

## **SAS® Visual Analytics 6.2**

User's Guide



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#### SAS® Visual Analytics 6.2: User's Guide

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## **Using This Book**

#### **Audience**

The features of SAS Visual Analytics are designed for the following users:

- Persons needing to explore data in support of ad hoc business questions.
- Persons responsible for designing and creating reports for their enterprise.
- Persons responsible for analyzing report data and making decisions based on that data.

Persons responsible for managing SAS servers and managing the SAS Visual Analytics environment should refer to SAS Visual Analytics: Administration Guide.

#### **Prerequisites**

Here are the prerequisites for using SAS Visual Analytics:

- A user ID and password for logging on to SAS Visual Analytics.
- A supported web browser installed on your desktop client.
- A supported version of the Adobe Flash player installed on your desktop client.
- Access to data sources that can be used to obtain data for exploration or reports.

If you have questions about whether you are ready to use SAS Visual Analytics, contact your system administrator.

## **What's New**

## What's New in SAS Visual Analytics 6.2

## **SAS Visual Analytics Home Page**

New and enhanced features on the home page include:

- SAS tables appear in the My Content and Other Content sections.
- You can refine your search results to include additional SAS types (for example, tables).
- The **Manage Content** section has been enhanced. For example, you can add collections or specify which collections you want to see. A collection is a virtual file system, which enables users to group content such as explorations, reports, and tables without actually moving them.
- The object inspector has been enhanced. For example, you can see collections.
- If you have the Theme Designer for Flex: Administration role in SAS Management Console, then you can access the SAS Theme Designer for Flex from the home page.

#### **SAS Visual Data Builder**

New and enhanced features in SAS Visual Data Builder include:

#### **Enhancements to Working with Data**

- You can use in-memory tables from SAS LASR Analytic Server as input tables for a query.
- You can join tables from more than one library.
- You can import a SAS Information Map into a query. Maps that are based on tables are supported. Maps based on OLAP cubes are not supported.
- For deployments that use Greenplum Data Computing Appliance, the generated SAS statements use the HPDS2 procedure to distribute data for staging tables. This enhancement is an efficient method for distributing data.

#### **Enhancements to Importing Data**

The import local data feature is enhanced as follows:

- You can preview a spreadsheet or delimited file before you import it.
- When you import a delimited file, you can specify the encoding to use for reading the file.
- You can import a SAS data set from your desktop.
- You can import files up to 2 GB in size. The application reads the data in blocks and transfers them to the server.

Note: Support for creating a single output table when importing multiple worksheets from a workbook is no longer available. You can import multiple worksheets during a single import: each worksheet is imported into a separate table. You can perform

additional data preparation of these tables using select, join, and append functions after the tables are loaded.

You can import remote data by browsing for SAS data sets that are available to your SAS Application Server and load them to SAS LASR Analytic Server.

#### **Enhancements to Customizing Code**

- You can add preprocessing and postprocessing SAS statements to your query.
- You can view all the code for the query, including the SQL procedure statements and LIBNAME statements.
- You can customize the code for the entire query when you unlock the code. In the previous release, you could modify the SELECT statement only.

## **SAS Visual Analytics Explorer**

### **Enhancement for Visualizations and Analytics**

- The new Decision Tree visualization type enables you to perform decision tree analysis.
- Forecasting has been enhanced to support underlying factors and scenario analysis.
- New advanced filters enable you to create filters that use multiple data items.
- You can create ranks to select the top (greatest) and bottom (least) aggregated values for a category.
- The new Manage Visualizations window enables you to arrange, filter, and sort your visualizations.
- Crosstab visualizations now support an indented display mode.

- Correlation matrix visualizations now enable you to compare two sets of measures and sort by the correlation value.
- The geo map visualization has a new colored regions overlay.
- You can customize data ranges and color gradients for some visualization types. Customized data ranges can be shared between visualizations.
- For visualizations that contain hierarchy data, you can click values on the visualization axis to drill down the hierarchy.

#### **Enhancements for Data Management**

- New data source filters enable you to subset the entire data source for the exploration.
- You can calculate measures by using aggregated data.
- You can sort and group your data items in the **Data** pane.
- You can create Percent of Total data items to display the percentage of the total value for a measure.
- You can derive hierarchies from date, time, or datetime data items.
- Changing the data source for an exploration has been enhanced. The new data source is no longer required to include all of the same data items as the current data source.

## **SAS Visual Analytics Designer**

#### **Enhanced User Interface for the Designer**

■ The left pane has four tabs (**Objects**, **Data**, **Imports**, and **Shared Rules**) at the same level. (Previously, the **Data** tab appeared below the **Objects** tab.) By default,

- only the **Objects** and **Data** tabs appear. To display the **Imports** and **Shared Rules** tabs, click **v** after the last tab name or use the **View** menu.
- The Data tab handles tables with a large number of data items. You can sort and group data items on the **Data** tab.
- The **Properties** tab (in the right pane) for all of the report objects has been enhanced. For example, the alignment has been updated to improve readability. There is more consistency between the property names in the designer and in the explorer.
- The user interface for display rules has been enhanced.
- You can change report themes.
- If you have the Theme Designer for Flex: Administration role in SAS Management Console, then you can access the SAS Theme Designer for Flex from the **Styles** tab.

#### **Enhanced Report Objects**

- List tables have been enhanced. For example, you can change the text alignment for column headings, change the text and background color for totals, hide vertical and horizontal lines, and add and remove alternating row colors. You can remove column headings. You can drag and drop multiple data items onto list tables.
- Crosstabs have been enhanced. For example, you can change the text and background color for subtotals. You can change font styles and add a percentage of subtotals.
- Report objects can be duplicated using the pop-up menu. All properties, filters, ranks, display rules, roles, and styles are copied. However, interactions are not copied.
- A new geo region map (also known as a choropleth map) is available.
- Geo bubble maps and geo region maps retain zoom and pan settings.

- Objects in vertical containers have a height property and objects in horizontal containers have a width property.
- Graphs have a hyperlink axis when a hierarchical data item is used. When you click on the hyperlinked label, you drill down on the graph, just as if you had doubleclicked the label.
- For time series report objects, you can specify units of time.
- Gauges (KPIs) support high cardinality.
- The slider gauge supports dates (which are continuous) and numeric categories.
- Controls have been enhanced. The drop-down list, list, button bar, and text input controls support a brush interaction and sorting.
- You can add and remove data items by right-clicking on a graph.
- You can include or exclude missing values when filtering based on discrete values using a range slider control.

#### **Enhanced Imported Report Objects**

- You can change the data source for report objects that are imported from the explorer.
- You can import heat maps, box plots, and forecasts from the explorer.

#### **Enhanced Data Items**

- You can create a new aggregated calculated item for tables and graphs.
- You can create ranks to select the top (greatest) or bottom (least) values for category values. You can choose whether other values or ties are included.
- You can rank based on the frequency data item.
- Advanced filters enable you to filter using multiple data items.

- You can sort on formatted data. You can sort on unformatted data only when the user-defined formats that have an underlying numeric value.
- You can calculate measures by using aggregated data.
- You can create Percent of Total data items to display the percentage of the total value for a measure.
- You can derive hierarchies from date, time, or datetime data items.

#### **Enhanced Linking**

- You can create a link from a report object, text, or image to another report.
- You can create links to different sections in a report.
- You can specify a link to an external URL from report objects (including text objects).

## **SAS Visual Analytics Viewer**

New and enhanced features in SAS Visual Analytics Viewer include:

- You can view a link to a specific section in a target report. You can also view links from a report object, text, or image to another report.
- Comments can be added for individual objects in a report.
- If you have the Create Reports capability, then you can use the **Edit Report** button to open SAS Visual Analytics Designer and edit the current report.
- Prompt values can be changed for prompted stored processes.

## **SAS Visual Analytics Administration**

#### **SAS Visual Analytics Administrator**

- You can register tables.
- You can set permissions on libraries.
- You can delete tables from metadata.
- You can delete physical tables from HDFS (if you are using the SAS High-Performance Deployment of Hadoop).
- You can use an interactive editor to create permission conditions for row-level security.
- You can manage mobile devices either by blacklisting or whitelisting.
- You can more efficiently stage and load data, because the user interfaces for these tasks are simplified and provide pre-populated values where possible.
- A gauge that indicates available memory in a distributed SAS LASR Analytic Server is visible in multiple locations in the user interface.
- You can add new metadata folders from certain secondary windows (such as the Choose a Location window).
- You can access concise instructions for selected tasks by selecting **Help** ▶ **How to** from the main menu.

#### Other Enhancements in Administration

You can make it easy for registered users to use their own data in SAS Visual Analytics. With the new automated data loading feature, users place tables in a

- designated host folder that is periodically scanned by a scheduled task. When the task discovers a table that is not already loaded, it loads that table to memory.
- A new predefined server (the Public LASR Analytic Server) and library (the Visual Analytics Public LASR library) provide broad access and support the new automated data loading feature.
- In the Search Interface to SAS Content, log4j logging is enabled for the index loading script (loadindex.sh).
- In the metadata definition for a SAS LASR Analytic Server, you can set memorybased constraints on the availability of certain tasks. This causes a distributed server to reject certain requests (for example, loading additional data) when the server's available physical memory falls below a certain level.
- To simplify metadata-layer permission requirements, the Create permission is no longer used. Instead, the Write permission controls actions that were previously controlled by the Create permission.
- You can promote SAS Visual Analytics objects from one 6.2 environment to another 6.2 environment. You can promote objects from one metadata server to another metadata server or within a metadata server.
- Changes and enhancements to capabilities and roles include the following:
  - A new suite-level capability, Create Collections, enables users to create groups of bookmarks that point to objects such as reports and explorations. □ A new administrative capability, Monitor LASR Analytic Server, controls the availability of the Resource Monitor and Process Monitor tabs. The Email capability and the Print as PDF capability are now at the suite level. The View Comments capability (now named Add or View Comments) provides the ability to add comments. In the initial configuration, all of the SAS Visual Analytics roles provide this capability.
  - ☐ The Require Passcode on Mobile Devices capability is now supported.
  - The Manage Custom Lists capability is now named Customize Hub.

#### **Documentation Enhancements**

With the exception of what's new and accessibility information, content about SAS Visual Analytics Administrator has been removed from this book. SAS Visual Analytics Administrator functionality is now documented in the SAS Visual Analytics: Administration Guide. Cross-references are provided.

## Accessibility

# Accessibility Features of SAS Visual Analytics

#### **Overview**

SAS Visual Analytics has been tested with assistive technology tools. It includes accessibility and compatibility features that improve the usability of the product for users with disabilities. (Some accessibility issues remain and are noted below.) These features are related to accessibility standards for electronic information technology that were adopted by the U.S. Government under Section 508 of the U.S. Rehabilitation Act of 1973 (2008 draft proposal initiative update). Applications are also tested against Web Content Accessibility Guidelines (WCAG) 2.0, part of the Web Accessibility Initiative (WAI) of the Worldwide Web Consortium (W3C). For detailed information about the accessibility of this product, send e-mail to accessibility@sas.com or call SAS Technical Support.

#### **Documentation Format**

Please contact accessibility@sas.com if you need this document in an alternative digital format.

#### **Landmarks**

Landmarks are references to the primary areas of an application's user interface. They provide a quick and easy way for keyboard users to navigate to these areas of the application.

To access the list of landmarks that are available for a specific context, press Ctrl+F6 to open the Landmarks window. Use the arrow keys to select a landmark, and then press Enter to navigate to that area of the application.

## **User Interface Layout**

SAS Visual Analytics contains the following interfaces:

- The SAS Visual Analytics home page contains three main sections:
   The top of the home page contains the menu bar, which contains menus, a Search field, and a Log Off button.
   The center of the home page contains the workspace. In the workspace, you can create content, view your content, or view content created by other users.
   The right side of the home page contains a Common Actions pane, which provides an alternate way to create reports, explore data, and manage your environment or favorites. The Links pane links you to the introductory video for SAS Visual Analytics or to other pages that you have bookmarked. The SAS Resources pane links you to resources on the SAS website and to social media.
   SAS Visual Data Builder enables you to perform analytic data preparation
- SAS Visual Data Builder enables you to perform analytic data preparation operations. The application window contains four main sections:
  - ☐ The top of the window contains the application name and an application bar that includes a menu bar and a **Log Off** button.

The left side of the window contains a collapsible navigation pane. This pane contains a view of the SAS Folders tree. You can navigate the tree to select a table (one table at a time) for use in preparing data for analysis.
The center of the window (the workspace) contains tabs that you use for designing queries. Each query is designed on a tab.
The bottom of the window contains a series of tabs that you use for creating calculated columns and for filtering data.
The right side of the window contains a <b>Properties</b> tab that you use for managing the properties of queries and tables. The information is dynamic and shows the properties of the item that is selected in the workspace.
S Visual Analytics Explorer enables you to explore data. The application window ntains four main sections:
The top of the window contains the Home bar, the menu bar, and the toolbar. The Home bar contains a <b>Home</b> button that enables you to return to the SAS Visual Analytics home page. The menu bar contains menus and a <b>Log Off</b> button. The toolbar contains icons that enable you to manage your explorations and visualizations.
The left side of the window contains the data pane. The data pane contains all of the data items in your visual exploration. A table at the bottom of the data pane enables you to modify the properties of the data item that is currently selected.
The center of the window (the workspace) contains the visualizations (charts, tables, histograms, and maps) for your visual exploration. A dock bar at the bottom of the workspace enables you to manage your visualizations.
The right side of the window contains the <b>Roles</b> , <b>Filters</b> , <b>Ranks</b> , <b>Properties</b> , and <b>Comments</b> tabs. The <b>Roles</b> tab enables you to manage data roles for the current visualization. The <b>Filters</b> tab enables you to create filters to subset your data. The <b>Ranks</b> tab enables you to create ranks to select data based on the greatest or least aggregated values for a category. The <b>Properties</b> tab enables you to manage properties for the current visualization. The <b>Comments</b> tab enables you to view and create comments for the current visualization.

SAS Visual Analytics Designer provides a framework for working with data and reports. The application window contains four main sections: The top of the window contains the Home bar and the menu bar. The Home bar contains a **Home** button that enables you to return to the SAS Visual Analytics home page. The menu bar contains menus and a **Log Off** button. The left side of the window contains the **Objects**, **Data**, **Imports**, and **Shared** Rules tabs. These tabs enable you to select report objects, to select data sources, or to import other reports or report objects. A table at the bottom of the **Data** tab enables you to modify the properties of the data item that is currently selected. The **Shared Rules** tab enables you to create a new display rule for a gauge, which is used by other gauges to designate intervals and colors for ranges. The center of the window is the canvas on which you design reports. Above the canvas, there is an area where you can drop a filter control and a category data item to create section prompts. The right side of the window contains a pane with multiple tabs. The **Properties** tab enables you to manage the properties for the currently selected report object. The **Styles** tab enables you to specify styles for the data, frame, and text, and to specify colors for the data. The **Display Rules** tab enables you to populate or add intervals for the report object that is currently selected in the canvas. The **Comments** tab enables you to view and create comments for the report after you save it. The **Filters** tab enables you to create filters for the selected report object. The **Ranks** tab enables you to add rankings to report objects. The **Interactions** tab enables you to create or update filter or brush interactions for the report

To customize the application window and its features, select **File** ▶ **Preferences**. On the SAS Visual Analytics home page, click either a or Edit Preferences to open the Preferences window. For more information about the layout and features of SAS Visual Analytics, see "Your First Look at the SAS Visual Analytics Home Page" on page

objects in a section. The **Roles** tab enables you to manage data role

assignments for the selected report object.

#### **Themes**

An application's theme is the collection of colors, graphics, and fonts that appear in the application. The following themes are provided with this application: SAS Corporate, SAS Blue Steel, SAS Light, and SAS Dark. To change the theme for the application, select File ▶ Preferences and go to the Global Preferences page. On the SAS Visual Analytics home page, click either a or **Edit Preferences** to open the Preferences window. For more information about the layout and features of SAS Visual Analytics, see "Your First Look at the SAS Visual Analytics Home Page" on page 12.

You can use keyboard shortcuts to magnify the contents of the browser window or to invert the application colors. For more information, see "Keyboard Shortcuts" on page xxix.

Note: If you have special requirements for your themes, then contact your system administrator or visual designer about using the SAS Theme Designer for Flex application to build custom themes. SAS Theme Designer for Flex is installed with SAS themes. For more information about this tool, see SAS Theme Designer for Flex: User's Guide.

