About SAS Graph Builder

SAS Graph Builder (the graph builder) enables you to create custom graph templates, which can then be used in reports.

In your graph template, you can change the layout, add new graph elements, modify data roles, change options, and so on. You do not associate real data with the graph templates in the graph builder. Rather, you build graph templates using sample data that is shipped with the graph builder. Report designers assign data when they include your graph templates in their reports.

The graph templates that you build have a consistent appearance that is compatible with other SAS report objects. The graph builder enables you to produce a wide array of graph templates with special features for layouts and visual options. Using the graph templates that you build, report designers can create simple or complex graphical views of their data. For details of the available graph elements, see "Graph Elements" on page 3.

You can do the following in the graph builder:

- drag and drop graph elements onto the canvas to create a custom graph template. For more information, see “Building a New Graph Template” on page 9.
- determine and configure which data roles become available for assignment. For more information, see “Working with Data Roles” on page 11.
- combine and arrange the graph elements as needed. For example, you can layer multiple graph elements in a cell, create a lattice of cells in rows and columns, or combine these layouts.

There are two types of lattice graphs:

- A user-defined lattice is a multi-cell graph in which you create each cell independently. Each cell can contain different types of plots. For more information, see “Working with User-Defined Lattices” on page 16.
- A data-driven lattice is a multi-cell graph in which the cell data is determined by the values of one or more class variables. The number of cells is determined by the unique values of the class variables. Each cell of the lattice has the same graph elements. However, these graph elements have different values of the class variables. For more information, see “Creating Data-Driven Lattices” on page 23.
specify the visual attributes of the graph elements. You can specify options for the graph, the graph cells, for individual graph elements, for the axes. For more information, see “Working with Options” on page 27.

Accessing SAS Graph Builder

Use SAS Drive to Access SAS Graph Builder

After you sign in to SAS Graph Builder using the standard sign-in window for SAS applications, you will see SAS Drive, which enables you to access SAS Graph Builder. In addition, it enables you to access content that you and others have created.

Use the Side Menu to Access SAS Graph Builder

If you are using another SAS Viya application (for example, SAS Visual Analytics), you can access SAS Graph Builder from the side menu. Click in the application menu bar. Using the side menu, select Build Graphs. Here is an example of what you might see in the side menu:

Note: The items available in the side menu depend on your assigned identity and the products licensed at your site.

Sign Out of SAS Graph Builder

Use the application bar to sign out of SAS Graph Builder. Click the user name button, and then click Sign out. When you click Sign out, you are signed out of all SAS web applications. For example, suppose that you have both SAS Studio and SAS Graph Builder open, and then you click Sign out.
when you finish working on a graph template in SAS Graph Builder. In this case, you have also signed out of SAS Studio.

Graph Elements

Band Plots

A band plot consists of a filled band between defined upper and lower limits. Use band plots to convey confidence or error intervals.

*Figure 1  Band Plot Element*

Bar Charts

A bar chart consists of vertical or horizontal bars that represent quantitative data. Use bar charts to compare data that is aggregated by the distinct values of a category.

*Figure 2  Bar Chart Element*
Bubble Plots

A bubble plot consists of circles that are plotted on X and Y axes and sized based on an additional data mapping. Use bubble plots when you want to show three data items in one visualization.

Figure 3  Bubble Plot Element

Line Charts

A line chart consists of data points that are plotted on category and response axes and joined with straight line segments. Use line charts to visualize a trend in the response data over category values.

Figure 4  Line Chart Element

Needle Plots

A needle plot displays vertical lines that connect the data points to a horizontal baseline. Needle plots are useful when you want to show values that are both above and below a given value.
Pie Charts

A pie chart displays a circle divided into multiple slices for each value of a category data item based on a single measure data item. Use pie charts to visualize the relative contribution of each part to the whole.

Scatter Plots

A scatter plot displays the values of measures by using markers. Use scatter plots to show the relationship between two variables. When you apply more than two measures, the object displays a scatter plot matrix. A scatter plot matrix is a series of scatter plots that display every possible pairing of the measures that are applied to the plot.
Schedule Charts

A schedule chart displays the duration of events by using bars. The edges of each bar indicate the start and end times of an event. Use schedule charts to visualize the relationships of tasks in a project or event.

Series Plots

A series plot consists of data points plotted on X and Y axes and joined with straight line segments. Use series plots to visualize a trend in the Y-axis values over the X-axis values.
Step Plots

A step plot displays a series of horizontal and vertical line segments that connect input data points. Use step plots to see the exact point on the X axis when a change in the Y-axis measure occurs.

Time Series Plots

A time series plot displays data over time by using a line that connects the data values. Use time series plots to visualize a trend in the response data over time.
Treemaps

A treemap displays a category as a set of rectangular tiles. Each tile represents a category value, and the size of each tile represents either the frequency count or the value of a measure. Use treemaps to visualize hierarchical data values in the context of the whole.

Vector Plots

A vector plot consists of lines with a magnitude and direction. Use vector plots to visualize vector fields. Vector plots can also be used to display a change over time when none of the spatial axes are available to map time to (for example, movement on a geographic map or a change in the position of a marker over time).
Waterfall Charts

A waterfall chart (also known as a progressive bar chart) shows how the initial value of a measure increases or decreases during a series of operations or transactions. The first bar begins at the initial value, and each subsequent bar begins where the previous bar ends. The length and direction of a bar indicate the magnitude and type (positive or negative, for example) of the operation or transaction. The resulting chart is a stepped bar showing how incremental changes lead to the final value of the measure.

