON properties needed for rendering the context layer. For example, smartMapping properties define the border styles within the context layer.

Depending on the type of context layer, the addon_json properties may resemble the following:

```
"layerObjectType" : "esri/layers/ArcGISDynamicMapServiceLayer",
    "smartMapping": { "webMapInfo": {
        "queryString" : "id:id",
        "itemDataUrl" : "url",
        "layerTypeEx" : "layerType"
}}
```

where:

esri/layers/ArcGISDynamicMapServiceLayer

Defines the context layer as a dynamic map service.

id

Is the ID of the context layer on Esri ArcGIS. This can be found in the URL for the layer on the Esri ArcGIS site, or as the value of the "serviceItemId" property in the JSON properties accessible from the service URL of the layer.

If there is no layer ID, then this property can be omitted.

url

Is the map service URL for the layer. This should match the value that you provide for the uri field.

layerType

Is an optional value to specify the type of context layer. It can be one of the following values:

❏ **group.** Identifies the context layer as a group layer composed of multiple feature layers. For more information, see *https://developers.arcgis.com/javascript/latest/ api-reference/esri-layers-GroupLayer.html*.

❏ **map-image.** Identifies the context layer as a map image layer, which can contain multiple sub-layers rendered as images rather than features. For more information, see *https://developers.arcgis.com/javascript/latest/api-reference/esri-layers- MapImageLayer.html*.

❏ **feature.** Identifies the context layer as a feature layer, which is a single layer created from a map service or feature service. For more information, see *https:// developers.arcgis.com/javascript/latest/api-reference/esri-layers-FeatureLayer.html*.

❏ **imagery-tile.** Identifies the context layer as an imagery tile layer, created from a tiled image service. For more information see *https://developers.arcgis.com/ javascript/latest/api-reference/esri-layers-ImageryTileLayer.html*.

❏ **imagery.** Identifies the context layer as an imagery layer, created from an image service. For more information, see *https://developers.arcgis.com/javascript/latest/ api-reference/esri-layers-ImageryLayer.html*.

❏ **elevation.** Identifies the context layer as an elevation layer used in a 3D SceneView. For more information, see *https://developers.arcgis.com/javascript/ latest/api-reference/esri-layers-ElevationLayer.html*.

❏ **tile.** Identifies the context layer as a tile layer, created from a cached map service. For more information, see *https://developers.arcgis.com/javascript/latest/api-reference/esri-layers-TileLayer.html*.

❏ **web-map.** Identifies a complete, two-dimensional WebMap. For more information, see *https://developers.arcgis.com/javascript/latest/api-reference/esri-WebMap.html*.

❏ **web-scene.** Identifies a complete, 3D web scene. For more information, see *https://developers.arcgis.com/javascript/latest/api-reference/esri-WebScene.html*.

If your context layer is neither a group layer nor a map image layer, the layerTypeEx property is not needed.

For example, the add-on JSON for a map image layer may resemble the following:

```
"layerObjectType" : "esri/layers/ArcGISTiledMapServiceLayer",
"smartMapping": { "webMapInfo": {
    "queryString" : "id:1234567890abcdefghij1234567890ab",
    "itemDataUrl" :
"https://services5.arcgis.com/1234567890abcdef/arcgis/rest/services/
Layer_Name/FeatureServer",
    "layerTypeEx" : "map-image"
    }
}
```

uri

Is the URL to the map service that provides the context layer.

Customizing the Properties of an Existing Context Layer

To customize the properties of an existing context layer, click the down arrow next to a context layer name or right-click the context layer line and click *Customize context layer*.