Custom report themes are now automatically created when a coordinating custom application theme is created in SAS Theme Designer for Flex. These custom report themes can then be used in SAS Visual Analytics reports.

## **Keyboard Shortcuts**

The following table contains the keyboard shortcuts for the application. In the user interface, the shortcuts are displayed within parentheses in tooltips and menu labels.

Note: Some application-level keyboard shortcuts do not work when you first open an application. When that happens, press Tab to place the focus on the application, and then try the keyboard shortcut again.

**Note:** When you use a keyboard shortcut to activate a button, first give the focus to the field or section that the button is associated with before you use the keyboard shortcut.

For example, if a table has an associated ② button, you must first move the focus to the table before you press Ctrl+?.

#### Keyboard Shortcuts

Task	Keyboard Shortcut
Open a Help pop-up window from the ② button.	Ctrl+?
	<b>Note:</b> This shortcut does not work on some keyboards (for example, the Italian keyboard).
Zoom in.	Ctrl+plus sign
Zoom out.	Ctrl+minus sign
Reset the zoom state.	Ctrl+0
Maximize view (collapses the category pane and the tile pane, and hides the status bar and the application bar, which includes the menu bar and the workspace bar).	Ctrl+Alt+Shift+M
	<b>Note:</b> This keyboard shortcut does not work when the focus is on the workspace bar.
or	
Exit maximized view (expands the category pane and the tile pane, and shows the status bar and the application bar).	
Open a pop-up menu.	Shift+F9 (if a menu is available in that context)
	<b>Note:</b> If you use Shift+F9 to display the popup menu, then it is always displayed in the top left corner of the user interface control that you are using.
Open the Landmarks window.	Ctrl+F6
Temporarily invert or revert application colors (for the current session only).	Ctrl+~
<b>Note:</b> You can set the <b>Invert application colors</b> preference in the Preferences window if you want the color change to persist across sessions.	

Task	Keyboard Shortcut
Idan	Reyboard Shortcut
Rename the selected tab.	Make sure that focus is on the tab. Press F2 and specify the new name. To commit your changes, press Enter. To cancel your changes, press Esc.
Close the selected tab.	Make sure that focus is on the tab, and then press Delete.
	Note: Some tabs cannot be closed.
Switch in and out of Edit mode for a table cell.	To enter Edit mode, select a cell and press F2.
	To exit Edit mode, press Esc.
Navigate between table headings and table content.	For a two-dimensional table, first make sure that focus is on the table and that you are not in Edit mode. Press Ctrl+F8 to switch focus between column headings and table cells. Use the arrow keys to navigate from heading to heading.
	For a multidimensional table, first make sure that focus is on a table cell and that you are not in Edit mode. Press Ctrl+F8 to switch focus between column headings, row headings, and table cells. Use the arrow keys to navigate from heading to heading.
Navigate the content rows of a table.	When table cells are in Edit mode:  Press Tab and Shift+Tab to move from cell
	to cell horizontally across columns.
	Press Enter and Shift+Enter to move from cell to cell vertically across rows.
	When table cells are not in Edit mode, use the arrow keys to move from cell to cell.

Task	Keyboard Shortcut
Sort columns in a table.	To sort a single column, navigate to the column heading of the column that you want to sort. Press spacebar to sort the column.
	To sort additional columns, navigate to the column heading of each additional column that you want to sort. Press Ctrl+spacebar.

## **Exceptions to Accessibility Standards**

Exceptions to accessibility standards are documented in the following table.

**Note:** The JAWS issues occur when JAWS is used with Internet Explorer. Other browsers were not tested with JAWS, unless noted.

Exceptions to Accessibility Standards

Accessibility Issue	Workaround
Sometimes, you cannot use the keyboard to sequentially navigate through the interface and move the focus in a meaningful order.	No workaround is available.
The SAS High Contrast theme has a few unresolved focus and contrast issues.	For contrast issues, select a different theme and then press Ctrl+~ to invert the colors.
The SAS Light theme and SAS Dark theme might not provide sufficient color contrast for some users.	Use the SAS Corporate theme or the SAS High Contrast theme.
JAWS cannot read some of the controls in the application, such as images, icons, and buttons.	No workaround is available.
JAWS cannot read the tooltips of items in trees, lists, and menus.	No workaround is available.

Accessibility Issue	Workaround
JAWS refers to table controls as list boxes.	When JAWS reports that a control is a list box, keep in mind that it might actually be a table.
JAWS can sometimes read controls that have been disabled.	No workaround is available.
Sometimes, JAWS does not correctly work with the controls in the Preferences window.	While you are in Virtual PC cursor mode, traverse the entire window to familiarize yourself with its contents before you change any of the settings. You might need to switch between Forms mode and Virtual PC cursor mode to access all of the controls.
JAWS does not correctly read the states in a tri-state check box tree if JAWS is not in Forms mode.	Disable the JAWS Virtual PC cursor when you work with the check box tree. Tab to the tree, and press Insert+Z to disable the Virtual PC cursor. When you finish interacting with the tree, press Insert+Z to re-enable the Virtual PC cursor.
The keyboard shortcuts that are used to interact with editable tables can conflict with keyboard shortcuts for the JAWS forms mode.	As a best practice, disable the JAWS Virtual PC cursor when you work with tables. Tab to the table, and press Insert+Z to disable the Virtual PC cursor. When you finish interacting with the table, press Insert+Z to re-enable the Virtual PC cursor.
JAWS cannot read two-column property tables.	No workaround is available.

Accessibility Issue	Workaround
JAWS does not correctly read the information in a table:	No workaround is available.
JAWS cannot read the column headings of a table.	
When table cells are not editable and the focus is on the body of the table, JAWS reads an entire row at a time instead of cell by cell.	
When table cells are editable, and the focus is on the body of the table, JAWS reads only the first row of the table. If you use the arrow keys to select a cell or row, then JAWS does not read anything. If you press Enter to edit a cell, then JAWS reads the row that contains the edited cell.	
When you are in a table cell, if you press Home, End, Page Up, or Page Down, the selected cell will change to be one in the first column of the currently displayed columns for the table.	Use the arrow keys to navigate through the cells of the table.
You cannot use the keyboard to scroll to the left and the right in some tables.	No workaround is available.
You cannot use the keyboard to activate the links within how-to topics and Help pop-up windows.	Use the <b>Help</b> menu to access the linked documents.
You cannot use Shift+F10 to open a pop-up menu.	Use Shift+F9 to open pop-up menus that are created for the SAS application. The generic menu that is provided by the Flash player cannot be opened by Shift+F9.
	<b>Note:</b> If you press Shift+F10 in Internet Explorer and no context menu is available, the browser will move the focus to the <b>File</b> menu for the browser tab. To return focus to the application area of the browser window, press Esc.

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Accessibility Issue	Workaround
You cannot use the keyboard to access the close (x) button that is in the top right corner of a tab.	Make sure that the focus is on the tab, and then press Delete to close the tab.
You cannot use the keyboard to access the close (x) button that is in the top right corner of a tile in the tile pane.	Make sure that the focus is on the tile, and then press Delete to close the tile. (The object that is displayed in the tile is not deleted.)
Visual focus for the menu bar is indicated with an outline around the entire menu bar instead of around individual menus.	To select individual menus, use the left or right arrow key.
Sometimes, you cannot use the Tab key to move the focus to the application area of a web browser (that is, the part of the browser window that is controlled by the Flash player).	The following workaround is applicable to Internet Explorer only.  Press Ctrl+number, where number is the ordinal position of the application's tab in the set of tabs that are open in your browser window. Then press Tab to move the focus into the application area.
You cannot use the Tab key to move the focus outside of a code or expression editor. Pressing Tab within the editor only inserts tabs.	For Internet Explorer, press Shift+F10 and then press Esc to move the focus outside of the editor.  For Firefox, press Alt+Tab to switch to another application. When you switch back, the focus will be outside of the editor.
You cannot use Ctrl+Alt+Shift+M to minimize or maximize the view if the focus is on the workspace bar.	No workaround is available.
If you tab to an item that is partially or entirely off-screen, the item is not automatically scrolled back into view.	Sometimes, you can use the arrow keys or the Tab key to scroll the item back into view.
When you use the Ctrl+plus sign keyboard shortcut to zoom in, some portions of the interface can become hidden from view.	Use the keyboard to access the hidden parts of the interface.

Accessibility Issue	Workaround
The Ctrl+plus sign and Ctrl+minus sign keyboard shortcuts for zooming in and out do not work on some menus unless the menus are first opened.	Open the menu before you use the keyboard shortcut.
The Ctrl+plus sign and Ctrl+minus sign keyboard shortcuts for zooming in and out do not work on all elements in the application window (for example, tooltips and button labels).	No workaround is available.
If you maximize a tile in the <b>Home</b> workspace and then use the Tab key to navigate, the focus appears to be lost after you tab away from the <b>Log Off</b> button.	After you maximize the tile, press the Tab key 10 to 25 times, and eventually, the focus will return to the maximized tile.
You cannot use the keyboard to navigate in the <b>Layout</b> section because it is a Read-Only interface that is used for the visual verification of the elements that have been created.	Use the test button that is in the <b>Layout</b> section to preview your elements in a secondary window. The items that are displayed in the secondary window are identical to the items that are displayed in the <b>Layout</b> section, but unlike the items in the Read-Only <b>Layout</b> section, you can interact with the items in the secondary window.
	<b>Note:</b> After the application opens the secondary window, press Tab to place the focus in the window.
JAWS cannot read the labels for the <b>Red</b> , <b>Green</b> , and <b>Blue</b> fields in the Custom Colors window.	No workaround is available.
You cannot use the keyboard to access the color blocks in the <b>Recently used</b> section of the color selection control.	No workaround is available.
JAWS does not explain how to open a drop-down menu or drop-down list.	Press Ctrl+down arrow to open the control.

Accessibility Issue	Workaround
When JAWS reads the control names in a breadcrumb, it does not distinguish between the breadcrumb buttons that contain dropdown menus and those that do not.	Check for a drop-down menu by pressing Ctrl +down arrow on a breadcrumb button. A drop-down menu will open if one exists for that button.
When you use the down arrow to scroll through the items in a "combo box," any item that opens a secondary window will do so when you arrow down to it and will prevent you from navigating to items that are farther down in the drop-down list.	Press Ctrl+down arrow to scroll through the items in the drop-down list and then press Enter or Tab to make a selection.
When you add a date value to the predefined list for a date element, you cannot use the keyboard to access the date-selection button in the table cells in the Customize Data window for the predefined list.	Enter the date value in the field that is next to the date-selection button.
JAWS cannot read the contents of a tree table (that is, a table that contains a tree) unless the table is in Edit mode.	Make sure that the focus is in the tree table, and press F2 to enter Edit mode.
JAWS cannot read the content selection tree.	No workaround is available.
Sometimes, after you close a tab to hide it from view, you can still use the keyboard to access the contents of the tab.	No workaround is available.

# **Accessibility Workarounds for SAS Visual Analytics Explorer**

Exceptions to accessibility standards for SAS Visual Analytics Explorer (the explorer) are documented in the following table:

Exceptions to Accessibility Standards for the Explorer

Accessibility Issue	Workaround
JAWS cannot read the diagram in the decision tree visualization.	No workaround is available.
JAWS cannot read values for a visual filter in the <b>Filters</b> tab.	No workaround is available.

# Accessibility Workarounds for SAS Visual Analytics Designer

Exceptions to accessibility standards for SAS Visual Analytics Designer (the designer) are documented in the following table:

Exceptions to Accessibility Standards for the Designer

Accessibility Issue	Workaround
You cannot access the list of tabs in the right panel of the designer using only the keyboard.	Use the <b>View</b> menu to give focus to the tabs in the right panel. You can select the <b>Comments</b> , <b>Display Rules</b> , <b>Filters</b> , <b>Interactions</b> , <b>Properties</b> , <b>Ranks</b> , <b>Rules</b> , or <b>Styles</b> tab.
When JAWS is running, the Page Up and Page Down keys do not switch tabs properly.	No workaround is available.
The drop-down lists in the designer do not have labels. They are read by the screen reader as "combo box."	No workaround is available.
JAWS does not read the labels for collapse and expand panes correctly. They are read by the screen reader as "splitter button zero."	Use the View menu to select either Maximize View or Exit Maximized View.

Accessibility Issue	Workaround
You cannot re-position a report object on the canvas in the tiled report layout.	Use the precision report layout and then use the <b>Properties</b> tab to adjust the size and position of the report objects. Under the <b>Size</b> and <b>Position</b> heading, you can adjust the <b>Left</b> , <b>Top</b> , <b>Depth</b> , <b>Width</b> , and <b>Height</b> properties.
JAWS cannot read the diagram for creating filter and brush interactions in the interactions view.	No workaround is available.

# **Accessibility Workarounds for SAS Visual Analytics Viewer**

Exceptions to accessibility standards for SAS Visual Analytics Viewer (the viewer) are documented in the following table:

Exceptions to Accessibility Standards for the Viewer

Accessibility Issue	Workaround	
You cannot access links in reports using only the keyboard.	No workaround is available.	

## **Accessibility Workarounds for SAS** Visual Data Builder

Exceptions to accessibility standards for SAS Visual Data Builder (the data builder) are documented in the following table:

Exceptions to Accessibility Standards for the Data Builder

Accessibility Issue	Workaround
When you use the keyboard to view the table properties from the <b>Properties</b> tab, the application loses focus and you can no longer navigate using the keyboard only.	No workaround is available.
When you use the keyboard to select a check box on the <b>Properties</b> tab, the application loses focus and you can no longer navigate using the keyboard only.	No workaround is available.
When the application prompts you for a user ID and password to access data, you cannot navigate to the window using the keyboard only.	No workaround is available.
When you schedule a query, and tab to the <b>Select one or more triggers for this query</b> radio button, the <b>New Time Event</b> does not become enabled. You cannot schedule a new query using only the keyboard.	No workaround is available.
When you schedule a query, you cannot tab to the radio buttons in the <b>Grouping</b> conditions area.	Press the Tab key to move forward to the <b>OK</b> button, and then press Shift+Tab to move backward to the <b>Grouping conditions</b> radio buttons.
When you schedule a query, and specify a new time event, you cannot use the Tab key to access all of the radio buttons.	No workaround is available.
JAWS cannot read the diagram for building queries.	No workaround is available.



# Introduction to SAS Visual Analytics

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# About SAS Visual Analytics

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# What Is SAS Visual Analytics?

SAS Visual Analytics is an easy-to-use, web-based product that leverages SAS high-performance analytic technologies. SAS Visual Analytics empowers organizations to explore huge volumes of data very quickly in order patterns and trends and to identify opportunities for further analysis. SAS Visual Data Builder enables users to summarize data, join data, and enhance the predictive power of their data. Users can prepare data for exploration and mining quickly and easily. The highly visual, drag-and-drop data interface of SAS Visual Analytics Explorer (the explorer), combined with the speed of the SAS LASR Analytic Server, accelerate analytic computations and enable organizations to derive value from massive amounts of data. This creates an unprecedented ability to solve difficult problems, improve business performance, and mitigate risk rapidly and confidently. SAS Visual Analytics Designer (the designer) enables users to quickly create reports or dashboards, which can be viewed on a mobile device or on the web.

SAS Visual Analytics empowers business users, business analysts, and IT administrators to accomplish tasks from an integrated suite of applications that are accessed from a home page. The central entry point for SAS Visual Analytics enables

users to perform a wide variety of tasks such as preparing data sources, exploring data, designing reports, as well as analyzing and interpreting data. Most important, reports can be displayed on a mobile device or in the SAS Visual Analytics Viewer (the viewer).

### **Benefits of Using SAS Visual Analytics**

Using SAS Visual Analytics, users can enhance the analytic power of their data, explore new data sources, investigate them, and create visualizations to uncover relevant patterns. Users can then easily share those visualizations in reports. Traditional reporting is prescriptive. That is, you know what you are looking at and what you need to convey. However, data discovery invites you to plumb the data, its characteristics, and its relationships. Then, when useful visualizations are created, you can incorporate those visualizations into reports that are available on a mobile device or in the viewer.