Building a New Graph Template

To build a new graph template:

1. Select **New Custom Graph** in the menu bar (or in the graph builder’s canvas area if no existing graph template is loaded).
Select **Elements** in the left pane to display the **Graph Elements** pane.

Drag a graph element from the **Graph Elements** pane and drop it onto the blank canvas.

**Note:** Sample data is used in the graph template. Report designers assign real data when they include the graph template in a report.

Graph elements are added to the graph template in containers called cells. The cell for the first element that you add to a blank canvas area is designated as cell A1. For more information about cells, see “About User-Defined Lattices” on page 16.

**TIP** As an alternative, you can create a graph template from the Graph Gallery, which is located to the right of the canvas area. If you prefer to use this shortcut, then skip the first three steps of this procedure and simply click on one of the graph types in the Graph Gallery.

(Optional) Select **Roles** in the right pane to display the **Role Definitions** pane. In the **Role Definitions** pane, you have the following options:

- In the **Graph** section, you can edit the default data roles for the new graph element or add more roles. For more information, see “Working with Data Roles” on page 11.
- In the **Shared Roles** section, you can identify roles that can be shared by two or more graph templates. For more information, see “Sharing Data Roles” on page 21.
- In the **Data Driven Lattice Roles** section, you can create a dynamic layout by adding roles for lattice rows and columns. For more information, see “Creating a Data-Driven Lattice” on page 24.

(Optional) Add additional graph elements to the graph template in either of the following ways:

- by overlaying additional graph elements on the existing element. For more information, see “Adding an Overlay Graph Element” on page 14.
- by adding the new graph element in a new cell in a user-defined lattice of rows and columns. For more information, see “Working with User-Defined Lattices” on page 16.

(Optional) Select **Options** in the right pane to display the **Options** pane. In the **Options** pane, you can change the options for the graph template, the cells, the graph elements, or the axes in each element. For more information, see “Working with Options” on page 27.

Click [   ] in the menu bar to save the graph template. You are also offered the opportunity to save the graph template if you attempt to create a new graph template, load an existing graph template, or close graph builder while the canvas area contains an unsaved graph template.

After you have saved the graph template, it can be imported into SAS Visual Analytics for use in reports. See “Import Custom Graph Objects” in SAS Visual Analytics: Working with Report Content for information about importing custom graph objects.

**Note:** When making changes to a graph template, you can click [   ] in the menu bar to cancel the most recent change or [   ] to restore the most recent canceled change.
Working with Data Roles

About Data Roles

When you drag and drop a graph element onto a graph template, data roles are created to associate required data items with the graph element. You can create additional, optional data roles to further customize the graph element. However, you do not assign data items to roles in the graph builder. When the graph template becomes available to report designers for use in their reports, the report designers assign data items to the available roles.

Role Classifications

When you edit or create a role, you must specify a classification that determines the type of data used in the role. Roles in the graph builder use the following classifications:

- **Category**
  - is a data item whose distinct values are used to group and aggregate measures.

- **Datetime**
  - is a date or time data item whose distinct values are used to group and aggregate measures.

- **Measure**
  - is a data item whose values can be used in computations. These values are numeric.

You can also specify that any of these classifications can be used for the role.

Optional Role Types

In addition to the required roles for graph elements, such as X or Y axis, Time, or Category, you can add the following optional roles.

**Note:** The role types that are available depend on the graph element.

- **Target**
  - specifies a data column that is used to generate a targeted bar chart. A targeted bar chart compares data that is summarized by the value of a category in reference to target values.

- **Group**
  - specifies a data column that is used to group the data. The graph elements for each unique group value are automatically distinguished by different visual attributes, such as color, line style, and so on.

  The Group role can be a Category data type or a Datetime data type.

- **Color**
  - specifies a data column that is used to color the data.
In some graph elements, such as a bar chart, the Group role also colors the graph based on the values of the group data item. In those graph elements, the Color role is used to color the data across a color gradient. In this case, the Color role must be a Measure data type.

**Note:** When you add the Color role to a graph element in a data-driven lattice, the Measure data type is not always available. The Measure data type is not available for a bar chart, a scatter plot, or a waterfall chart.

**Data Label**
- specifies a data column that supplies labels for the graph element.

**Data Tip**
- specifies a data column that supplies data tips for the graph element.

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### Creating an Optional Role

To create an optional role:

1. Select **Roles** in the right pane to display the **Role Definitions** pane.
2. In the **Role Definitions** pane, click **Add Role** in the **Graph** section for the graph element. The Add Role window is displayed.
   - **Note:** The contents of the Add Role window vary depending on the current graph element.
3. Select the type of role that you want to create. For more information, see "Optional Role Types" on page 11.
4. (Optional) Change the default role name to provide a more meaningful name.
5. Select the classification for the role. For more information, see "Role Classifications" on page 11.
6. (Optional) Select **Required** to require report designers to assign data to the role. If this option is not selected, then report designers can choose whether to assign data to the role.
7. If the **Allow multiple data assignments** check box is available, then you can select or clear the check box to specify whether more than one measure can be assigned to the role. For example, in a line chart, if multiple measures are assigned to the Y axis, then the graph shows a line for each measure.
8. Click **OK** to close the window and create the optional role.