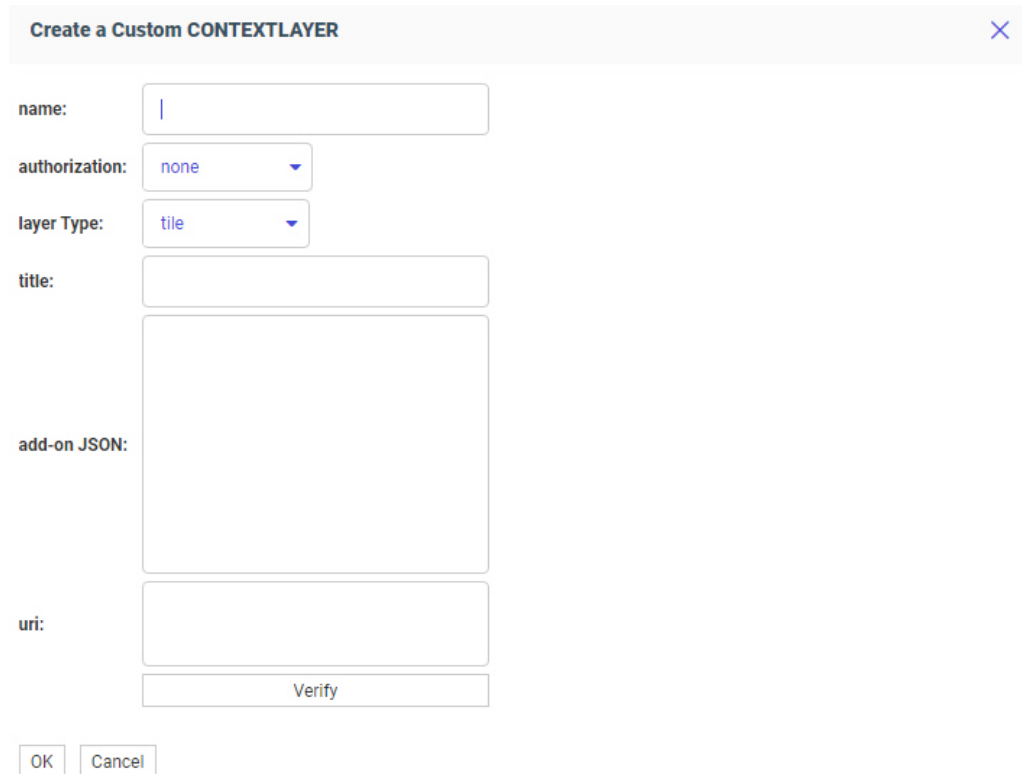The Customize CONTEXTLAYER dialog box opens, as shown in the following image.

Edit the properties you want to change. If you change the URI, you can click *Verify* to make sure the map service is valid and accessible.

When you are finished, click *OK*, then click *Save* on the GEO configuration editor Context Layers page.

Adding a New Context Layer

To add a new context layer to the configuration, click *Add*.

The **Create a Customized CONTEXTLAYER** dialog box opens, as shown in the following image.

Enter a name for the context layer, the authorization type, a layer type, a title to display, any additional JSON needed for rendering the context layer, and the URI to the map service that provides the context layer, and click *Verify*.

When you have configured the properties, click *OK*, then click *Save* on the GEO configuration editor Context Layer page.