SAS Visual Analytics provides users with the following benefits:

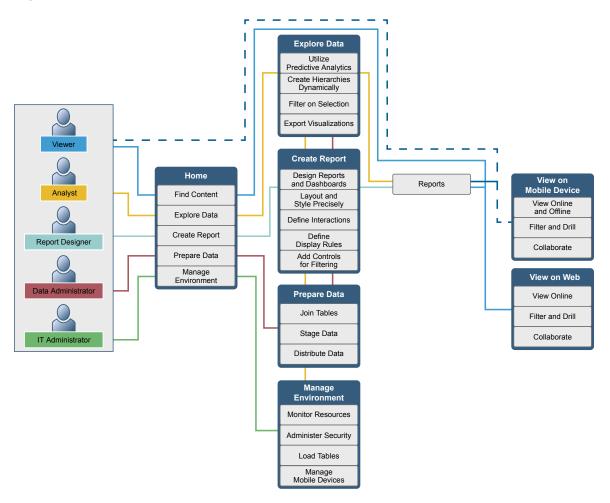
- enables users to apply the power of SAS analytics to massive amounts of data
- empowers users to visually explore data, based on any variety of measures, at amazingly fast speeds
- enables users to share insights with anyone, anywhere, via the web or a mobile device

# **How Does SAS Visual Analytics Work?**

You can use SAS Visual Analytics to explore and view data, interact with and create reports, and display reports on a mobile device or on the web. You can explore your data by using interactive visualizations such as charts, histograms, and tables. Report authors can easily point and click to query central sources of data. You can add filters and design the layout using tables, graphs, and gauges. You can use drag and drop to create a well-formatted report.

The following figure illustrates how the different pieces of SAS Visual Analytics work together. It shows how users interact with the different interfaces.

Figure 1.1 Overview of SAS Visual Analytics



6 Chapter 1 / About SAS Visual Analytics

# Accessing SAS Visual Analytics

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# Overview of SAS Visual Analytics Capabilities

Users might have access to different functionality, depending on their assigned roles. Roles are mapped to capabilities. A *capability*, also known as an *application action*, defines the operations a user can perform.

SAS Visual Analytics provides four predefined roles—Report Viewing, Analysis, Data Building, and Administration. A predefined set of capabilities is available for each role. A system administrator can modify these roles and specify the capabilities for each role that meet the guidelines for your company. They can also define new roles. If you have questions about your assigned role, contact your system administrator. For more information about the roles and the capabilities that are available, see the SAS Visual Analytics: Administration Guide.

**Note:** This user's guide discusses tasks that you might be able to perform, depending on your role.

# **Log On to SAS Visual Analytics**

SAS Visual Analytics uses the standard Log On window for SAS applications.

1 To display the SAS Visual Analytics Log On window, click on the URL that is supplied by your system administrator or paste it into the address field of your browser. For example, you might enter:

http://<serverName>:<portNumber>/SASVisualAnalyticsHub

Display 2.1 Log On Window for SAS Visual Analytics



- 2 To log on to SAS Visual Analytics:
  - a In the User ID field, enter your user ID.
  - **b** In the **Password** field, enter the password for the user ID.
  - c Click Log On.

The SAS Visual Analytics home page is displayed. For more information, see "Your First Look at the SAS Visual Analytics Home Page" on page 12.

**Note:** Your password is case sensitive. Your user ID might be case sensitive, depending on the operating system that hosts the web application server.

# **Log Off from SAS Visual Analytics**

To log off from SAS Visual Analytics, click **Log Off** in the upper right corner of the user interface.

**Note:** When you click **Log Off**, you are logged off from all environments.

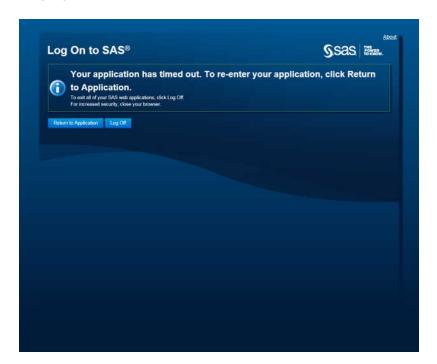
If you are prompted about unsaved changes, click Log Off to exit without saving or click **Continue** to return to SAS Visual Analytics and keep working.

If you lose your connection to SAS Visual Analytics (for example, your session times out), then you are prompted to click **Return to Application**. By default, if there is no activity for several hours, then SAS Visual Analytics automatically logs you off and displays the logon window. If you are logged off automatically, then you must begin again at the point at which you last saved your work.

Your system administrator can change the inactivity period. He or she can also specify that SAS Visual Analytics automatically logs you off and displays the logon window instead of the **Return to Application** button. As a best practice, save your work frequently.

The following example shows the message that appears after your session has timed out.

Display 2.2 Session Timed Out Message for SAS Visual Analytics



# About the SAS Visual Analytics Interface

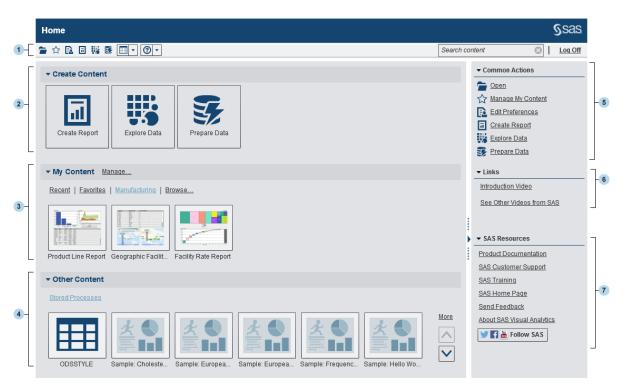
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# Your First Look at the SAS Visual Analytics Home Page

After you log on to SAS Visual Analytics using the standard Log On window for SAS applications, you will see the home page. The home page enables you to create new content in SAS Visual Analytics. In addition, it enables you to access content that you and others have created.

Here are the features of the home page:

Figure 3.1 The Home Page



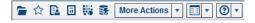
1 The menu bar enables you to access task options, such as creating reports, exploring data, managing your environment or favorites, setting your view, and getting help on using SAS Visual Analytics. You can search all SAS content from the

- menu bar, and you can log off from SAS Visual Analytics. For more information about searching, see "About Searching from the Home Page" on page 29.
- 2 The Create Content area provides icons to let you quickly create a new report, explore data, or prepare data, depending on your role and the associated capabilities. Other installed SAS applications might add actions to the Create Content area.
- 3 The My Content area lists any explorations, reports, queries, tables, or stored processes that you have opened or created recently. It also lists any content that you have marked as a favorite or as part of a collection. Click **Browse** to explore folders to find a report, exploration, stored process, or table.
  - Note: All tables are displayed because the home page does not distinguish between LASR tables and other tables.
- **4** The **Other Content** area displays lists of explorations, reports, stored processes, queries, or tables that your system administrator has added for you. If your system administrator has not created any lists, then you will not see any content in the Other Content area. The heading is still displayed. If you have an Administration role, then you will also see a Manage link that enables you to manage lists.
- 5 The **Common Actions** pane provides an alternate way for you to create reports, explore data, and manage your environment or favorites. If you have an Administration role, then you will also see a Prepare Data link. Other installed SAS applications might add actions to the **Common Actions** pane.
- **6** The **Links** pane provides a link to the introductory video for SAS Visual Analytics and links to other pages that you have bookmarked. You might also see links to other SAS products, such as SAS Theme Designer for Flex, depending on your role and the SAS licenses that your site has.
  - Position your mouse pointer over the **Links** heading to activate the **+**, which opens the Add Link window. Click \( \subseteq \) to open the Manage Links window, where you can add, delete, re-order, and hide links.
- 7 The SAS Resources pane provides links to resources on the SAS website and to social media.

If you have the **Theme Designer for Flex: Administration** role in SAS Management Console, you can access the SAS Theme Designer for Flex from the **More Actions** item on the menu bar.

Here is an example of the menu bar with the **More Actions** item.

**Display 3.1** Home Page Menu Bar with the More Actions Item



Once you start using the home page, thumbnails enable you to open explorations, reports, stored processes, tables, queries, and folders that you have created or opened. The default view is secure, generic thumbnails that represent the content. Your system administrator can set a property that specifies the use of thumbnails that are shared and unique to each object. Shared thumbnails are unique for each individual report object, so each report looks different from other reports, and each exploration looks different from other explorations.

Generic thumbnails are distinguished by content type only. All reports look the same, but they appear different from explorations. Here are examples of the generic thumbnails that you might see on the home page:

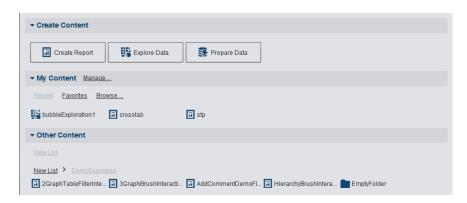
**Display 3.2** Generic Thumbnails for an Exploration, a Report, and a Stored Process



You can choose to view the content on the home page as a list. To change your view, click on the menu bar, and then select **Thumbnail** or **List**. The default is **Thumbnail**.

Here is an example of the list view for the home page:

#### Display 3.3 List View



For more information about other parts of the SAS Visual Analytics interface, see the following topics:

- "Your First Look at SAS Visual Data Builder" on page 39.
- "Your First Look at the Explorer" on page 124.
- "Your First Look at the Designer" on page 272.

# **About the Availability of Menus and** Menu Selections in SAS Visual **Analytics**

All of the following conditions influence whether a SAS Visual Analytics menu or menu selection is available to use:

- your role and the associated capabilities. For example, you must have a Data Building role to prepare data.
- your location in SAS Visual Analytics. For example, some application features are available only if you are designing a report.

- the currently selected report object. For example, ranges are not available for list tables.
- whether the data for a report has been defined. For example, if the data has not been selected, then you cannot create a filter.

For more information about roles and capabilities, see the SAS Visual Analytics: Administration Guide.

# **Specifying Your Preferences**

#### **About Preferences**

All of your preferences persist between sessions.

### **Specifying Global Preferences**

You can specify global preferences that are applied to all SAS web applications that are displayed with the Adobe Flash player. These preferences are set by each user.

To specify global preferences:

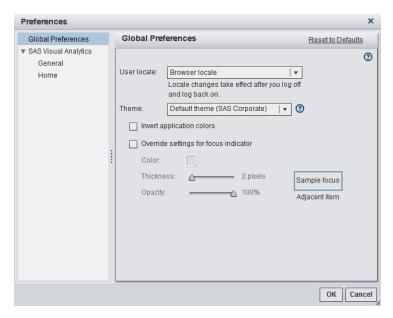
1 Click either a or **Edit Preferences** on the home page. The Preferences window is displayed.

**Note:** If you are in the data builder, the explorer, the designer, or the viewer, then select **File** ▶ **Preferences** to open the Preferences window.

- 2 Click Global Preferences in the left pane.
- **3** Select a **User locale** to specify your language and geographic region.
  - Select a **Theme** to change the color scheme and other visual settings for all of your SAS web applications.
  - Select **Invert application colors** to invert all of the colors in your SAS web applications.

Select Override settings for focus indicator to change the color, thickness, and opacity of the focus in your SAS web applications.

Display 3.4 Global Preferences in the Preferences Window



- Click **OK** to apply your changes.
- If you changed the User locale, then you must log off and log back on to SAS Visual Analytics for the change to take effect.

### **Specifying the SAS Visual Analytics General Preferences**

Using the SAS Visual Analytics home page, you can specify your general preferences for SAS Visual Analytics.

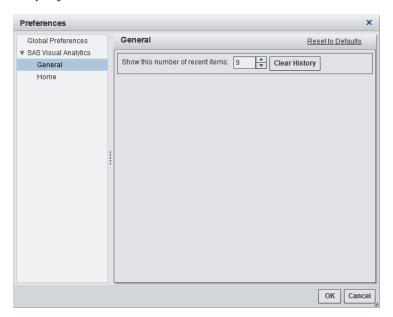
To specify your general preferences:

- Click either a or **Edit Preferences** to open the Preferences window.
- Click **General** in the left pane.

3 Specify a value for **Show this number of recent items**. There is a minimum of one item and a maximum of 16 items. The default setting is 9 items.

Click Clear History to reset your history.

Display 3.5 General Preferences Window for SAS Visual Analytics



4 Click **OK** to apply your changes.

### **Specifying Your Initial Screen Preference**

You can specify the initial screen that you want to see after you log on to SAS Visual Analytics.

To specify the initial screen preference using the home page:

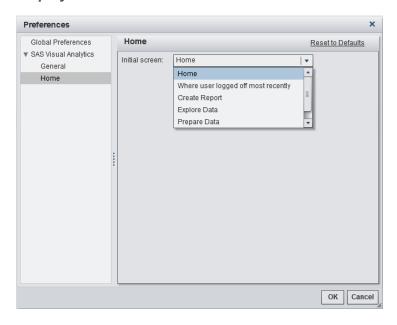
- Click either a or Edit Preferences to open the Preferences window.
- 2 Click Home in the left pane.
- 3 Select an option from the **Initial screen** drop-down list.

The following options are available:

- Home
- Where user logged off most recently
- Create Report
- Explore Data
- Prepare Data
- A Specific Object

If you select **A Specific Object**, then you can specify only one of these content types (for example, reports, explorations, tables, stored processes, and so on) for your initial screen. The content types depend on the SAS products that your site has licensed and how they are configured.

Display 3.6 Home Preference in the Preferences Window



4 Click **OK** to apply your changes.

### **Specifying Other Preferences**

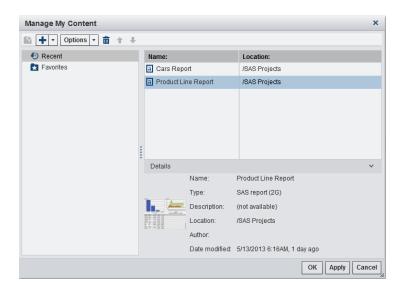
You can specify other preferences in SAS Visual Analytics:

- For information about SAS Visual Data Builder preferences, see "Specifying Your Preferences for SAS Visual Data Builder" on page 43.
- For information about SAS Visual Analytics Explorer preferences, see "Specify Preferences That Are Specific to SAS Visual Analytics Explorer" on page 127.
- For information about SAS Visual Analytics Designer preferences, see "Specifying" Your Preferences for the Designer" on page 281.

# **Managing Content on the Home Page**

The home page displays recent reports, explorations, stored processes, tables, and queries, as well as favorites under the My Content heading on the home page. To manage your content, click Manage to the right of the My Content heading. The Manage My Content window is displayed.

**Display 3.7** Manage My Content Window



The following icons are available in the Manage My Content window:

lcon	Description
*	Creates a new folder for your reports, explorations, stored processes, tables, and queries.
+	Adds a report, exploration, stored process, query, or table to your list of favorites. You can also create or add a collection of favorites.
Options	Enables you to select either Clear Recent History or Clear Favorites.
亩	Enables you to delete favorite or recent content, one at a time. You can delete multiple items by pressing the Ctrl key. For a collection, you will have a choice of permanently deleting the collection or simply removing it under the <b>My Content</b> heading on the home page.
<b>†</b>	Enables you to move favorites content up in the list to change what is displayed under the <b>My Content</b> heading on the home page.
•	Enables you to move favorite content down in the list to change what is displayed under the <b>My Content</b> heading on the home page.

When you select a report, exploration, stored process, or table in the Manage My Content window, the details such as the name and location of that item are displayed. Favorite groups are displayed only in the tree on the left side of the Manage My Content window.

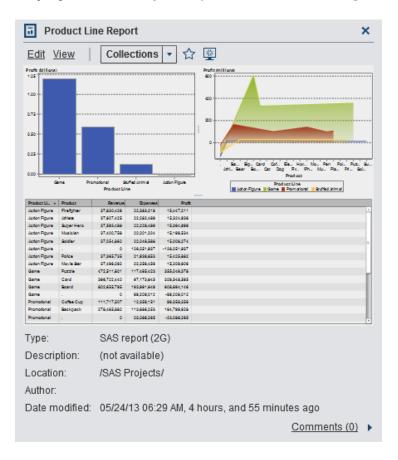
# Discovering Details Using the Object Inspector on the Home Page

The home page provides an object inspector that enables you to quickly find more information about an object when you click it. You can see a description of the report, exploration, stored process, table, query, folder, or collection; the location of the selected object; the author; and when the object was modified. A small toolbar lets you add the object to your favorites or set it as your initial screen. When you set a favorite or specify that an object should be set as your initial screen, the  $\stackrel{\leftarrow}{\bowtie}$  icon turns yellow ( $\stackrel{\leftarrow}{\bowtie}$ ).