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### Editing a Role

To edit a required or optional role:

1. Select **Roles** in the right pane to display the **Role Definitions** pane.
2. In the **Graph** section of the **Role Definitions** pane, locate the role that you want to edit. Click next to that role.
3. Select **Edit Role** from the resulting menu to open the Edit Role window.
   - **Note:** The contents of the Edit Role window vary depending on the current role and its parent graph element.
4 (Optional) Change the default role name to provide a more meaningful name.

5 (Optional) Change the classification for the role. For more information, see “Role Classifications” on page 11.

6 (Optional) Select Required to require report designers to assign data to the role. If this option is not selected, then report designers can choose whether to assign data to the role.

7 (Optional) Select or clear the Allow multiple data assignments check box to specify whether more than one measure can be assigned to the role. For example, in a line chart, if multiple measures are assigned to the Y axis, then the graph shows a line for each measure.

8 Click OK to close the window and save changes.

Deleting an Optional Role

To remove an optional role that you have added:

1 Select Roles in the right pane to display the Role Definitions pane.

2 In the Graph section of the Role Definitions pane, locate the optional role that you want to remove. Click next to that role and then select Delete Role from the resulting menu.

Examples: Defining a Color Role

The following example shows the effect of defining an optional Color role for a bubble plot graph element. The required roles for a bubble plot determine the X- and Y-axis values and the size of the bubbles. In this example, the optional Color role is assigned a Category data type that colors the bubbles according to the category values. The following figure shows the custom graph object used in a report in which the Color role has been assigned a data item that contains gender values.

Figure 15  Bubble Plot with a Category Color

The following example shows the effect of defining an optional Color role for a bar chart graph element. The required roles for a bar chart determine the category and response values. In this
example, the optional Color role is assigned a Measure data type that determines the color gradient of the bars in the group. The following figure shows the custom graph object used in a report in which the Color role has been assigned a data item that contains age values.

*Figure 16  Bar Chart with a Gradient Color Range*

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**Adding an Overlay Graph Element**

**About Overlay Elements**

In an overlay, one graph element is superimposed on another graph element in the same cell graph. In the following example, a step plot is overlaid on a bar chart.

*Figure 17  Step Plot Overlaid on a Bar Chart*

When you overlay elements, the overlay is scaled appropriately along the axis to match the scale used for the overlaid element.
Adding an Overlay

To create an overlay:

1. Select **Elements** in the left pane to display the **Graph Elements** pane.
2. Drag a graph element from the **Graph Elements** pane and drop it onto the canvas.
3. Drag and drop a second graph element directly onto the existing graph element.
   
   **Note**: Some graph elements, such as the pie chart and the treemap, cannot be layered. Other graph elements can be overlaid only on specific element types. A message is displayed when you try to drag and drop a graph element that is not compatible with the existing element. For more information, see “Incompatible Graph Elements” on page 36.

   If the graph elements are compatible, they are automatically assigned a shared role. This enables both graph elements to have a common X-axis role. You can unshare the shared role if needed. For more information, see “Sharing Data Roles” on page 21.

4. (Optional) In the **Role Definitions** pane, you can change the default shared role names to provide more meaningful names.

Changing the Order of Graph Elements in a Cell

When you overlay a graph element on top of another, the graph elements are layered with the last one added on top. For example, suppose that you create a graph template with a line chart, and then you add a bar chart. Because the bar chart was added last, it appears in front of the line chart. Depending on the data that is assigned to the graph elements in SAS Visual Analytics, the bar chart might obscure part of the line chart. You can reorder the graph elements so that the line chart appears in front of the bar chart.

To change the order of the graph elements in a cell:

1. Select **Outline** in the left pane to display the **Outline** pane.
2. In the section of the **Outline** pane for the cell that you want to change, drag the graph elements to the desired order.

Removing a Graph Element

To remove a graph element from the cell:

1. Select **Outline** in the left pane to display the **Outline** pane.
2. In the **Outline** pane, click **x** next to the graph element that you want to remove.
Working with User-Defined Lattices

About User-Defined Lattices

When a graph template contains more than one cell, the cells are arranged in rows and columns called a user-defined lattice. Each cell is created independently and can contain different types of graph elements. A graph element can be added to an existing cell or added so that it creates a cell in a new row or column.

Cells are identified by a combination of a letter and a number, such as A1, B1, A2, and so on. The letters identify columns and the numbers identify rows. The following table represents the labeling for a user-defined lattice that contains three columns and three rows:

<table>
<thead>
<tr>
<th>A1</th>
<th>B1</th>
<th>C1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>B2</td>
<td>C2</td>
</tr>
<tr>
<td>A3</td>
<td>B3</td>
<td>C3</td>
</tr>
</tbody>
</table>

The following example shows a user-defined lattice with four cells as it appears in a report. The A2 cell is empty.

*Figure 18  User-defined Lattice with Four Cells*

Adding a Graph Element to a User-Defined Lattice

To create a user-defined lattice:
1 Drag a graph element from the **Graph Elements** pane and drop it onto the blank canvas area. The graph element is created in the center of the graph area of the canvas in a cell designated A1.

2 Drag and drop another graph element onto the canvas in either of the following ways:
   - Drag and drop the graph element onto the right or left border of the existing graph to create a new column. The area becomes shaded to indicate the location of the new column.
   - Drag and drop the graph element onto the top or bottom border of the existing graph to create a new row.