Using Your Extension in a Request

If you have installed and configured your extension as described, your extension will be available for use in the Db2 Web Query tools as a chart type in the *Other* format category under *HTML5 Extension*, as shown in the following image.
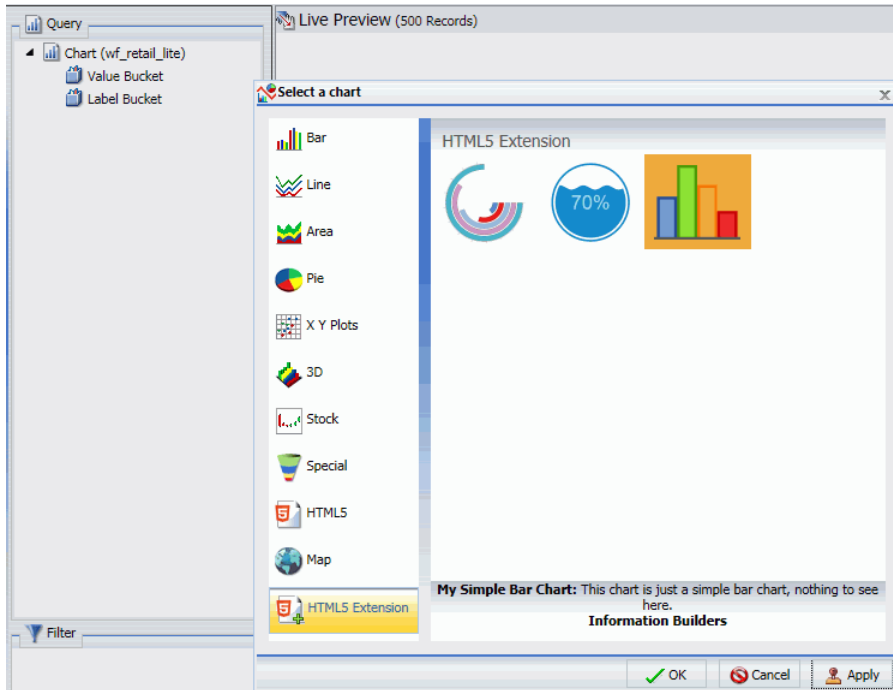
When creating a chart using Db2 Web Query, chart extensions are available in the Custom category when you expand the chart picker, as shown in the following image.

The attribute categories you defined in the dataBuckets object of your extension are available in the Query pane in InfoAssist or Display panel in Db2 Web Query.

Additionally, in Db2 Web Query, the properties defined in the propertyAnnotations object are available on the Format tab, in the Other section, when General is selected in the Quick Access menu. Clicking *Extension properties* opens the Extension properties panel, where you can make changes to the available properties, as shown in the following image, which shows properties for the liquid gauge chart extension.

The following syntax is added in the FOCEXEC:

❑ The LOOKGRAPH value is EXTENSION.

❑ The actual extension to use is identified in the chartType property of the *GRAPH_JS block in the StyleSheet.

For example, for a liquid gauge chart:

```
*GRAPH_JS
    chartType: "com.ibi.liquid_gauge",
```

❏ Each custom attribute category name is prepended with a greater-than character (>). For example, for a simple bar chart that has one label field and four value fields:

```
TYPE=DATA, COLUMN=N1, BUCKET= >labels, $
TYPE=DATA, COLUMN=N2, BUCKET= >value, $
TYPE=DATA, COLUMN=N3, BUCKET= >value, $
TYPE=DATA, COLUMN=N4, BUCKET= >value, $
TYPE=DATA, COLUMN=N5, BUCKET= >value, $
```

❏ Extension chart properties are listed under the extensions:*extension_name* object. For example, for a liquid gauge chart with the number of waves set to 3 and the wave color set to a shade of dark blue, the properties appear as follows:

```
"extensions": {
    "com.ibi.liquid_gauge": {
        "waveCount": 3,
        "waveColor": "#083f9e"
    }
}
```

The following is a sample request using the liquid gauge extension.

```
GRAPH FILE wf_retail_lite
SUM PCT.WF_RETAIL_LITE.WF_RETAIL_SALES.QUANTITY_SOLD
BY WF_RETAIL_LITE.WF_RETAIL_GEOGRAPHY_CUSTOMER.BUSINESS_REGION
WHERE_GROUPED WF_RETAIL_LITE.WF_RETAIL_GEOGRAPHY_CUSTOMER.BUSINESS_REG
ION EQ 'North America'
ON GRAPH PCHOLD FORMAT JSCHART
ON GRAPH SET LOOKGRAPH EXTENSION
ON GRAPH SET AUTOFIT ON
ON GRAPH SET STYLE *
TYPE=DATA, COLUMN=N2, BUCKET= >value, $
*GRAPH_JS_FINAL
"chartType": "com.ibi.liquid_gauge",
"extensions": {
    "com.ibi.liquid_gauge": {
        "waveCount": 3,
        "waveColor": "#083f9e"
    }
}
*END
ENDSTYLE
END
```