Your role and capabilities determine the availability of actions on the toolbar (such as viewing, editing, or opening) in the object inspector. For more information about roles and capabilities, see the SAS Visual Analytics: Administration Guide.

Here is an example of what you might see for a report that has been viewed:

Display 3.8 The Object Inspector on the Home Page



If you have the Report Viewing role and the View Report and Stored Process capability, then the toolbar enables you to open a report in the viewer by clicking **Open**.

If you have the **Visual Analytics: Analysis**, **Visual Analytics: Data Building**, or **Visual Analytics: Administration** role and the Create Report capability, Explore Data

capability, or both, then the toolbar in the object inspector enables you to do the following:

- **Edit** a report, which opens the report in the designer so that you can edit or change the objects in the report.
- **View** a report, which opens the report in the viewer.
- Open an exploration, which displays the explorer. The Open link is also available for stored processes, queries, and folders.
- **Create Report** for a table, which displays the designer.
- **Explore Data** for a table, which displays the explorer.
- Click **Collections** to select an existing collection or to create a new collection. For more information, see "Managing Collections" on page 23.
- Click  $\stackrel{\wedge}{\sim}$  to add the object to your list of favorites. When the star icon is yellow, click to remove the object from your list of favorites.
- Click to set the report or exploration as the initial screen when you start SAS Visual Analytics. There is a yellow box around the 

  to indicate when the object is set as the initial screen. Click the icon to remove the initial screen setting.

Any user who has the Add or View Comments capability can add comments to any report, exploration, stored process, table, or query. They view existing comments about any report, exploration, stored process, table, or query using the **Comments** link in the lower right of the object inspector. You cannot comment on folders, favorite groups, or collections.

For more information, see "Adding Comments to Objects on the Home Page" on page 25.

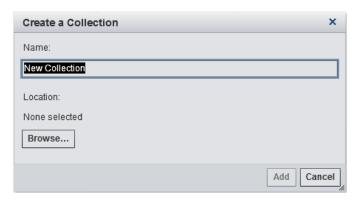
## **Managing Collections**

You can create a collection that points to your favorite reports, explorations, stored processes, tables, queries, folders, and favorite groups. A collection is like a group of bookmarks.

#### To create a new collection:

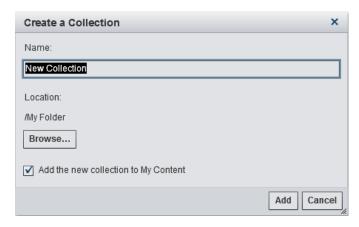
- **1** Do one of the following:
  - On the home page, click Manage to the right of the My Content heading. The Manage My Content window is displayed.
    - Click + to open the menu, and then select **Create a Collection**. The Create a Collection window is displayed.

Display 3.9 Create a Collection Window



In the object inspector, click Collections. Then, select Create a Collection. The Create a Collection window is displayed.

Display 3.10 Create a Collection Window for the Object Inspector



2 Enter a Name for the collection.

3 Click Browse to select a Location for the collection. The Choose a Location window is displayed.

Select an existing folder or create a new one. You can also select an existing collection. Click **OK** to return to the Create a Collection window.

Note: When you create a new collection, you can add items to it only from within the Manage My Content window if the collection is a root collection in **My Collections**. For example, if you create Collection B, and add it to Collection A, then Collection B appears on the right side of the Manage My Content window and you cannot add items to it.

- 4 (Optional) If you opened the Create a Collection window from the object inspector, then you can clear the Add the new collection to My Content check box. This means the new collection to will not be displayed on the home page next to the Favorites link.
- 5 Click **Add**. The new collection will appear on the left in the Manage My Content window.

To rename a collection, right-click on the name of the collection in the Manage My Content window. Then, select **Rename**. Type a new name and then press Enter.

To permanently delete a collection, right-click on the name of the collection in the Manage My Content window. Then, select **Delete**. Click **OK** in the confirmation message that is displayed.

To remove a collection under the **My Content** heading on the home page, right-click on the name of the collection in the Manage My Content window. Then, select **Remove** from My Content. Click Remove in the confirmation message that is displayed.

# **Adding Comments to Objects on the Home Page**

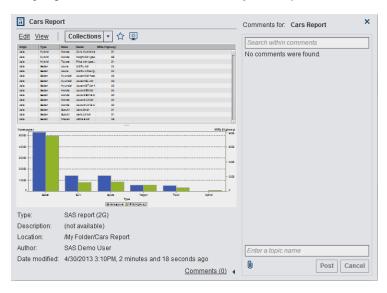
If you have the Add or View Comments capability, then you can use the object inspector on the home page to add (or view) comments to objects on the home page. You can

add comments to reports, explorations, stored processes, tables and queries. You can also respond to existing comments or edit your own comments. You cannot comment on folders, favorite groups, or collections. You cannot see visualization-level comments on the home page.

#### To add a comment:

- 1 Click on a report, exploration, stored process, tables, or query to open the object inspector.
- 2 Click Comments in the lower right corner to expand the object inspector.

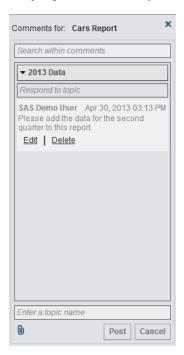




3 Enter a topic name and a comment.

#### Here is an example:

**Display 3.12** Adding a Comment



Click Post to add your comment. The Comments link in the object inspector will update to show that there is a comment.

(Optional) Click 🗓 to attach a file or an image to your comment.

To respond to an existing comment:

- Click on a report, exploration, stored process, tables, or query to open the object inspector.
- Click **Comments** in the lower right corner to expand the object inspector.
- Select an existing comment. Then, enter a reply.
- (Optional) Click 🗓 to attach a file or image to your reply.
- Click Post to add your comment. The Comments link in the object inspector will update to show that there is a comment.

**Note:** To edit another user's comments or to delete comments, you must belong to the predefined role **Comments:Administrator**. This role includes the capabilities of editing or deleting comments.

#### To search for a comment:

- 1 Enter the word or phrase that you want to search for in the search field. Press Enter.
- 2 (Optional) To clear your search, click ♥. Then, you can enter another word or phrase in the search field.

4

# Searching from the SAS Visual Analytics Home Page

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Refining Your Search Results	31

# **About Searching from the Home Page**

You can search all reports, explorations, stored processes, tables, and queries that are on the metadata server from the menu bar on the home page. The list of items that you can search for depends on the SAS products that your site has licensed.

Display 4.1 Search Field on the Menu Bar



The search field on the menu bar supports the following types of searches:

- single word
- multiple word
- in-word wildcards
- spaces in strings that use quotation marks
- plus (+) and minus (-) syntax

The plus (+) sign and minus (-) sign are prefix operators. This means that the operator precedes the search term that is required or excluded, rather than following it. For example:

- Specifying 2011 2012 2013 matches documents that contain any of the three terms.
- □ Specifying +2011 +2012 +2013 matches only documents that contain all three terms.
- □ Specifying 2011 2012 -2013 matches documents that contain 2011 or 2012, but only if they do not contain 2013.

**Note:** Single- and multiple-word searches that are plain text have a wildcard appended to them. For example, if you search for the word *sample*, then it is converted to <code>sample\*</code>. This means that you get different results than if you entered "sample", +sample, or \*sample\*.

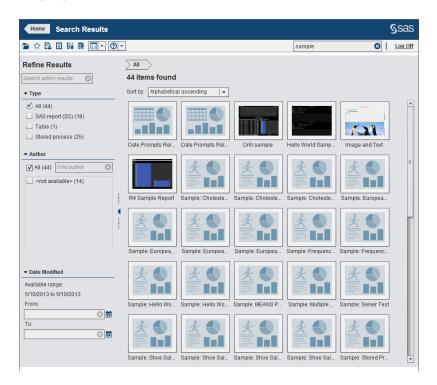
The search is not case sensitive.

Up to 5000 items can be returned in a single search. If your search results exceed 5000 items, then the first 5000 items appear, and a message is displayed at the top of the Search Results window. The message tells you how many results matched your search and how many have been displayed. Narrowing your search using the search field enables the relevant search results to be displayed. When you submit a new search that returns in fewer than 5000 items, you can see all the search results.

Search results on the home page are not ranked. In the workspace, you can use the **Sort by** drop-down list to specify that you want the list of items to sort by **Alphabetical ascending**, **Alphabetical descending**, **Date ascending**, or **Date descending**. The default is **Alphabetical ascending**.

Suppose that you search for the word *sample*. All items that contain the word *sample* are displayed in the workspace. Here is an example of the search results:

**Display 4.2** Search Results on the Home Page



# **Refining Your Search Results**

You can refine your search results using your original search on the metadata server. After you enter your original search using the menu bar on the home page, the search results are displayed in the workspace. Note that when you refine your search results, the initial 5000 item subset is not affected.

The refine search feature is dependent on your locale. The search is not case sensitive. No special characters are recognized except spaces and quotation marks.

You can refine the search results displayed in the workspace using the **Search within** results field in the left pane. When you enter a term or terms, you can use quotation

marks and spaces when you are searching within your results. Only the items that match your refined search appear in your workspace. Each search term that you enter must appear at least once in the object name, the description, or the author name in the metadata.

You can also refine your search results by selecting (or clearing) check boxes in the left pane. Note that the totals in the parentheses in any panel are dependent on what has been selected in the other two panels.

The following panels are available:

The Type panel shows the available object types. In SAS Visual Analytics, you can search for SAS report (2G), Table, Stored process, Visual data query, orVisual exploration. Depending on the SAS products that you have licensed at your site, other SAS object types might appear in the Type panel. The default is AII object types.

The available types are determined by the capabilities that your system administrator has assigned. For example, you might see only the AII, SAS report (2G), Table, and Stored process check boxes in the Type panel.

If you select all of the check boxes for the individual types, then the check boxes clear, and the **All** check box is selected automatically. If you clear the check boxes for all of the types, then the **All** check box is selected automatically.

**Note:** If your role permits you to see only one type, then you will not see the **Type** panel.

The Author panel enables you to search for a specific author, or to select one or more authors by name.

The number in parentheses beside the author's name identifies the number of objects that the author has created using the filters that have been selected in the other panels.

If you select all of the check boxes for the authors in the list, then the check boxes clear, and the **All** check box is selected automatically. If you clear the check boxes for all of the authors, then the **All** check box is selected automatically.

The **Date Modified** panel lists the dates that the objects that were last modified. You can refine the search to a specific date range by specifying a **From** date, a **To** date, or both.

The dates are time zone dependent. If your company has offices in multiple time zones, then the date modified time stamp on the object reflects the time at which it was saved using the current user's time zone. For example, if a report was modified by a user on January 3 at 2:00 a.m. in New York, another user in California sees that it was modified on January 2 at 11:00 p.m.

At the top of the workspace, you can see the breadcrumbs for the selections that you have made to refine your search. Breadcrumbs change as you modify the selections in the Type, Author, and Date Modified panels. The breadcrumbs also show any search strings that you entered in the **Search within results** field.

The appearance of the left panel is saved across sessions of SAS Visual Analytics. For example, if you collapse the **Type** panel, and then change the width of the **Refine** Results section, when you log off and log back on, the Type panel remains collapsed, and the Refine Results section has the new width. This is important to remember if you close the Refine Results section. Your Refine Results selections are not retained across sessions or primary searches in SAS Visual Analytics.

Suppose that you search for the word *sample*. Then, you refine the search results by selecting **Stored process** for **Type**. All stored processes that contain the word *sample* are displayed in the workspace. Here is an example of the refined search results:

Display 4.3 Refined Search Results on the Home Page





## **Preparing Data**

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## Overview of SAS Visual Data Builder

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### What Is SAS Visual Data Builder?

SAS Visual Data Builder enables analysts and data administrators to perform data preparation for analytics. You can design queries to perform joins, add calculated columns, and subset and sort data. Several productivity features speed the creation of columns based on common aggregation functions.

Once you design your queries, you can reuse them as subqueries for more sophisticated queries, export them as jobs for scheduling, or schedule them directly from the user interface.

The application has data import features that enable you to access data from spreadsheets, delimited files, and SAS data sets. Once you import the data, you can prepare it for analysis or join it with existing data.

The application provides a series of features that are used in deployments that include SAS LASR Analytic Server. You can load an existing table directly into memory, load the results of a query into memory, or append rows to an in-memory table on a server.

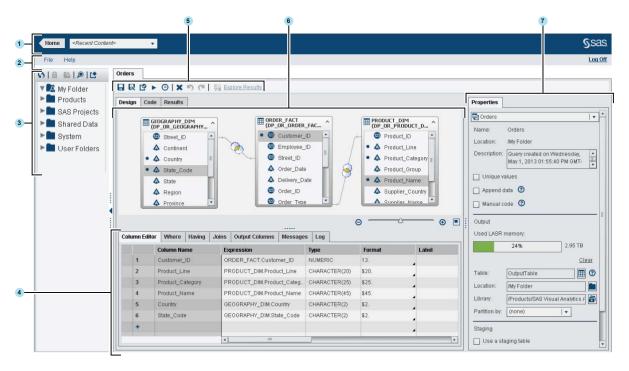
## **Accessing SAS Visual Data Builder**

You can access SAS Visual Data Builder by using any of the following methods:

- On the SAS Visual Analytics home page, select a query. In the details view, click
   Edit. Or you can double-click the query to open it in SAS Visual Data Builder.
- On the Visual Analytics home page, click Prepare Data to open SAS Visual Data Builder.
- Follow a web link or enter the URL to access SAS Visual Data Builder directly. For example, you might enter http://hostname.example.com/ SASVisualDataBuilder.

# Your First Look at SAS Visual Data Builder

The SAS Visual Data Builder interface contains the following elements:



- 1 The application bar enables you to return to the home page.
- 2 The menu bar contains menus that enable you to perform tasks.
- 3 The navigation pane displays a tree of tables and queries.
- 4 The lower pane contains tabs that enable you to specify column expressions and subset data.
- 5 The toolbar contains icons that enable you to develop and manage your queries.
- **6** The workspace enables you to design queries.

**7** The properties panel enables you to manage the properties of the item that is selected in the workspace.

#### **About Access to DBMS Data**

SAS Visual Data Builder can be used to read source tables from third-party vendor databases and to write tables to them as well. The SAS/ACCESS Interface products provide this feature. The user ID and password that you use to log on to SAS Visual Data Builder might not be valid for a third-party vendor database. If this is the case, then you are prompted for credentials to the DBMS when you access the database with a Read or a Write operation. As an alternative to being prompted, you can store a login in metadata that has valid DBMS credentials. For more information, see "How to Store Passwords for a Third-Party Server" in SAS Intelligence Platform: Security Administration Guide.

If you are prompted for credentials and supply an invalid user ID or password, you are denied access to the data. In this case, you can select **File Clear Credentials Cache** to remove the invalid credentials from your session. The next time you access the data source, you are prompted again.

Third-party databases are often more restrictive about column names or length than SAS. For more information, see "DBMS-Specific Naming Conventions" in SAS/ACCESS for Relational Databases: Reference.

## **Working with User-Defined Formats**

The preferred method for making user-defined formats available to a SAS Application Server is to name the format catalog formats.sas7bcat and to place it in <code>SAS-config-dir/Lev1/SASApp/SASEnvironment/SASFormats</code>. For more information about using user-defined formats, see SAS Intelligence Platform: Data Administration Guide.

SAS Visual Data Builder can use existing user-defined formats. The Format column displays the user-defined format name. However, if you change the format, then you cannot restore the original user-defined format.

# Specifying Preferences for SAS Visual Data Builder

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Specifyina	Your Preferences for SAS Visual Data Builder	43

# Specifying Global and General Preferences

To specify global SAS preferences, see "Specifying Global Preferences" on page 16. To specify general preferences, see "Specifying the SAS Visual Analytics General Preferences" on page 17.

# **Specifying Your Preferences for SAS Visual Data Builder**

To specify preferences that are specific to SAS Visual Data Builder:

- Select File ▶ Preferences to open the Preferences dialog box.
- 2 Select SAS Visual Data Builder ▶ General.

Select a default SAS Application Server to use from **Default application server**. If you have added SAS Application Server instances to your deployment, make sure

that the Job Execution Service has been configured to use the application server. For more information, see SAS Intelligence Platform: Middle-Tier Administration Guide.