3 To add more cells, continue dragging and dropping graph elements onto the borders of the existing graph to create new columns or rows. You can drag and drop a graph element onto the area between two columns to insert a new column. Or you can drag and drop a graph element onto the area between two rows to insert a new row. If the existing graph contains a lattice with an empty cell, you can drag and drop the graph element into that empty cell.

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### Moving a Cell within the Lattice

To move a cell to a different row and column position:

1 Select **Outline** in the left pane to display the **Outline** pane.

2 In the **Outline** pane, drag the cell identifier (for example, B2) for the cell that you want to move. Drop it above the identifier for the cell to which you want to move it. The remaining cells in the lattice are shifted to accommodate the move.
Resizing a Row or a Column

You can change the width of a column and the height of a row in a user-defined lattice. For example, you might want one particular column to be wider than the others.

To resize a row:
1. Select the row between the row that you want to change and an adjacent row.
2. Drag the handle upward or downward to change the row height.

To resize a column:
1. Select the column between the column that you want to change and an adjacent column.
2. Drag the handle left or right to change the column width.

Deleting a Row or a Column

In order to delete a row or column in a user-defined lattice, you must clear the contents of all cells in the row or column. When all cells in a row or column are blank, the empty row or column is removed as well.

To clear the contents of a cell:
1. Select Outline in the left pane to display the Outline pane.
2. In the Outline pane, click next to each of the graph elements in the cell.

Example: Creating a Butterfly Chart with a User-Defined Lattice

In addition to creating grids of graph elements, you can also use a user-defined lattice to create the effect of custom graph elements. This example uses a user-defined lattice to create a butterfly chart. The butterfly chart is useful for comparing two unique values. In this chart, the two values are arranged on each side of the Y axis.

1. In the graph builder, select Graph Elements in the left pane to display the Graph Elements pane.
2. Drag a bar chart from the Graph Elements pane and drop it onto the canvas area.
3. Drag and drop a second bar chart from the Graph Elements pane onto the right edge of the canvas. This action creates a new column for the second bar chart.
4. Share the category roles:
   a. Select Roles in the right pane to display the Role Definitions pane.
   b. Click next to the Category role for either bar chart.
c Expand the **Create shared role** list and select the Category role for the other bar chart.

d In the resulting Add Shared Role window, click **OK** to close the window and create the shared role.

For more information about shared roles, see “Sharing Data Roles” on page 21.

5 Change both bar charts to a horizontal layout.

   a Select **Options** in the right pane to display the **Options** pane.

   b In the **Options** pane, select the first bar chart element.

   c For the **Direction** option, select **Horizontal**.

   d Repeat the previous two steps for the other bar chart.

6 Specify a uniform column and row axis.

   a In the **Options** pane, select **Graph Template**.

   b For the **X axis range** option, select **Same for all cells**.

   c For the **Y axis range** option, select **Same within each row**.

   The bar charts should resemble the following:

7 Reverse the order of the X (Response) axis for the left bar chart.

   a In the **Options** pane, select **X Axis** for the left bar chart.

   b Select the **Reverse order** option.

   The graph template should resemble the following:
8 Display the grid lines for the X axes.
   a In the **Options** pane, select **X Axis** for the left bar chart.
   b For the **Grid lines** option, select **On**.
   c Repeat the previous two steps for the right bar chart.

9 Click **Save** in the menu bar to save the graph template.

**Note:** After you have saved the graph template, it can be imported into SAS Visual Analytics for use in reports. See “Import Custom Graph Objects” in *SAS Visual Analytics: Working with Report Content* for information about importing custom graph objects.

The following figure shows the resulting custom graph object used in a report to compare predicted sales compared to the actual sales for a line of retail products.

*Figure 19  Butterfly Chart Created with a User-Defined Lattice*
Sharing Data Roles

About Shared Data Roles

If your graph template contains multiple graph elements, you can specify that some data roles are shared across two or more graph elements. You share data roles when you want the graph elements to use the same data role for either of their axes. When report designers who use the graph template in their reports assign roles, a single data column is assigned to all roles that use the shared role.

Note: If the graph element types are compatible, overlaid graph elements are automatically assigned a shared role. (See “Incompatible Graph Elements” on page 36.) You can unshare a role if needed.

Shared roles are very useful in user-defined lattices. They enable you to manage data roles across columns and rows. For example, you might share data roles if you want to analyze relationships in your data.

In the following figure, the X axis of the scatter plot shares a role with the Response axis of the bar chart.

*Figure 20  Two Graph Elements with a Shared Role*

When the resulting custom graph object is used in a report, the data might be applied as shown in the following figure. The bar chart shows engine sizes for different regions of the world. (The engine size has been changed from a Sum to an Average measure.) The scatter plot shows the miles-per-gallon trend for the different engine sizes.
Sharing a Data Role

To share a data role:

1. Select **Roles** in the right pane to display the **Role Definitions** pane.

2. In the **Graph** section of the **Role Definitions** pane, locate the role that you want to share in one of the graph elements. Click **next to that role.**

3. Expand the **Create shared role** list in the resulting menu and select the corresponding role from another graph element. This opens the **Add Shared Role** window.

4. (Optional) Change the default shared role name to provide a more meaningful name.