Run the chart. The output is shown in the following image.
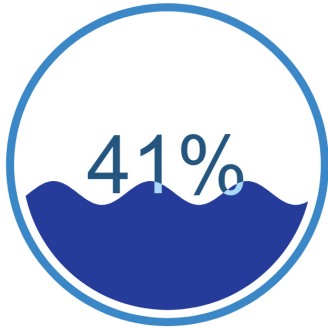
Configuring Automatic Refresh

Db2 Web Query Designer allows you to integrate real-time streaming data with your charts using the Automatic refresh option. For example, for IoT analytics applications, if you configured a connection to a streaming data source using the Kafka adapter, the Automatic refresh option can be enabled to update your chart dynamically at a specified interval (in seconds). Depending on your specific use case or requirements, you can configure multiple charts using the Automatic refresh option and add them to assembled pages. Each chart will refresh independently with updated data based on the specified refresh rate.

Considerations

The Automatic refresh option is supported for all chart types, except for maps (for example, Proportional Symbol and Choropleth maps). The Automatic refresh option is not available for reports in Db2 Web Query Designer. In addition, this option is not included in InfoAssist. Automatic refresh is only supported for stand-alone charts. If you convert the chart to a page, a warning appears, alerting you that automatic refresh will not be carried over.

### *Procedure:* How to Enable and Configure the Automatic Refresh Option for a Chart

1. Create a new chart in Db2 Web Query Designer. To best utilize the automatic refresh feature, use a streaming data source, such as one using the Kafka adapter.

2. Choose a chart type from the chart picker, as shown in the following image.
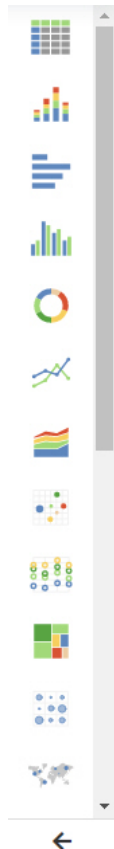
3. Add measures and dimensions according to your requirements by dragging them onto the canvas.

   Note: You can also double-click a measure or dimension to add it to the relevant bucket or drag it into the relevant bucket.

4. Apply any required formatting or styling to your chart (for example, adding a header or footer).

5. To turn on automatic refresh, on the Settings tab, expand the Content section. Select the *Enable auto-refresh* check box, as shown in the following image.
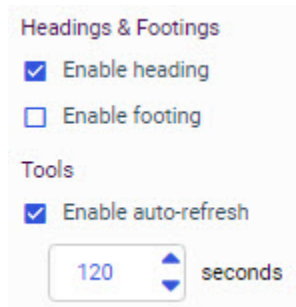
6. By default, the refresh interval is set to 120 seconds. Use the spinner or type a value to specify the refresh rate in seconds, which is the period of time to wait until the chart polls the corresponding data source to reflect any updated data.

   Note: You can specify a maximum value of 120 seconds (two minutes) as the refresh rate.

7. Click *OK*.

   You can continue to build and modify your chart as required.

8. When you are finished, click *Save* on the Visualization toolbar to save your chart.

9. To test and verify that your chart is being refreshed correctly, locate it on the Hub, right-click it and select *Run* from the context menu.

   Observe your chart while it is running and make a note of any adjustments that should be made. For example, if the chart is being refreshed too quickly, then you should consider increasing the number of seconds specified for the Automatic refresh option.

Procedure: **How to Disable the Automatic Refresh Option for a Chart**

To disable the Automatic refresh option:

1. Open a visualization that uses automatic refresh. On the Db2 Web Query Hub, right-click a visualization and click *Edit*.

   The selected visualization opens in Db2 Web Query Designer.

2. On the Settings tab, expand the Content section.

3. Clear the *Enable auto-refresh* check box.

4. Save your content. When it is run, your content no longer refreshes automatically.

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