3 Select SAS Visual Data Builder ▶ Scheduling.

Specify a default scheduling server, batch server, and deployment directory. For more information, see "Scheduling Preferences" on page 107.

4 Click **OK** to apply your changes.

## **Designing Queries**

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## What Is a Query?

A query is a metadata object that manages the references to input tables, output tables, staging tables, joins, and summarizations from a SAS Visual Data Builder session. You can save queries and open them later to edit the data preparation operations that are

performed in the query. You can use saved queries as subqueries when you design a new query.

## **About Designing Queries**

You can use SAS Visual Data Builder to design queries that perform analytic data preparation. You can use a query to subset, sort, join, and add calculated columns to tables.

As you design your query, you can click  $\ ^{\ }$  to validate your query. Use the  $\ ^{\ }$  button to preview or run the query.

The preview option uses a temporary table for the results. You can run the query after you specify an output table for the query and then save the query.

## **Creating a New Query**

You can create a new query by clicking the from the navigation pane.

## **Saving Your Query**

To save your current query, click 🗔, and enter a name and select a location.

When you save the query, you clear the undo and redo history.

## Saving a Query as a New Query

Open an existing query from the SAS Folders tree that closely matches the query that vou want to create. Click , and then enter a new name and select a location. Perform any customizations.

**Note:** If the existing query has output properties (table, location, library, and partition by), then the new query is saved with the same output properties as the existing query. If you do not want to use the existing output table, clear the output table information, and specify a new table.

#### See Also

"Output Tables" on page 55

## **Using the Design Tab**

The **Design** tab is the default view for working with queries. This tab provides an easyto-use interface for designing a query. You can perform the following tasks with the Design tab:

- Drag and drop tables or queries from the SAS Folders tree onto the workspace.
- Join tables by using your pointer to select the source column, and then drag the pointer to the corresponding column in the joined table.
- Add columns to the **Column Editor** tab by clicking the column name from the table in the workspace or by right-clicking on the table and selecting **Add All Columns**.
- Use the **Column Editor** tab to specify column expressions, aggregations, and sort. You can set the attributes for a column, such as the type, format, and label.

- View the Output Columns tab to see the number of output columns and attributes. When you specify aggregations and pivot by columns, the number of output columns can increase dramatically.
- Click to check that the query is valid.
- Check the Messages tab for information about warnings and errors such as invalid column expressions.
- Check the Log tab to view the SAS log. A SAS log is generated when you preview, run, or validate a query.
- Use the Properties tab in the right pane to specify output table information.

#### See Also

- "Working with Tables" on page 53
- "Working with Columns" on page 62
- "Working with Query Filters" on page 73
- "Working with Joins" on page 77

## Adding a Data Source to a Query

## **Adding a Table**

To add a table to a query, use the SAS Folders tree to locate the table (<sup>⊞</sup>) and then drag and drop the table onto the workspace.

TIP You can also click P and search for the table by name and location.

## Adding a Subquery

After you have designed a guery and saved it, it can be used as an input data source to a new query. To add a subquery to a query, use the SAS Folders tree to locate the query (121), and then drag and drop the query onto the workspace.

The subguery is represented in the workspace by the structure of the output table.

## **Best Practices for Adding Data Sources**

When you plan to join data sources (tables or queries), the order in which you add the data sources to the workspace matters. The first data source that is added to the workspace is automatically assigned as the left table for any joins that you add to the query.

If you are designing a query that uses a fact table and dimension tables, drag and drop the fact table onto the workspace first. You can perform left, right, or full joins with the dimension tables faster because you need to specify the join type only. However, if you drag and drop a dimension table first, you can easily use the 🕏 button on the **Joins** tab to switch the left and right tables in the join.

If you are not using a fact table or dimension tables, then the sequence for adding tables to the workspace might not be very important. Just remember that the first table dropped onto the workspace is assigned as the left table, and you can switch the left table and right table on the **Joins** tab.SAS Visual Data Builder takes advantage of vendor-specific features in SQL processing whenever possible. If the source tables are from a third-party vendor database, the SAS/ACCESS Interface engine can optimize the performance of the query by passing the SQL statements through to the database.

## Removing a Data Source from a Query

To remove a data source from a guery, select the item in the workspace, right-click, and select **Remove Table**. This action applies to tables and subqueries.

## **Tips for Appending Data**

The following list includes some strategies for appending data:

- Design a query to load the baseline data to the output table and run it.
- Modify the query, or use **Save As** to create an identical query and modify that one.
- Select the **Append data** check box.
- Add a filter on the **Where** or **Having** tab to select the changed data.
- Schedule the query.

## **Specifying Properties for a Query**

On the **Properties** tab, you can specify the following properties:

#### Name

displays the name for the query.

#### Location

displays the metadata folder location for the query object.

#### **Description**

specifies a description of the query.

#### **Unique values**

specifies whether the SQL keyword DISTINCT is applied to the SELECT statement that is used to generate the result set for the query.

#### Append data

specifies whether the result set for the query is appended to the output table. If a staging table is used, then the staging table is replaced with the result set before appending to the output table.

#### Manual code

specifies that the guery uses the SQL that is written by the user on the **Code** tab when the check box is selected. For more information, see "Customizing Code" on page 101.

#### Table

specifies the table name for either the staging output or the final output.

#### Location

specifies the metadata folder location to use for registering the staging table or output table metadata.

#### Library

specifies the library to use for the staging table or output table.

#### Partition by

specifies the column to use for partitioning the output table. This property applies when the output table is in a SAS LASR Analytic Server library or SAS Data in HDFS library only. For more information, see "Partitioning Tables" on page 87.

#### See Also

"Specifying Properties for a Source Table" on page 54

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## **Source Tables**

SAS Visual Data Builder supports using tables and queries as input data for a query. When you drop a table onto the workspace, SAS Visual Data Builder connects to the SAS Metadata Server to determine the column names and data types for the table. When you drop a subquery onto the workspace, the data builder makes the same request, but determines the column names and data types for the output table of the subquery.

Because SAS Visual Data Builder uses metadata for source tables, you must register the table metadata before you can access the data. Source tables can be registered in metadata with SAS Visual Analytics Administrator or SAS Management Console.

#### See Also

- "Adding a Data Source to a Query" on page 48
- SAS Visual Analytics: Administration Guide
- SAS Intelligence Platform: Data Administration Guide

# **Specifying Properties for a Source Table**

When a table is selected in the workspace, or when you select it from the **Properties** menu, you can specify the following:

#### Alias

displays the SAS table name that is stored in metadata. You can specify a new value to use as a table alias. The alias name is stored with the query, and it does not affect the metadata information for the table.

#### Name

displays the metadata object name. You can change the metadata object name in the SAS Folders tree by using **Rename**.

#### Location

displays the table's metadata folder.

#### Library

displays the table's library.

#### Auto-aggregate

specifies whether to apply aggregations to the columns for this table when the columns are added to the query.

#### **Functions**

specifies the aggregations to apply to the columns for this table when the columns are added to the query.

#### See Also

"Using the Auto-Aggregate Functions" on page 69

## **Output Tables**

## **About Output Tables**

When you design a query, you specify an output table on the **Properties** tab. When you save the guery, the output table is registered (or updated) in the metadata. When you run the query, the physical output table is created. The metadata that is created when you save the guery enables you to use the table as a source table for another guery or another SAS application.

## **Specifying the Output Table**

Every guery must have an output table in order to run it. How you specify the output table affects whether metadata is updated or created.

The following table shows the different ways to specify an output table.

Action	How To
Create a new output table *.	Click <b>Clear</b> , and specify a table name, location, and library. If the query was already saved with an output table, that table is not changed and is no longer associated with the query.
Reuse an existing table.	Select a metadata table . If the query was already saved with an output table, that table is not changed and is no longer associated with the query.

Action	How To
Change the name of the output table *.	Enter the new name in the <b>Table</b> field, and save the query. This changes both the name and physical name in metadata in order to make them the same. All queries, reports, explorations, and so on, still reference the same table object.

<sup>\*</sup> If you replace the default table name, OutputTable, with another name before you save the query, the data builder registers a new output table and uses it with the query.

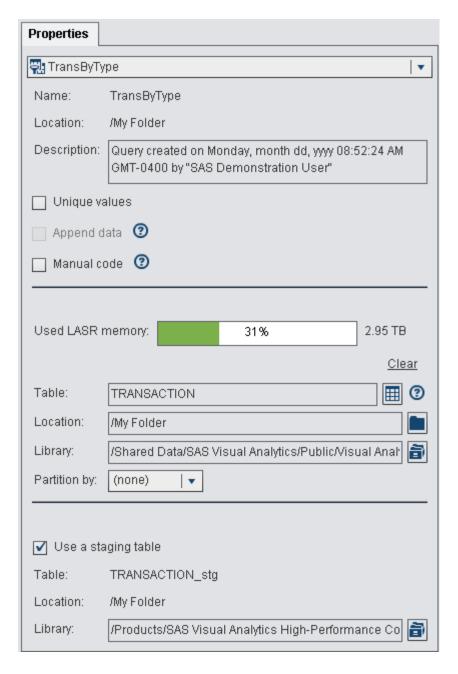
#### To specify an output table:

- 1 Select the top-level query object from the **Properties** tab.
- 2 Specify an output table name, location, and library. For SAS libraries, use 32 characters or less, and do not include spaces or special characters. Third-party vendor databases can have restrictions as well.

If you select a SAS LASR Analytic Server or SAS Data in HDFS library, the **Partition by** menu becomes available. After the settings for the output table are specified, the **Staging** section becomes available.

The following display shows an example of the Output and Staging properties.

Display 8.1 Output and Staging Properties



## **Staging Tables**

### **About Staging Tables**

SAS Visual Data Builder supports staging data. Staging data is a best practice because you can use SAS Visual Data Builder to access and transfer data from operational systems once, rather than frequently interfere with the operational systems and reduce their performance. Using SAS Visual Data Builder to stage data can provide the advantage of adding calculated columns when you stage the data. Like the output table, the staging table is registered in metadata when you save the query. The physical table for the staging table is created when you run the guery. The physical table is always replaced with the results of the query.

You cannot specify the name for a staging table. The name of the output table is used, and an STG (with two underscores) suffix is applied to the name. The suffix is used for the table name in metadata. The physical name of the staging table does not include the suffix.

## **Specifying a Staging Table**

To use a staging table:

- Select the top-level query object from the **Properties** tab.
- The settings in the **Output** section must be set.
- Expand the **Staging** section, and select the **Use a staging table** check box.
- Specify a library.

## **Output and Staging Table Interactions**

The following table identifies the supported combinations for output tables and staging tables. In addition, whether you can append data to tables is indicated.

 Table 8.1
 Output Table and Staging Table Interactions

Output Table	Staging Table	Append Data
SAS or DBMS *	None	Supported
SAS Data in HDFS	None	Not supported
Teradata or Greenplum **	None	Supported
SAS LASR Analytic Server	None	Supported
SAS or DBMS *	SAS or DBMS *	Supported
SAS LASR Analytic Server	SAS or DBMS *	Supported ***
SAS LASR Analytic Server	SAS Data in HDFS  Note: SAS LASR Analytic Server is the only supported output.	Not supported
SAS LASR Analytic Server	Teradata or Greenplum **	Supported ***

Output Table	Staging Table	Append Data
Any	SAS LASR Analytic Server  Note: SAS LASR Analytic Server libraries are not supported for staging tables.	Not supported

- \* The SAS or DBMS value represents data stored in SAS data sets or a third-party vendor database, respectively.
- \*\* The Teradata or Greenplum value represents deployments that use a third-party vendor appliance as a co-located data provider for SAS LASR Analytic Server.
- \*\*\* Appending data is performed by the SAS LASR Analytic Server engine. Appends are not performed by having the server read data in parallel.

#### See Also

"Working with SAS LASR Analytic Server" on page 83

## Working with Columns

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## Adding Columns to a Query

### **Understanding How SAS Visual Data Builder Works with Columns**

When you add a data source (a table or subquery) to the workspace, the columns from the data source are not automatically added as output columns to the query.

You need to add the columns to the guery that you want to use as input. After the columns are added, you can specify column expressions and aggregations and use the sort and pivot by features.

Note: As an exception, the auto-aggregate feature requires that you set the default aggregations for the table before they are added to the guery.

When a data source is dropped onto the workspace, the column types are represented by the following icons:

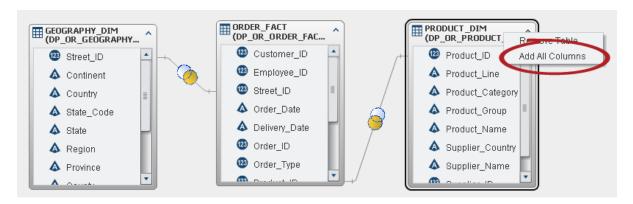
Table 9.1 Icons for Data Types

Icon	Description
23	This icon represents numeric data.
<b>A</b>	This icon represents character data.  Note: Date, time, and datetime data use this icon. After the column is added, the <b>Type</b> and <b>Format</b> columns are updated with information about the new column.

## **Adding All of the Columns from a Table**

To add all of the columns from a table to a query, select the table in the workspace, right-click, and select **Add All Columns**.

**Display 9.1** Add All Columns



## Adding a Single Column from a Table

To add one column from a table to a query, select the column name with your pointer.

Display 9.2 Add One Column



TIP If you select the column name an additional time, the column is added to the query again. This can be helpful if you want to use a column for both numeric and character data. When you add a column more than once, a number is added to the column name. If you change the column name, make sure that you do not have more than one column with the same name.

## **Adding a New Column Manually**

To add a new column manually:

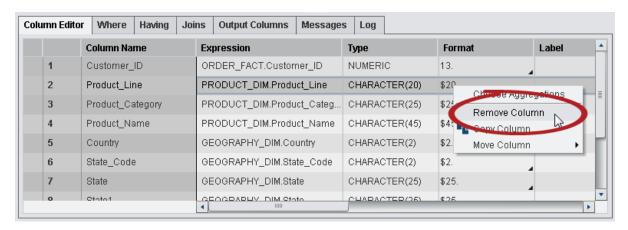
- 1 Click the Column Editor tab.
- 2 Click + at the bottom of the table.
- 3 Specify values for the Column Name, Expression, and Type fields. The remaining fields are optional.

## **Removing Columns**

To remove a column from a query:

- Click the Column Editor tab.
- **2** Select the column to remove, right-click, and select **Remove Column**.

Display 9.3 Removing a Column



TIP Hold down the Shift key or Ctrl key and click to select multiple columns.

## **Specifying a Column Expression**

To specify a column expression:

- 1 On the **Column Editor** tab, select table-name.column-name from the **Expression** column. If you added a new column manually, then you need to make sure that you specified a table name and a column name.
- 3 On the Fields tab, select columns from the source tables that you have added to the query.
  - TIP You can begin entering the table name and column name in the SQL expression area to use the autocomplete feature.
- 4 On the **Functions** tab, select the functions to apply to the source column.

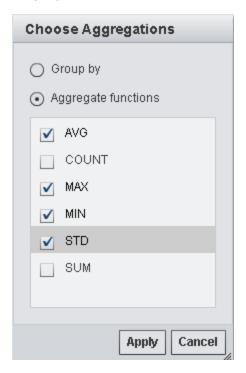
- **5** Enter arithmetic operators and expressions such as CASE statements directly in the **SQL expression** area.
- 6 Click **Apply** to save the column expression.

## **Specifying Aggregations**

To specify an aggregation for a column:

- 1 On the **Column Editor** tab, place your pointer in the **Aggregations** cell for the column and click. Click the ellipsis button to select the aggregations to use.
- 2 In the Choose Aggregations dialog box, select the Aggregate functions radio button.

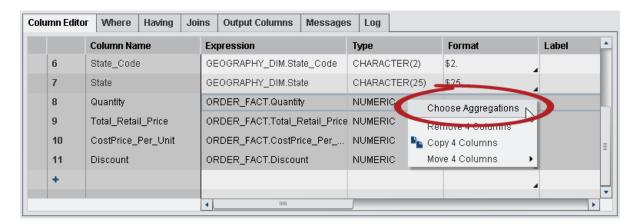
Display 9.4 Choose Aggregations Dialog Box



3 Select the check boxes for the aggregate functions to use. Click Apply.

If you want to apply a common set of aggregate functions to a group of columns, hold down the Ctrl key, select the columns on the Column Editor tab, right-click, and select **Choose Aggregations.** 

Display 9.5 Choose Aggregations Menu Item



The following display shows how adding aggregations results in additional output columns. The aggregate function is appended to the column name.