5. Click **OK** to close the window and create the shared role.

You can also explicitly create a shared role and then use that shared role in graph elements:

1. Select **Roles** in the right pane to display the **Role Definitions** pane.

2. In the **Role Definitions** pane, click **Add Role** in the **Shared Roles** section. The **Add Shared Role** window is displayed.

3. (Optional) Change the default shared role name to provide a more meaningful name.

4. Select the classification for the role. For more information, see “**Role Classifications**” on page 11.

5. (Optional) Select **Required** to require report designers to assign data to the role. If this option is not selected, then report designers can choose whether to assign data to the role.

6. If the **Allow multiple data assignments** check box is available, then you can select or clear the check box to specify whether more than one measure can be assigned to the role.

7. Click **OK** to close the **Add Shared Role** window and create the shared role.

To use the shared role that you have defined:
1. Select **Roles** in the right pane to display the **Role Definitions** pane.

2. In the **Graph** section for the element in which you want to use the defined shared role, click \( \) next to the role that you want to share.

3. Expand the **Use Shared Role** list and select the defined shared role that you want to use.

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**Unsharing a Data Role**

To stop sharing a role:

1. Select **Roles** in the right pane to display the **Role Definitions** pane.

2. In the **Graph** section of the **Role Definitions** pane, locate the role that you no longer want to share. Click \( \) next to that role and then select **Unshare** from the resulting menu.

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**Deleting a Shared Data Role**

To delete a shared role that you have defined:

1. Select **Roles** in the right pane to display the **Role Definitions** pane.

2. In the **Shared Roles** section of the **Role Definitions** pane, locate the shared role that you want to remove. Click \( \) next to that role and then select **Delete Role** from the resulting menu.

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**Creating Data-Driven Lattices**

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**About Data-Driven Lattices**

A data-driven lattice is a multi-cell graph in which the cell data is determined by the values of one or more class variables. Class variables are specified when the report designer creates a report that includes the lattice. The number of cells is determined by the unique values of the class variables. Each cell of the lattice has the same graph elements. However, these graph elements have different values of the class variables.

The following figure shows a graph template that includes a data-driven lattice with a columnar role used in a report. In the report, the graph template includes a three-cell lattice of bar charts showing engine size and miles per gallon for different types of automobiles. The country of origin is specified as the class variable. As a result, a cell is created for each country of origin.
Here are the characteristics of data-driven lattices:

- You can define up to two lattice roles: one role for the rows and another role for the columns. When the report designer uses the lattice in a report, the class variables are assigned to the lattice roles. All class variables must come from a single data source. The number of rows and columns in the graph is determined by the unique values of the class variables.

- If you specify that the role is required, then a report designer must assign data to the role. If this option is not selected, then report designers can choose whether to assign data to the role. In that case, it is possible for a graph template to have no lattice.

- Graph elements can be overlaid the same way they are overlaid in single-cell or user-defined multi-cell graphs. When the report designer adds a lattice to a report, the overlaid graph element is displayed in every cell.

  Note: Graph elements cannot be overlaid unless their aggregations are compatible. If you try to save a template that contains incompatible aggregations, then a message appears in the Role Definitions pane prompting you to make changes. Graph elements with compatible aggregations either perform no aggregation at all or they use the same set of shared Category roles.

- Options that you specify for graph elements are applied to all of the cells of the graph template.

Data-driven lattices are not available in either of the following cases:

- when the graph template already contains more than one cell
- when a Color role with a Measure data type has been added to a bar chart, waterfall chart, or scatter plot

Creating a Data-Driven Lattice

To create a data-driven lattice:

1. Create the graph template that you want to serve as the basis for your lattice. For more information, see “Building a New Graph Template” on page 9.

2. Select Roles in the right pane to display the Role Definitions pane.

3. In the Data-Driven Lattice Roles section of the Role Definitions pane, click Add Role. The Add Role window is displayed.

4. For Role Type, select Lattice Row or Lattice Column to specify the layout for the cells.

5. (Optional) Change the default role name to provide a more meaningful name.
6 Select the classification for the role. For more information, see “Role Classifications” on page 11.

7 (Optional) Select Required to require report designers to assign data to the role. If this option is not selected, then report designers can choose whether to assign data to the role. In that case, it is possible for a graph to have no lattice.

8 If the Allow multiple data assignments check box is available, then you can select or clear the check box. When this option is selected, more than one measure can be assigned to the role. For example, in a line chart, if multiple columns are assigned to the Y axis, then the graph shows a line for each measure.

9 Click OK to close the Add Role window and create the data-driven lattice role.

10 (Optional) Repeat the previous steps to specify a role for the other lattice dimension. For example, if you specified a role for a multi-row layout, you can define an additional role for columns.

Example: Columnar Data-Driven Lattice

The following figure shows a data-driven lattice graph used in a report of the sales for a line of retail products over a period of time. The graph template specifies a row-based lattice in which the rows correspond to the corporate divisions that are responsible for the sales. The corporation has two divisions, resulting in a graph with one column and two rows.

Figure 23 Example Data-Driven Lattice

To create the example graph template:

1 Select Elements in the left pane to display the Graph Elements pane.
2 Drag a line chart from the Graph Elements pane and drop it onto the canvas area.

3 Select Roles in the right pane to display the Role Definitions pane.

4 In the Graph section of the Role Definitions pane, click ⌁ next to the Category role for the line chart and then select Edit Role from the resulting menu. The Edit Role window is displayed.