Display 9.6 Output Columns Tab with Aggregations

Column Editor	Where	Having	Joins	Output Columns	Mes	sages	Log	
#	Column Name			Туре		Format		
7	State			CHARACTER(25)	\$25.			
8	Quantity_STD			NUMERIC				
9	Quantity_MIN			NUMERIC				
10	Quantity_MAX			NUMERIC				
11	Quantity_AVG			NUMERIC				
12	Total_Retail_Price_STD			NUMERIC				
13	Total_Retail_Price_MIN			NUMERIC				
14	Total_Retai	I_Price_M	1 XA	NUMERIC				
15	Total_Retai	I_Price_A	VG I	NUMERIC				
16	CostPrice_	Per_Unit_	TD 1	NUMERIC				
17	CostPrice_	Per_Unit_	MIN I	NUMERIC				
18	CostPrice_	Per_Unit_	XAM	NUMERIC				

## **Removing All Aggregations**

To remove all the aggregate functions and group by settings:

- 1 On the **Column Editor** tab, select all the columns.
- 2 Right-click, and select **Remove Aggregations**.
  - TIP This menu option is available only when all of the columns are selected.

# **Using Group By Variables**

When you add an aggregation to a column, the remaining columns are automatically used as group by variables. The **Aggregations** column displays GROUP BY for these variables.

You can use a column as a group by variable by following the steps in "Specifying Aggregations" and selecting the **Group by** radio button.

# **Using the Auto-Aggregate Functions**

The auto-aggregate feature is a productivity feature that enables you to specify a set of aggregations to apply as default aggregations to numeric columns for a specific table. A typical use is to automatically aggregate some of the columns in a fact table.

To use the auto-aggregate feature:

- 1 Select a table on the **Design** tab. On the **Properties** tab, the table properties are displayed.
- 2 Select Enable for Auto-Aggregate.
- **3** Click the ellipsis button next to **Functions** to open the Choose Aggregations window.
- 4 Select the check boxes for the aggregate functions that you want to apply, and then click **Apply**.

Whenever you add a column to the query, the selected aggregate functions are automatically applied.

# **Using the Pivot By Feature**

The pivot by feature provides an easy and powerful way to summarize data for analytics. You can specify a column to use as a categorical variable and the unique values to use. When the query is run, the output table is summarized with the aggregations that you apply.

To use the pivot by feature:

- On the **Column Editor** tab, place your pointer in the **Pivot By** cell for the column to use as the pivot column. Click the ellipsis button to select the pivot column and values.
- 2 In the Pivot Values dialog box, select the pivot by column. You can enter search criteria in Filter fields to filter the column names.

The following display shows an example of pivoting by three values in the Product Category column.

Display 9.7 Pivot Values



3 After the unique values for the column are loaded, select the check boxes for the values to use in the summarization. Click **Apply**.

The following display shows an example of the **Column Editor** tab when a pivot by column is used. The minimum and maximum Total Retail Price are calculated for each Customer ID and are then pivoted by (transposed by) three values of the Product Category column.

Display 9.8 Column Editor Tab with a Pivot By Column

Colu	ımn Editoı	Where Havi	ing Joins Output Columns Messa	ges Log				
		Column Name	Expression	Туре	Format	Label	Aggregations	Pivot By
	1	Customer_ID	ORDER_FACT.Customer_ID	NUMERIC	13.		GROUP BY	
	2	Total_Retail_Pr	ORDER_FACT.Total_Retail_Price	NUMERIC		TRP	MIN;MAX	PRODUCT_DIM.Product_Category
	+							

TIP TRP is specified as a label for the Total Retail Price column. Look at the next display to see how the label is used to create labels for the new columns.

The following display shows how pivoting the Customer ID column by three values of the Product Category column results in additional output columns. A substring of the pivot by values is used as a prefix to each column name and the aggregate function is used as a suffix. The pivot by column label and aggregate function are used in the output column label.

Display 9.9 Output Columns Tab with Pivot By Values

Column Edito	r Where	Having	Joins	Outp	ut Columns	Message	es Log	
#	Column Na	me			Туре		Format	Label
1	Customer_	JD			NUMERIC		13.	
2	OUTD_Tota	al_Retail_l	Price_MIN	4	NUMERIC			OUTDOORS_TRP_MIN
3	INDO_Tota	I_Retail_F	rice_MIN		NUMERIC			INDOOR_SPORTS_TRP_MIN
4	CHI1_Total	I_Retail_P	rice_MIN		NUMERIC			CHILDREN_SPORTS_TRP_MIN
5	OUTD_Tota	al_Retail_l	Price_MA	Х	NUMERIC			OUTDOORS_TRP_MAX
6	INDO_Tota	il_Retail_F	rice_MA>	(	NUMERIC			INDOOR_SPORTS_TRP_MAX
7	CHI1_Total	I_RetaiI_P	rice_MAX		NUMERIC			CHILDREN_SPORTS_TRP_MAX

10

# Working with Query Filters

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# **About Filtering Data**

You can use the **Where** and **Having** tabs to filter data in SAS Visual Data Builder.

The SQL expression on the **Where** tab is applied to the input data. This SQL expression is often used to subset data on the columns in the source tables.

The SQL expression on the **Having** tab can be applied to either the input data or the calculated columns. This SQL expression is typically used to subset data on calculated columns in the output table.

# **Specifying a WHERE Clause**

To add a WHERE clause to a query:

1 Click the Where tab.

- 2 On the **Fields** tab, expand the table node, and select the column to use for filtering data.
  - TIP You can type in Filter fields to locate the column.
- 3 Double-click the column or drag and drop it in the **SQL expression** area.
- **4** (Optional) You can click the **Functions** tab and select the functions to use with filtering.
- **5** For character variables, you can click **Unique Values** to load the unique values of the column. Select the check boxes to specify the unique values to include in the filter.
  - Click **Apply** to add the unique values to the **SQL** expression area.
- **6** Edit the WHERE clause in the **SQL expression** area as follows:

Number of Values	Edit	Example
A single character value	Add an equal sign between the column name and the unique value.	CARS.Make   'Acura'
More than one character value	Specify an IN operator and enclose the unique values in parentheses.	CARS.Make IN ( 'Acura', 'Audi')
Numeric comparison	Specify a numeric operator and a constant, or specify a numeric operator and another column name.	CARS.Cylinders >= 6 PRDSALE.Actual > PRDSALE.Estimate

Click to save the filter with the query.

# **Specifying a HAVING Clause**

To add a HAVING clause to a query:

- Click the **Having** tab.
- 2 On the **Fields** tab, expand the table node, and select the column to use for filtering data. The **Output Columns** node includes the calculated columns.
  - TIP You can type in **Filter fields** to locate the column.
- Double-click the column or drag and drop it in the **SQL expression** area.
- 4 (Optional) You can click the **Functions** tab and select the functions to use with filtering.
- 5 For character variables, you can click **Unique Values** to load the unique values of the column. Select the check boxes to specify the unique values to include in the filter.
  - Click **Apply** to add the unique values to the **SQL** expression area.
- Edit the HAVING clause in the **SQL expression** area as follows:

Number of Values	Edit	Example
A single character value	Add an equal sign between the column name and the unique value.	CARS.Make = 'Acura'
More than one character value	Specify an IN operator and enclose the unique values in parentheses.	CARS.Make IN ( 'Acura', 'Audi')

Number of Values	Edit	Example
Numeric comparison	Specify a numeric operator and a constant, or specify a numeric operator and another column name.	AVG(CARS.Horsepower) >= 165  PRDSALE.Actual > PRDSALE.Estimate

7 Click ... to save the filter with the query.

#### **Best Practices for Filters**

SAS Visual Data Builder provides the **Where** and **Having** tabs for filtering data. Follow these best practices:

- Filter on the Where tab first because the WHERE clause reduces the rows to consider for further subsetting.
- When you specify a filter on a column that is an index or primary key, avoid using a function whenever it is possible. Using a function, such as CAST (order\_id as DOUBLE), risks performing a full-table scan rather than using the index.
- Filter on the table that has the smallest number of rows first.
- If you need to remove a table that is used on the Where or Having tabs, then remove the reference to the table from the filters before you remove the table from the query. Otherwise, if you remove a table that is referenced in a filter, then all of the filtering conditions are cleared.

# Working with Joins

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#### **About Joins**

SAS Visual Data Builder supports joins for tables and subqueries. You can join tables to each other, including self joins. You can join subqueries to tables and join subqueries to subqueries. When you use a subquery in a join, the join condition is made against the output table for the subquery. The data builder supports joining up to 256 tables.

When you drop a table or subquery onto the workspace, the data builder attempts to determine a join condition automatically. When the data builder creates a join

automatically using foreign keys or by matching columns, the join is added as an inner join. The data builder also supports left, right, and full joins. You need to specify the join type manually if you do not want an inner join.

In addition to easily adding joins to a query, SAS Visual Data Builder generates an SQL statement with all of the joins declared explicitly. For example, you can specify an inner join in a WHERE clause, such as WHERE t1.order id=t2.order id. However, mixing inner joins in a WHERE clause and outer join types in a single query can be complex to read and understand.

SAS Visual Data Builder always generates an SQL statement with inner joins declared explicitly. For example, see the following code sample:

```
LEFT JOIN
        LIB1.TRANSACTION TYPE DIM TRANSACTION TYPE DIM
            ON CASH FLOW FACT. TRANSACTION TYPE KEY =
                TRANSACTION TYPE DIM. TRANSACTION TYPE KEY
    INNER JOIN
        LIB1.TRANSACTION DIM TRANSACTION DIM
            ON PARTY DIM.SEGMENT ID = TRANSACTION DIM.SEGMENT ID
            AND PARTY DIM.TRANSACTION KEY = TRANSACTION DIM.TRANSACTION KEY
```

# **How Does the Automatic Join Feature** Work?

#### **Feature Overview**

SAS Visual Data Builder attempts to join tables and queries automatically as you add them to the workspace. When you drag and drop a table or query onto the workspace, information about the table or guery is retrieved from the SAS Metadata Server. For subqueries, the metadata for the output table is retrieved.

# **Using Foreign and Primary Keys**

If primary key or foreign key information is registered in the metadata for the table that you drag and drop onto the workspace, then the data builder retrieves the foreign key and primary key information.

The data builder then iterates over each of the tables that are already in the workspace in the same sequence in which they were added to the workspace. The data builder retrieves the foreign key and primary key information for the table, and compares the length, type, and name with the key columns for the newly added table. If a match is found, then the tables are used in the join, and the columns are added as a join condition. The data builder continues to search for matches between the two tables, and it adds join conditions when possible. After a set of join tables is identified, the data builder does not continue iterating over the tables that are already in the workspace.

# **Matching by Name**

If there is no foreign key or primary key information for the table that is dragged and dropped onto the workspace, then the data builder does not use foreign key or primary key information for the tables already in the workspace.

The data builder retrieves the column information for all of the columns in the newly added table. The data builder then iterates over each of the tables that are already in the workspace in the same sequence in which they were added to the workspace. The data builder compares the length, type, and name for each column with each column in the newly added table. If a match is found, then the tables are used in the join, and the columns are added as a join condition. The data builder does not continue to search for matches between the two tables, and it does not continue iterating over the tables that are already in the workspace.

# **Selecting the Join Type**

When the data builder finds the first set of matching columns by comparing keys or matching names, it sets the join type for the two tables. The data builder checks the metadata for the columns to determine whether the columns are nullable. The data builder performs the following steps to set the join type:

- 1 If the column for the existing table is not nullable, but the column for the newly added table is nullable, the tables use a left join.
- 2 If the column for the existing table is nullable, but the column for the newly added table is not nullable, the tables use a right join.

- 3 If both columns for the existing table and newly added table are nullable, the tables use a full join.
- 4 If none of the previous conditions are met, the tables use an inner join.

You can specify the join type by right-clicking on the join icon, and selecting the join type from the menu.

# **Adding a Join**

# **Dragging and Dropping Join Lines**

To add a join by selecting a column name and dragging your pointer to another column:

- Place your pointer on one of the columns in a table to use, and then click and drag your pointer to a column in the other table to use in the join.
- 2 If you want a join type other than an inner join, select the join, right-click, and then select the join type.

TIP The first table that is added to the workspace is always set as the left table. You can switch the right table and left table by using the Joins tab.

# **Using the Joins Tab**

To add a join condition by specifying the join properties:

- Click the **Joins** tab.
- 2 Click +.
- 3 Use the menus to replace **Not Selected** with the table names to use in the join. Click **Save**.

- The default join type is an inner join. Use the menu in the **Join Type** column to select a different join type.
- Click + in the Join conditions area.
- Use the menus to replace **Not Selected** with the column names to use in the join condition. Click Save.
- Click . to save the join condition with the query.

# Removing a Join

You can remove a join by using either of the following methods:

- Select the join in the workspace, right-click, and select **Remove Join Condition**.
- Click the **Joins** tab, select the row in the table, and click **x**.

# **Managing Joins in a Query**

Once a join is added to a query, you can change the join by selecting it in the workspace, right-clicking, and changing the join type or removing the join condition.

You can also change a join by clicking the **Joins** tab, and then selecting the row in the table. You can make the following changes:

- add and remove tables from the join list
- reorder the sequence of joins by moving them up or down
- switch the left table and right table assignments for a join
- add, remove, and change the columns that are used in the join condition

The **Joins** tab shows the join condition for the entire query. Make sure that you select a row in the upper table to set the columns in the **Join conditions** area.

The workspace shows a link between the tables that are used in a join. If you specify a left join or right join, the Venn diagram icon reflects which table provides the bulk of the data. If you rearrange the tables in the workspace (switching the left table and right table), the Venn diagram icon continues to reflect which table provides the bulk of the data. In order to change the data relationship, use either of the following methods:

- Switch the left table and right table by selecting a row from the table, and clicking \( \frac{1}{2} \).
- Change the join type from left to right or from right to left.

# **Best Practices for Managing Joins**

In most cases, the sequence in which joins are specified on the **Joins** tab does not matter. However, it is possible that the query optimizer for the data source can perform the joins in a sequence that reduces performance. In these rare cases, you can change the sequence in which joins are specified on the **Joins** tab by selecting the join in the list, and clicking **↑** or **♣**. This join sequence is still determined by the query optimizer, but you can control how the SQL for the join is presented to the query optimizer.

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# **Understanding Co-Located Data**

One of the most powerful benefits of SAS LASR Analytic Server is the ability to read data in parallel from a co-located data provider. In this configuration, the SAS LASR

Analytic Server software is installed on the same hardware as the data provider. The currently supported data providers are the following:

- SAS High-Performance Deployment of Hadoop
- Teradata Data Warehouse Appliance
- Greenplum Data Computing Appliance

SAS Visual Data Builder excels at accessing data from a variety of data sources, performing analytic data preparation, and then staging the prepared data with a colocated data provider. After the data is staged, the server can load the data to memory for exploration with SAS Visual Analytics Explorer.

The SAS Deployment Wizard registers a default library for the SAS LASR Analytic Server and a library for the co-located data provider. For the third-party vendor products, the default library name and location are as follows:

Teradata Data Warehouse Appliance

/Products/SAS Visual Analytics High-Performance Configuration/ Visual Analytics Teradata

Greenplum Data Computing Appliance

/Products/SAS Visual Analytics High-Performance Configuration/ Visual Analytics Greenplum

# **Using SAS Data in HDFS Libraries**

# **Default Library**

When your deployment includes SAS High-Performance Deployment of Hadoop, the SAS Deployment Wizard registers a library for it. This library is available for use in the SAS Folders tree, and it is located in /Products/SAS Visual Analytics High-Performance Configuration/Visual Analytics HDFS.

# **Staging Library**

You can specify a SAS Data in HDFS library as a staging library. This is a common use because the rows for the output table are distributed among the machines in the cluster. The server can then read the data in parallel when it loads the table to memory.

You must specify a SAS LASR Analytic Server library for the output library when you use a SAS Data in HDFS library for staging.