5 Change the Classification value for the role to Datetime. Specifying Datetime forces the report designer to assign date and time data to the Category role.

6 Click OK to close the Edit Role window and update the role definition.

7 In the Data-Driven Lattice Roles section of the Role Definitions pane, click Add Role. The Add Role window is displayed.

8 For Role Type, select Lattice Row.

9 For Classification, select Category.

10 Select Required. With this option selected, the report designer must assign data to this role to render the report with data assigned.

11 Click OK to close the Add Role window and save the lattice role definition.

12 Click ⌠ in the menu bar to save the graph template.

    Note: Once you have saved the graph template, it can be imported into SAS Visual Analytics for use in reports. See “Import Custom Graph Objects” in SAS Visual Analytics: Working with Report Content for information about importing custom graph objects.

---

Modifying Graph Templates

You can load a saved graph template into the graph builder and change any feature of the graph template. If you have saved any graph templates, a list of recently created templates appears in the canvas area when you open the graph builder. You can also search for saved graph templates in the following ways:

- by selecting Browse in the menu bar if no graph template is currently loaded
- by clicking ⌠ in the menu bar and selecting Open in the resulting menu if a graph template is currently loaded

    Note: Any changes that you make to a saved graph template do not affect existing reports that were created from the original graph template. However, new reports that are created after the modified graph template is saved will reflect the changes to the graph template.

To create a new graph template based on an existing graph template:

1 Load the desired graph template into the graph builder.

2 Click ⌠ in the menu bar.

3 Select Save As to save a new copy of the graph template with a different name.
Working with Options

About Options

Options enable you to control the overall appearance of your graph. Components that have options include graph elements, cells, axes, and the entire graph template. Report designers can override some options in their report.

To change the options for a graph template, cell, graph element, legend, or one or more axes:

1. Select **Options** in the right pane to display the **Options** pane.
2. In the list box, select the component for which you want to edit options.

   **TIP** You can also select the component in the graph. For example, if you click anywhere in a bar chart, then bar chart options are displayed in the **Options** pane.

3. Make your changes to the options for the component.

The following sections list the options for each component.

Graph Template Options

**Note:** The options that are available depend on the layout that you are using. For example, some of the options are available only with a lattice layout.

The graph template has the following options:

**Wall border**

specifies whether a border is drawn around the outer perimeter of the graph template.

**X Axis Range**

specifies whether the range for the X axis is different for each cell, the same for all cells in the same column, or the same for all cells in the graph template.

**Y Axis Range**

specifies whether the range for the Y axis is different for each cell, the same for all cells in the same row, or the same for all cells in the graph template.

**Background**

specifies whether a background can be displayed when the graph template is used in a report.

**Border**

specifies whether a border is drawn around the inner perimeter of the graph template.

**Overview axis**

specifies whether the overview is displayed. The overview axis is a scrolling axis that enables you to specify how much of the axis is displayed and which segment of the axis is displayed.

If selected, the **Contents** control is displayed. Using that control, you can specify whether the contents of the overview axis should be the same as the main graph (the default) or whether to
specify graph elements for the overview axis. If you select **Specify graph elements**, then you can drag and drop one or more compatible graph elements onto the overview axis area of the canvas.

---

**Cell Options**

Cells in a graph template have the following options:

- **Overlaid graph colors**: specifies whether each graph in the cell starts with a unique color or with its first default color.
- **Background color**: specifies an explicit background color.
- **Border**: specifies whether a border is drawn around the cell.
- **Wall color**: specifies an explicit wall color.
- **Wall outline**: specifies whether a border is drawn around the outer perimeter of the cell.

---

**Band Plot Options**

The band plot element has the following options:

- **Y Axis**: specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.
- **Transparency**: specifies the degree to which the background is visible through graph features.
- **Outline**: specifies whether outlines are drawn above and below the band.

---

**Bar Chart Options**

The bar chart element has the following options:

- **Direction**: specifies whether bars are drawn horizontally or vertically.
- **Y Axis**: specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.
- **Fixed baseline**: specifies whether a baseline is displayed on the bar chart.
  - If selected, a field is provided to specify the baseline value.
- **Spacing**: specifies the amount of space between bars.
Offset
specifies an amount to offset the bars from category axis values.

Transparency
specifies the degree to which the background is visible through graph features.

Combine excluded cells into “All Other”
summarizes all excluded data rows into an Other bar. This option is available when you use summarized data.

Grouping style
specifies how grouped data is displayed:
Cluster
displays each value of the grouping variable as a separate bar.
Stack
displays the values of the grouping variable as segments of each bar.

Grouping scale
specifies how the data values for a grouped chart are displayed:
Actual Values
displays the actual measure values.
Normalize groups to 100%
displays the values for each grouped bar as percentages of the total.

This selection has the following restrictions:
• Either the Group role must be assigned or multiple measures must be assigned.
• The **Fixed baseline** option is not available.
• Negative values are ignored in the stacked bar chart.

Data labels
specifies whether data values are displayed as text labels beside or above the bar, depending on the direction of the bar.

If selected, the **Overlap handling** control is displayed to specify whether label positions are automatically adjusted to prevent the labels from overlapping.

---

**Bubble Plot Options**

The bubble plot element has the following options:

Y Axis
specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Smallest bubble
specifies the smallest bubble size used in the plot.