#### **Output Library**

You can specify a SAS Data in HDFS library as an output library. The engine distributes the rows for the table to the machines in the cluster. Afterward, you can select the table from the SAS Folders tree, right-click, and select Load a Table. This menu option loads the table from HDFS to memory on a SAS LASR Analytic Server.

You can partition SAS Data in HDFS tables when they are used in an output library. You can select a column to use from the **Partition by** menu. Partitioning the table ensures that all of the rows with the same formatted value as the selected column are distributed to one machine in the cluster. The rows are also placed in the same HDFS block. When you load a partitioned table to memory, the partitioning information is retained, and the result is a partitioned in-memory table.

#### See Also

"Partitioning Tables" on page 87

#### Restrictions

The following restrictions apply to using SAS Data in HDFS libraries with SAS Visual Data Builder:

- You cannot specify a SAS Data in HDFS library as an input library because the SAS Data in HDFS engine is a Write-only engine.
- The **Append data** check box on the **Properties** tab is disabled. The SAS Data in HDFS engine does not support appending data.

If you specify a SAS Data in HDFS library as an output library, you cannot view the results on the **Results** tab because the SAS Data in HDFS engine is a Write-only engine.

# Using SAS LASR Analytic Server Libraries

# **Default Library**

During installation, the SAS Deployment Wizard registers a library for SAS LASR Analytic Server. This library is available for use in the SAS Folders tree, and it is located in /Products/SAS Visual Analytics Administrator/Visual Analytics LASR.

# **Input Libraries**

When you select a SAS LASR Analytic Server table as an input table, be aware of the following best practices if the table is large. If the table is not large, then using it for input requires no special considerations.

Here are the considerations for using a large SAS LASR Analytic Server table as an input table:

- A WHERE clause is processed in memory by the server if no aggregations or joins are used. Specify a filter on the Where tab so that you use only the rows that you want.
- If you want to join the table, then design one query that copies the data to the same library as the table that you want to join it with. Specify a filter on the **Where** tab, if applicable. Then, design another query that performs the join.

# **Output Libraries**

Using a SAS LASR Analytic Server library for output is common for SAS Visual Data Builder. When you run the query, you can click **Explore Results** to automatically select the table and explore it in SAS Visual Analytics Explorer.

You can use the **Append data** check box on the **Properties** tab to add rows to an inmemory table. However, this option is not available if you use a SAS Data in HDFS library as a staging library.

# **Partitioning Tables**

When you specify a SAS LASR Analytic Server or SAS Data in HDFS library as an output library, you can specify a partition key for the table. You can select a column to use from the Partition by menu.

Partitioning uses the formatted values of the partition key to group rows that have the same value for the key. All of the rows that have the same value for the key are loaded to a single machine in the cluster. For SAS LASR Analytic Server libraries, this means that the rows that have the same value for the key are in memory on one machine. For SAS Data in HDFS libraries, all of the rows that have the same value for the key are written to a single file block on one machine. (The block is replicated to other machines for redundancy.) When the partitioned table is loaded onto a server, the partitioning remains when it is in memory.

If you select a partition key and also specify sort options for columns on the Column **Editor** tab, the sort options are passed to the engine in an ORDERBY= option. This enhancement applies to SAS LASR Analytic Server and SAS Data in HDFS libraries and can improve performance once the data is in memory.

When you specify a partition key, avoid using a variable that has few unique values. For example, partitioning by a flag column that is Boolean results in all rows on two machines because only two values are available. At the other end of the spectrum, partitioning large tables by a nearly unique key results in many partitions that have few rows.

Determining the optimal partition key can be a challenging task. However, as an example, if you tend to access data based on a customer ID, then you might improve performance by partitioning the data by customer.

#### See Also

SAS LASR Analytic Server: Administration Guide

# **Exploring Results**

When you design a query that uses a SAS LASR Analytic Server library for the output table, and you run the query, the **Explore Results** button becomes available. Click the button to access SAS Visual Analytics Explorer and the results of the query.

# Loading a Table to SAS LASR Analytic Server

To load a table into memory on a SAS LASR Analytic Server:

- 1 Use the SAS Folders tree to locate the table.
  - TIP You can also click , and search for the table by name and location.
- **2** Select the table, right-click, and select **Load a Table**.

Display 12.1 Load a Table Dialog Box

Load a Table		×
Used LASR mer	nory: 59% 2.95 TB	
Specify the settin	ngs for loading the table to SAS LASR Analytic Server.	
Source Table		
Name:	TRANSACTION	
Library:	/Shared Data/AutomationData	
LASR Table		
Name:	TRANSACTION	
Description:	Loaded on Friday, Month DD, Year 03:45:02 PM GMT-0400 from "AUTODATA.TRANSACTION" by "SAS Demonstration User"	
Location:	/Shared Data/SAS Visual Analytics/Public/LASR	Browse
Library:	/Shared Data/SAS Visual Analytics/Public/Visual Analytics Public LASR	Browse
	Subn	nit Close

3 The fields in the **Source Table** section are filled automatically.

Specify the following settings in the dialog box:

 Table 12.1
 Load a Table Dialog Box Properties

Field	Description
Name	Enter the name to use for the table. This name is registered in metadata with the SAS LASR Analytic Server library.

Field	Description
Description	Enter a description of the data. This description is displayed by SAS clients such as SAS Visual Analytics Explorer.
Location	Click <b>Browse</b> , and select a folder to use for the table metadata.
Library	Click <b>Browse</b> , and select the SAS LASR Analytic Server library to use with the table.

#### 4 Click Submit.

# **Monitoring Memory Usage**

For deployments that use a distributed SAS LASR Analytic Server, a memory gauge is visible on multiple windows. You can use the gauge to make sure that you do not overload the server or the hardware. An example of the gauge is shown in Display 12.1 on page 89.

The server rejects requests to add tables or append rows when 80% or more of the memory is used. (The default value for the server is 75%. SAS Visual Analytics deployments set the value at 80%.) System administrators can specify the value for the server with SAS Management Console.

#### See Also

SAS Visual Analytics: Administration Guide

13

# **Importing Data**

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# **About the Import Data Features**

#### Why Use the Import Data Features?

The import data features enable you to perform self-service, ad hoc data analysis. You can take a Microsoft Excel spreadsheet, delimited text file, or SAS data set from your desktop and transfer it to SAS LASR Analytic Server. Or, you can add the data as a SAS data set, a database table, or SAS Data in HDFS table.

If you have SAS data sets that are stored remotely with a SAS Application Server, you can load them to memory on SAS LASR Analytic Server.

The imported data can be used to enrich existing data that is already available in your SAS deployment. You can import data directly to memory on a SAS LASR Analytic Server.

After the data is in memory, you can explore the data and create visualizations with SAS Visual Analytics Explorer. You can use the powerful reporting capabilities of SAS Visual Analytics Designer.

#### What is Local Data and Remote Data?

To understand the difference between local data and remote data, consider the following:

#### local data

is available from the file systems on your desktop. This includes local file systems such as C:\ on Windows machines and paths such as /home/\$USER on UNIX machines. Network file systems and shares are also included, such as UNC paths like \\nas\spreadsheets.

#### remote data

is not available from the file systems on your desktop. You can direct the SAS Application Server to access the data that is available through file systems on the remote machine.

#### **Default Values**

The import data features for both local data and remote data are configured with default values to load data to SAS LASR Analytic Server.

If you want to use a library other than the default SAS LASR Analytic Server library, you can specify different values in the **Advanced** section of the import windows. You can specify a different SAS LASR Analytic Server library, a different library type (for imported local data only, imported remote data is restricted to SAS LASR Analytic Server libraries), and a different location for the table.

# **Importing Large Local Data Files**

When you import local data (spreadsheets, SAS data sets, or delimited text files), memory on the client PC is used to access the data files. For data files that are larger than 1G, make sure that the client machine meets the following requirements:

- The client machine should have at least 4G RAM, 8G is recommended.
- The client machine should use a 64-bit web browser and Adobe Flash Player.

Note: For a list of supported browsers, see http://support.sas.com/resources/ thirdpartysupport/v94/browsers.html.

When using a 64-bit web browser and Adobe Flash Player, the theoretical limit for importing local data files is 2G.

**Note:** Be aware that importing large local data files can require a long time to transfer and process the data. A progress indicator is provided to help you track the import.

# **Working with Spreadsheets**

#### **Multiple Worksheets**

When you import a spreadsheet (from your PC) that has multiple worksheets, the data builder offers to append the worksheets into a single table. SAS no longer supports this feature in SAS Visual Analytics 6.2 because rows with column names on subsequent worksheets cause all of the variables to be read as character data.

If you have more than one worksheet, clear the **Append worksheets together** check box so that each worksheet is imported as a separate table. You can then create a query for each of the tables to append all table content to a single table and achieve the same outcome.

TIP When you append to tables, make sure that the column names, data types, and lengths all match.

#### **Special Characters and Missing Values**

When you import a spreadsheet that uses special characters or has missing values, keep in mind the following considerations:

If the filename or worksheet names use special characters, the import can fail.

TIP Table names are restricted by the VALIDMEMNAME= SAS system option. Column names are restricted by the VALIDVARNAME= SAS system option.

- If a column has no values, it is skipped during the import process.
- If a row has missing values, but the cells are formatted (for example, Text), the import can introduce an error. The data builder combines the row with missing values with values from the following row. You can avoid this problem by formatting the cells as General.

#### **Pivot Tables**

Importing pivot tables is not supported.

# **Importing Local Data**

To import data from a spreadsheet, delimited text file, or SAS data set, follow these steps:

- 1 Select File ▶ Import Local Data, and then select the data file.
- 2 In the Import Local Data window, specify the following input file parameters:

Note: For SAS data sets, there are no parameters to specify.

#### Delimiter<sup>Applies to CSV</sup>

Select the delimiter that is used in the text file to import. You can specify a single character to use as a user-defined delimiter.

#### Select worksheet Applies to XLS

Select **All** or the check boxes for the worksheets to import. For more information, see "Working with Spreadsheets" on page 93.

**Note:** Make sure that you clear the **Append worksheets together** check box. That feature is not supported in SAS Visual Analytics 6.2.

#### Use data in the first row as SAS variable names

Select this check box when the worksheet has the variable names in the first row. The variable names are retrieved from the first non-empty row.

#### **Trim spaces**

Select this check box to remove leading spaces and trailing spaces from character variables.

#### Data records begin on row

The default is to import data records from the first row. If you select **Use data in** the first row as SAS variable names, then this value increments to 2. This check box is disabled if you import a spreadsheet and select multiple worksheets.

#### Encoding Applies to CSV

Select the encoding of the file. If you are importing UTF-8 or UTF-16 data, make sure the SAS Application Server is a Unicode server or that all of the file contents can be successfully transcoded to the encoding of the SAS Application Server. If you are importing a UTF-16 (big-endian or little-endian) file, make sure it contains a BOM (byte-order mark).

3 (Optional) Click **Preview** to view the data. You can preview delimited text files and spreadsheets only.

Preview displays up to 500 rows from the first 2 MB of the file.

4 Review the **Advanced** properties, and adjust them if needed.

Field	Description
Name	Specify a table name for the imported data.
Location	Click , and select a metadata folder. The imported data is registered as a table in the specified location.
Library	Click 🗐, and select the library in which to import the data.
	If you select the <b>Show SAS LASR Analytic Server libraries only</b> check box, then the list is filtered to show those libraries only.

# **Importing Remote Data**

To import a SAS data set that is accessible from your SAS Application Server, follow these steps:

Select File ▶ Import Remote Data, and then select the data file.

Note: Remember that the data files and directories are on the remote machine, not on your PC. In the Basic Properties table, the Date Created, Description, and **Keywords** fields are not used.

2 In the Import Remote Data window, review the **Advanced** properties, and adjust them if needed:

Field	Description
Name	Specify a table name for the imported data.
Location	Click , and select a metadata folder. The imported data is registered as a table in the specified location.
Library	Click 🗐, and select the library in which to import the data.

Click OK.

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# Importing SAS Information Maps

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# **About SAS Information Maps**

A SAS Information Map is business metadata that is applied on top of the data sources in your data warehouse. (Metadata is information about the structure and content of data. An information map does not contain any physical data.) Information maps provide business users with a user-friendly way to query data and get results for themselves.

SAS Information Maps are created with either SAS Information Map Studio or the INFOMAPS procedure. SAS Visual Data Builder cannot create, edit, or save an information map. However, the data builder can import the business logic from a relational information map and represent it as SAS statements that use the SQL procedure.

#### See Also

Base SAS Guide to Information Maps

# **Importing a SAS Information Map**

To import a SAS Information Map:

- 1 Use the SAS Folders tree to locate the map (4).
- Select the map, right-click, and select Import Query.

A new query is created with the same name as the map. The output table is automatically set with the same name as the map.

The business logic is imported from the map and represented as SAS statements on the **Code** tab.

TIP If you want to join a table, save the query, and then create a new query and add it as a subquery.

#### See Also

"Customizing Code" on page 101

#### **Limitations and Restrictions**

SAS Visual Data Builder has the following limitations and restrictions for working with information maps:

- The information map cannot use more than 50 physical tables. A table that is used more than once in a self join counts as one physical table.
- The information map cannot use more that 5000 physical columns. A column that is used in more than one data item counts as one physical column.

- Prompts are not supported. Even if a prompt has a default value, the default value is not included.
- Data items that are based on business data are not supported. For example, the equation Dataitem1 = Year + 2 (where Year is a data item) is not included in the query.
- Data items that are based on physical columns are not supported. For example, the equation Dataitem2 = FirstName | | LastName (where FirstName and LastName are columns) is not included in the query.
- The output table is automatically named with the same name as the map. The name field is limited to 32 characters.

# **Customizing Code**

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# **Using the Code Tab**

You can click the **Code** tab to view the SQL statements that are generated by the data preparation expressions on the **Design** tab.

The **Code** tab can also be used to enter custom code.

- The Preprocess and Postprocess views enable you to enter SAS statements that are run before and after the query runs.
- The All Code view shows the generated SQL statements. You can click the button to unlock the view so that you can manually edit all of the SAS statements for the query. After you have unlocked the view, the button icon changes to <?</p>

After you have unlocked the view, you cannot continue using the **Design** tab to edit the query, and the Preprocess and Postprocess views are disabled. However, if you have

not saved your changes to the code, you can click the button to be able to use the **Design** tab.

# **Preprocess and Postprocess Code**

In some cases, you might want to assign SAS options, load format catalogs, use LIBNAME statements, or run macros before running a query. You can unlock the code to enter the statements, but that prevents you from using the **Design** tab. However, the Preprocess view or Postprocess view might enable you to supplement the query while using the code generation features of the **Design** tab.

Any SAS statements that you enter in the Preprocess view or Postprocess view are included in the All Code view.

# **Considerations for Manually Editing Code**

# **Before You Manually Edit Code**

The code generation features in SAS Visual Data Builder can generate a lot of SAS statements with a few simple clicks. Depending on your needs, you might benefit by using the **Design** tab for adding input tables, performing joins, and filtering data before you customize the generated code.

The following features and settings must be specified before you unlock the code:

#### **Unique values**

Selecting this check box determines whether the DISTINCT keyword is included in the generated PROC SQL statement. After you unlock the code, the check box cannot be used to include the keyword.

#### Append data

Selecting this check box enables you to use the generated SAS statements for appending data to the output table before you unlock the code.

#### Output table

You must specify the table name, location, and library, and you must save the guery before you unlock the code. When you save the guery, the metadata for the table is registered.

#### Use a staging table

Selecting this check box registers the metadata for the table when you save the query. Select the check box, specify the library, and save before you unlock the code.

# **Input and Output Libraries**

When you unlock the code for manual editing, you must specify the libraries to use for your tables. You can do this with LIBNAME statements. If you dragged and dropped the tables onto the workspace before you unlocked the code for manual editing, the LIBNAME statements for the tables are automatically included.

#### See Also

SAS Statements: Reference

SAS/ACCESS for Relational Databases: Reference

# **Output and Staging Tables**

Specify the table names, locations, and libraries on the **Properties** tab just as you do on the **Design** tab.

Note: Specify the tables and save the guery before you unlock the code. If you do not specify the table name or the table name is already in use, you are not able to save the query.

#### See Also

SAS Language Interfaces to Metadata

# **Validating Custom Code**

If you entered SAS statements in the Preprocess or Postprocess views, those statements are not validated when you click  $\square$ .

If you unlock the code in the All Code view, the 🗳 button is disabled. You cannot validate customized code.