Largest bubble
specifies the largest bubble size used in the plot.

Transparency
specifies the degree to which the background is visible through graph features.
Line Chart Options

The line chart element has the following options:

Y Axis
  specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Fixed baseline
  specifies whether a baseline is drawn on the line chart.
  If selected, a field is provided to specify the baseline value.

Transparency
  specifies the degree to which the background is visible through graph features.

Grouping style
  specifies the style overlay that is used when multiple measures are assigned to the chart:
    Overlay unfilled
      displays the lines without color fills.
    Overlay filled
      displays the lines with transparent color fills.
    Stack filled
      displays the lines with opaque color fills that are stacked. The values of the stacked lines are plotted relative to the lines below them, rather than to the baseline of the chart.

Line
  specifies whether lines are drawn between the data points in the chart.

Markers
  specifies whether markers are displayed for the data points in the chart.

Data labels
  specifies whether data values are displayed as text labels in the chart.

Needle Plot Options

The needle plot element has the following options:

Y Axis
  specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Fixed baseline
  specifies whether a baseline is drawn on the needle plot.
  If selected, a field is provided to specify the baseline value.

Transparency
  specifies the degree to which the background is visible through graph features.

Markers
  specifies whether markers are displayed for the data points in the plot.
Pie Chart Options

The pie chart element has the following options:

Donut hole
specifies whether a blank circle is displayed inside the pie chart.

Diameter
if Donut hole is selected, specifies the diameter of the hole as a percentage of the pie size.

Starting point
specifies the position of the first wedge as an offset in degrees.

Direction
specifies whether the pie slices are laid out clockwise or counterclockwise. The slices are laid out in descending order.

Create “Other” slice for minimal values
specifies whether small values are grouped together into a slice labeled “Other.”

Minimum percentage for “Other”
if Create “Other” slice for minimal values is selected, specifies the threshold percentage for a distinct value to be displayed as a separate slice.

Grouping style
specifies how the values are displayed when the Group data role is assigned or when there are multiple measures assigned to the plot:

Stack
displays the pie charts for the group values or measures as a set of stacked rings.

Multiple
displays the pie charts for the group values or measures as multiple separate charts.

Pie label
specifies whether the names of the measures are displayed in the chart.

Category
specifies whether the category values are displayed in the chart.

Actual value
specifies whether the measure values are displayed in the chart.

Percent of total
specifies whether the measure values are displayed in the chart as a percentage of the total.

Location
specifies where the data labels are placed:

Auto
places the labels automatically based on the space available.

Callout
places the labels outside of the chart with a line connecting each label to the slice that it represents.

Inside
places the labels inside each slice of the chart.

Outside
places the labels outside of the chart.
Note: The Callout and Outside selections are not supported for a grouped pie chart.

Scatter Plot Options
The scatter plot element has the following options:

Y Axis
specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Transparency
specifies the degree to which the background is visible through graph features.

Schedule Chart Options
The schedule chart element has the following options:

Y Axis
specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Spacing
specifies the amount of space between bars.

Transparency
specifies the degree to which the background is visible through graph features.

Series Plot Options
The series plot element has the following options:

Y Axis
specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Transparency
specifies the degree to which the background is visible through graph features.

Break on missing values
specifies whether missing values cause breaks in the lines between data points.

Markers
specifies whether markers are displayed for the data points in the plot.

Data labels
specifies whether data values are displayed as text labels in the plot.

Step Plot Options
The step plot element has the following options:

Y Axis
specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.
Data point alignment
  specifies the location of the data point relative to the step.

Connect order
  specifies whether the data points that form the step line are connected in the order read from the data or as they occur left-to-right along the X axis.

Offset
  specifies an amount to offset all step lines and markers from X-axis values.

Transparency
  specifies the degree to which the background is visible through graph features.

Break on missing values
  specifies whether missing values cause breaks in the lines between data points.

Markers
  specifies whether markers are displayed for the data points in the plot.

---

**Time Series Plot Options**

The band plot element has the following options:

Y Axis
  specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Transparency
  specifies the degree to which the background is visible through graph features.

Grouping style
  specifies the style overlay that is used when multiple measures are assigned to the chart:
    - Overlay unfilled
      displays the lines without color fills.
    - Overlay filled
      displays the lines with transparent color fills.
    - Stack filled
      displays the lines with opaque color fills that are stacked. The values of the stacked lines are plotted relative to the lines below them, rather than to the baseline of the chart.

Fill baseline
  if either of the filled values are selected for **Grouping style**, specifies whether a baseline is used for the color fills.
  If selected, a field is provided to specify the baseline value.

Line
  specifies whether lines are drawn between the data points in the chart.

Markers
  specifies whether markers are displayed for the data points in the plot.

Data labels
  specifies whether data values are displayed as text labels in the plot.
Treemap Options

The treemap element has the following options:

Arrangement
  specifies the layout of the tiles in the treemap:
  
  Standard
  arranges the tiles into squares, with the largest tiles generally at the bottom left.
  
  Toggle
  arranges the tiles into a single row or column, with the largest tile on the left or at the top.
  
  The orientation of the tiles alternates between hierarchy levels. The top level is arranged as a row, the second level is a column, and so on.
  
  Flow
  arranges the tiles from largest to smallest, with the largest tile at the top left.

Level indicator
  specifies whether the name of the category or of the selected hierarchy level is displayed above the treemap.

Data labels
  specifies whether data values are displayed as text labels in the treemap.

Vector Plot Options

The vector plot element has the following options:

Y Axis
  specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Transparency
  specifies the degree to which the background is visible through graph features.

Arrowheads
  specifies whether arrowheads are drawn at the ends of the vector lines.
  
  If selected, a Shape control is displayed to specify the shape of the arrowheads.

Waterfall Chart Options

The waterfall chart element has the following options:

Y Axis
  specifies whether the Y (vertical) axis is displayed on the left or right side of the graph.

Fixed baseline
  specifies whether a baseline is drawn on the waterfall chart.
  
  If selected, a field is provided to specify the baseline value.
Spacing
specifies the amount of space between bars.

Combine excluded cells into “All Other”
specifies whether all excluded rows are summarized into an “All Other” bar.

Transparency
specifies the degree to which the background is visible through graph features.

Initial bar
specifies whether a bar with an initial value is added to the chart.
If selected, you can enter the initial value in the Value field and a custom label in the Label field.

Final (cumulative) bar
specifies whether a final, cumulative bar is added to the chart.
If selected, you can enter a custom label in the Label field.

Color by direction of value change
specifies whether the bars are colored based on whether the measure values are increasing or decreasing from the previous value.

Connect lines
specifies whether lines are drawn to connect the bars in the chart.

Data labels
specifies whether data values are displayed as text labels in the chart.
If selected, the Overlap handling control is displayed to specify whether label positions are automatically adjusted to prevent the labels from overlapping.

X and Y Axis Options
The X and Y axes of graph elements have the following options:

Reverse order
specifies whether axis values are displayed in decreasing rather than ascending order.

Fixed minimum
specifies a fixed minimum value for the axis.

Fixed maximum
specifies a fixed maximum value for the axis.

Grid lines
specifies whether grid lines are displayed for each tick on the axes.

Axis label
specifies whether a label is displayed for the axis.

Position
  if Axis label is selected, specifies whether the label appears on the top or side of the axis.

Fixed label
  if Axis label is selected, specifies whether the axis label is a static value.
  If selected, fields are provided to specify both the label value and a short form of the label.

Axis line
specifies whether a line is drawn for the axis. If selected, then you can specify the line color.
Tick values
specifies whether tick values are displayed along the axis.

If selected, the following options become available. The options that are available depend on the graph element and whether the X or Y axis is selected:

Integers only
specifies whether only integer tick values are displayed.

Text color
specifies the color that is used for the tick values.

Categorical values overlap handling
for a category axis, specifies how overlapping tick values are handled.

Measure values overlap handling
for a measure axis, specifies how overlapping tick values are handled.

Time data interval
for time data, specifies the time interval to use for the axis. Intervals can be Second, Minute, Hour, Day, Week, and so on.

Split time values
for time data, specifies that time values be split.

Tick marks
specifies whether the tick marks are displayed along the axis.

Alignment
if Tick marks is selected, specifies whether the tick mark is drawn at the value midpoint or midway between value midpoints. This option is available for discrete axes only.

---

Incompatible Graph Elements

The overlay feature enables you to superimpose one graph element on another. However, some graph elements cannot be layered in the same cell. The following table shows which graph elements are incompatible.

**Note:** Pie charts and treemaps are not compatible with any other graph elements. They are not listed in the table.

*Table 1  Graph Element Type Incompatibility*

<table>
<thead>
<tr>
<th>Graph Element</th>
<th>Not Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band plot</td>
<td>Bar chart (horizontal)</td>
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<tr>
<td></td>
<td>Schedule chart</td>
</tr>
<tr>
<td><strong>Graph Element</strong></td>
<td><strong>Not Compatible</strong></td>
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<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Bar chart (horizontal)</td>
<td>Band plot</td>
</tr>
<tr>
<td></td>
<td>Bar chart (vertical)</td>
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<tr>
<td></td>
<td>Line chart</td>
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<tr>
<td></td>
<td>Needle plot</td>
</tr>
<tr>
<td></td>
<td>Schedule chart</td>
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<tr>
<td></td>
<td>Vector plot</td>
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<tr>
<td></td>
<td>Waterfall chart</td>
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<tr>
<td>Bar chart (vertical)</td>
<td>Bar chart (horizontal)</td>
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<td></td>
<td>Schedule chart</td>
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<tr>
<td></td>
<td>Vector plot</td>
</tr>
<tr>
<td>Bubble plot</td>
<td>(Compatible with all graph elements except Pie chart and Treemap)</td>
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<tr>
<td>Line chart</td>
<td>Bar chart (horizontal)</td>
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<tr>
<td></td>
<td>Schedule chart</td>
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<td></td>
<td>Vector plot</td>
</tr>
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<td>Needle plot</td>
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<td>Schedule chart</td>
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<tr>
<td>Scatter plot</td>
<td>(Compatible with all graph elements except Pie chart and Treemap)</td>
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<tr>
<td>Schedule chart</td>
<td>Band plot</td>
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<td>Bar chart (horizontal or vertical)</td>
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<td>Needle plot</td>
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<td>Step plot</td>
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<td>Time series plot</td>
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<td></td>
<td>Waterfall chart</td>
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<td></td>
<td>Waterfall chart</td>
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</tbody>
</table>

* The waterfall chart requires the X axis to have a shared role to avoid unpredictable results.