# Scheduling Queries

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# **About Scheduling Queries**

# **How Does the Scheduling Feature Work?**

When you have a query open in the workspace, you can click  $\bigcirc$  to schedule the query. When you schedule a query, SAS Visual Data Builder performs the following operations:

**1** Creates a *job* that performs the query operations.

- 2 Creates a *deployed job* from the job.
- 3 Places the job into a new *deployed flow*.
- **4** Schedules the flow on a *scheduling server*.

You can use SAS Visual Data Builder to reschedule the query based on specified conditions (for example, run immediately or run whenever a trigger condition is met).

The job, deployed job, and deployed flow are metadata objects. The data builder stores them in the same metadata folder with the query. The metadata objects are named based on the following pattern:

vdb query id timestamp

# **Editing Queries That Are Already Scheduled**

If you edit a query that is already scheduled, you must click  $\oplus$  again so that the SAS statements for the query are regenerated and saved.

# Caution about Scheduling Queries to Run Now

When you schedule a query, one of the options is to run the query immediately. Select **Run now** in the Schedule window.

Performing the following steps results in an error condition:

- 1 Use a SAS data set for the output table of the query.
- 2 Run the query.
- 3 Click the **Results** tab to look at the output.
- 4 Schedule the query by selecting Run now.

These steps result in an error condition because SAS unlocks a SAS data set when it is opened for reading. When step 3 is performed, the output table is locked, and no other process can overwrite the output table. The following message is included in the SAS log:

### **Locked Error Message**

ERROR: A lock is not available for OUTPUTTABLE.

ERROR: Lock held by process xxxx.

You can avoid this error condition. If you want to schedule the query to run now, close the query, open it again, and then schedule it to run now. Alternatively, you can schedule the query to run in the future, and then close the query.

### **Scheduling Preferences**

### **Default Scheduling Server**

You can specify a different scheduling server in your application preferences. Any queries that you schedule after you specify a different scheduling server will use the new scheduling server.

Use the Server Manager plug-in to SAS Management Console to identify the scheduling servers that are included in your deployment. By default, your deployment includes a server that is named Operating System Services - hostname.example.com. This server is used as the default scheduling server.

The SAS Distributed In-Process Services Scheduling Server is an alternative server. To use this server, change the scheduling server. The default name is SAS Distributed In-Process Services Scheduling Server.

Some deployments include the Platform Suite for SAS server. To use this server, change the scheduling server. The default name is Platform Process Manager.

In all cases, when you schedule a new query, SAS Visual Data Builder retrieves your default scheduling server, and uses that value to look up the scheduling server in SAS metadata. The data builder uses the first server that matches the value in SAS metadata. Including the host name, such as Operating System Services hostname.example.com ensures that the data builder uses the server that you specify.

### **Default Batch Server**

You can specify a different batch server in your application preferences. Consider the following before you change the default batch server:

- The batch server must be registered in metadata as a component of a SAS Application Server that you can access.
- You must specify the same SAS Application Server as your default application server in your preferences.

As with the default scheduling server, SAS Visual Data Builder retrieves your default batch server, and uses that value to look up the batch server in SAS metadata the first time you schedule the query. The data builder uses the first server that matches the value in SAS metadata.

### **Default Deployment Directory**

A deployment directory is a SAS metadata object that represents the following items:

- the name of the SAS Application Server with which the deployment directory is associated (the default value is SASApp)
- a name for the deployment directory (the default value is Batch Jobs)
- the path to the deployment directory (the default value is SAS-config-dir/Lev1/ SASApp/SASEnvironment/SASCode/Jobs)

When you schedule a query, the SAS statements for the query are saved in a file. The file is saved in the path that is associated with the deployment directory. The file is named based on the same pattern that is described in "How Does the Scheduling Feature Work?" on page 105.

SAS Visual Data Builder retrieves your deployment directory, and uses that value to look up the deployment directory in SAS metadata the first time you schedule a query. The data builder uses the first server that matches the value in SAS metadata.

You can specify a different name for the default deployment directory. For more information about deployment directories and using the Server Manager plug-in to SAS Management Console, see *Scheduling in SAS*.

# When Are the Scheduling Preferences Used?

Any of the preferences that you change are used the next time you create a query and schedule it. If you edit an existing query that is already scheduled, the existing settings

for the scheduling server, batch server, and deployment directory are not updated with the changes. To change the settings for existing gueries that are already scheduled, use SAS Management Console to redeploy the deployed job for the query.

# **Creating Events**

### Why Use Events?

Events specify conditions that must be met before a step in the flow can take place. You can use SAS Visual Data Builder to create two types of events.

- Time events are evaluated based on a specified time being reached.
- *File events* are evaluated based on the state of a specified file.

You can create file events if your deployment includes a scheduling server that supports them, and the flow is deployed to that scheduling server. Time and file events can be used as triggers (conditions that must be met in order to run a flow on the scheduling server).

# **Creating a Time Event**

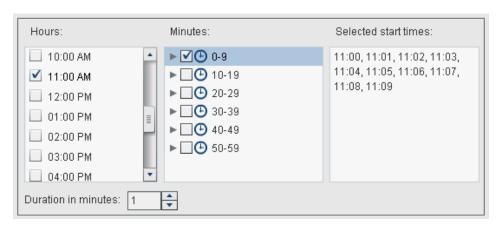
You can create a time event and use it as a trigger.

To create a time event:

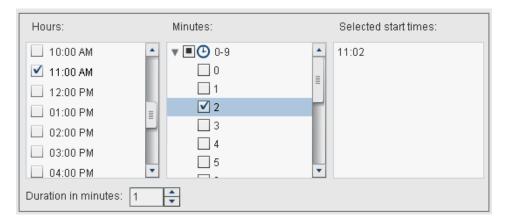
- 1 In the Schedule window, select **Select one or more triggers for this query**, and then click **New Time Event**.
- 2 In the New Time Event window, specify whether the time event should happen one time only or more than once. If the time event should happen one time only, specify the date and time for the time event.
- 3 If the time event should happen more than once, select **More than once**, and then select a radio button for how often the time event should repeat (such as hourly, weekly, or yearly).

**4** Specify the details of when the time event should repeat. The specific fields that are available depend on the recurrence interval that you select.

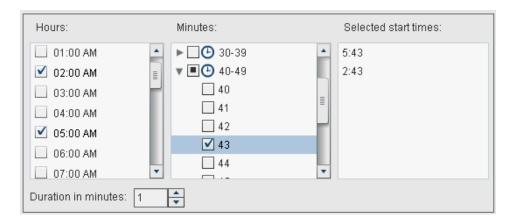
If the recurrence interval requires you to select start times, use the **Hours** and **Minutes** check boxes to select the times. The **Minutes** area contains groupings of 10-minute intervals. Selecting a check box for a minute grouping selects all of the minutes in that grouping.



To select individual minutes, expand the grouping.



If you select multiple values for **Hours**, all of the selections for **Minutes** apply to all of the selected hours. For example, if you select 02:00 AM and 05:00 AM in the **Hours** area, and 43 in the **Minutes** area, the time event is scheduled for 2:43 AM and 5:43 AM.



5 If needed, specify the start date and end date for the time event. The default is to start at the current date and time and not to have an end date.

# **Creating a File Event**

You can create a file event and use it as a trigger. The file event can check for various file conditions, such as its existence, size, or age.

Note: Not all scheduling servers support file events. Platform Suite for SAS and the SAS Distributed In-Process Services Scheduling Server are two servers that do support file events. The **New File Event** button that is used to create a file event is available only when the scheduling server supports file events.

To create a file event:

- In the Schedule window, select **Select one or more triggers for this query**, and then click New File Event.
- 2 In the New File Event window, specify or select the file to use for the file event.
- Select the condition to evaluate the file to make the file event true. For example, if you selected **not exist** for the condition, the file event would be true only if the selected file was not in the specified location.
- If needed, specify the details (such as size or age) about the condition.

# **Exporting Queries as Jobs**

For deployments that include SAS Data Integration Studio and prefer to deploy jobs, flows, and schedule flows manually, you can export a query as a job, and then perform the deployment steps.

This feature enables you to work with a query interactively while you design it, and then you can export the query as a job for automating the operations. After the job is exported, you can deploy the job for scheduling with SAS Data Integration Studio. For more information about deploying jobs, see *Scheduling in SAS*.

After a job is stored in metadata, you can open the job with SAS Data Integration Studio and edit it. This might be necessary if you need to add or remove columns or change the column expression in a calculated column.

If the deployment does not include SAS Data Integration Studio, then you can modify the query and export it as a job again. However, you cannot overwrite job objects in metadata with SAS Visual Data Builder. If you need to delete objects from metadata (such as jobs, libraries, or tables), use SAS Management Console.

To export a query as a job:

- 1 Use the SAS Folders tree to locate the query.
- **2** Select the query, right-click, and select **Export as a job**.
- 3 In the Export as a Job window, enter a name and specify a location. Click **Export**.

# **Additional Scheduling Resources**

SAS Visual Data Builder provides an easy-to-use method for taking a query and making it available for scheduling as a flow. In addition, the Schedule Manager plug-in to SAS

Management Console provides additional resources for managing deployed flows, job dependencies, and scheduling servers.

For users that are familiar with the Schedule Manager plug-in, be aware that SAS Visual Data Builder does not support scheduling a query without a trigger. In the Schedule Manager plug-in, this option is specified as the Manually to the scheduling server option. If this is your preferred method for scheduling, you can use the Schedule Manager plug-in to modify the flow for the scheduled query. If you use SAS Visual Data Builder to schedule the query afterward, the setting is lost, and you will need to repeat your steps with the Schedule Manager plug-in.

### See Also

Scheduling in SAS

# Using the Results Tab

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# **About the Results Tab**

After you have designed your query and clicked ▶, the query runs, and you are prompted to determine whether you want to view the results.

If you click **Yes**, the data builder retrieves the data and shows you the results on the **Results** tab.

Note: For large data sets, retrieving and displaying the data can require a long time.

# **Data Pages**

When you view data, a SAS server retrieves the data from the data set. Instead of returning all of the data, the data viewer requests a page of data. You can set the page size to between 20 and 2000 rows.

A slider is provided at the bottom of the **Results** tab so that you can navigate through the pages and browse the entire data set.

# **Navigate within the Data**

Navigate to a row in the table by entering the row number in the **Go to row** field. The **Go to first row** and **Go to last row** buttons provide navigation to the first and last rows of the table.

# **Find**

Search for text or numbers in the data set by clicking !!, typing in the **Find** field, and pressing Enter. The find feature searches through the rows in the data set for the value, and it highlights the first row with the value. You can navigate through the results by clicking **Find next** and **Find previous**.

Click to set advanced find options. The following list identifies the options:

- Options tab
  - Exactly matches the specified string
  - Contains the specified string (default setting)
  - □ Starts with the specified string

- Case sensitive
- Trim leading and trailing spaces (default setting)
- Columns tab

Enable and clear check boxes to specify the columns to search.

### Filter and Sort

Sort the data by clicking , and then choosing the columns and sort order. The Generated SQL statement field shows the sort criteria.

Filter the data by clicking  $\mathbf{T}$ , and setting the following options:

- The **Sample** tab is used to limit the number of rows to return or to select distinct values.
- The **Row Filter** table is used to subset data with a WHERE clause. You can filter on the values in multiple columns, set ranges for numeric values, and use IN and NOT IN criteria for character values. If the number of distinct values is less than 50, you can select check boxes for the values. If there are more than 50 distinct values, you must enter the values to use for filtering.
- The **Column Filter** tab is used to select the columns to display.

# **Export Data**

You can save the data that you view as a comma-separated values file. After you click . vou can choose to export the rows on the current data page, all of the rows, or a range of rows. The export feature has a limit of exporting 200,000 rows.

If you choose to export all of the data or a range of rows, you have to click Retrieve Data before you can click Export as CSV.

# **Column Headings**

Use the **Headings** menu to control the appearance of the column headings. You can view the column name from the data set, the column label from the data set, or a combination of the two. If a column does not have a label in the data set, then the column name is used.



# **Exploring Data**

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# Overview of SAS Visual Analytics Explorer

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# What Is SAS Visual Analytics Explorer?

SAS Visual Analytics Explorer (the explorer) is a component of SAS Visual Analytics that enables you to explore your data sources. You can explore your data by using interactive visualizations such as charts, histograms, and tables. You can also apply data analysis such as forecasting, correlation, and fit lines.

Your work in the explorer is saved as a metadata object called an *exploration*. An exploration (sometimes called a visual exploration) contains all of the visualizations, data settings, and filters from your explorer session.

You can use the explorer to explore in-memory tables from the SAS LASR Analytic Server. You can either open a table directly or you can open a saved exploration.

You can export your exploration results as reports, which can be refined in SAS Visual Analytics Designer (the designer) or viewed directly. Reports can be viewed on a mobile device or in the SAS Visual Analytics Viewer (the viewer).

You can save your explorations as PDF documents, share your saved explorations via e-mail, and export your visualizations as image files. You can export the data from your visualizations to a data file that you can use in other tools.

# **Accessing the Explorer**

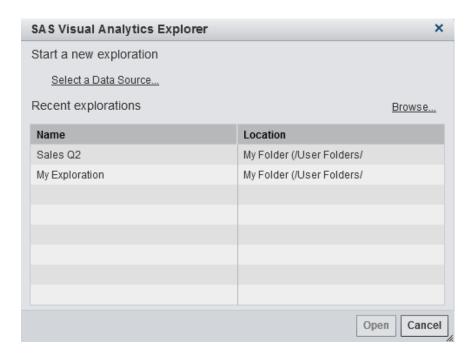
You can access the explorer by using any of the following methods:

- On the SAS Visual Analytics home page, click Explore Data.
   You can select a data source by using the Welcome window.
- On the SAS Visual Analytics home page, double-click on an exploration to open it in the explorer.
- Follow a link or enter the URL to access the explorer directly. For example, you might enter http://server.abc.com/SASVisualAnalyticsExplorer.
  After you have logged on to SAS Visual Analytics, you can choose a data source from the Welcome window.
- From an e-mail, follow a link directly to a specific exploration. After you have logged on to SAS Visual Analytics, the exploration opens in the explorer automatically.

### **The Welcome Window**

If you enter the explorer without a reference to a specific exploration, then the Welcome window appears.

**Display 18.1** The Welcome Window



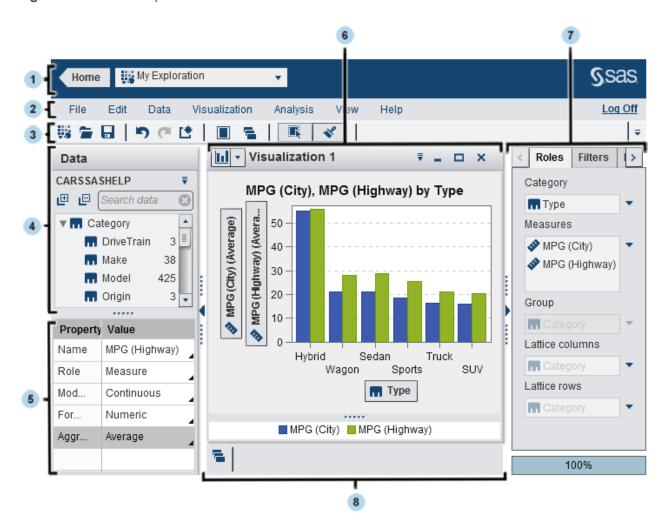
The Welcome window enables you to perform the following tasks:

- Create a new exploration by clicking **Select a Data Source**. The Open Data Source window appears.
  - In the Open Data Source window, select the data source that you want to open, and then click Open.
  - In the **Search** field, you can enter a short string to find all of the data sources whose names or descriptions begin with that string.
  - Note: You can also perform a search that matches a string anywhere in the data source name. Select the **Search** field and then press CTRL+Down to switch the search to Search (contains).
- Open an existing exploration. Select from your recent explorations, or select any exploration by clicking **Browse** to locate the exploration.

# **Your First Look at the Explorer**

Here are the main parts of the explorer user interface:

Figure 18.1 The Explorer User Interface



- 1 The application bar provides access to the home page and recent explorations.
- **2** The menu bar offers common tasks, such as creating a new exploration.
- 3 The toolbar enables you to manage your explorations and visualizations.

- The **Data** pane enables you to manage the data that is used in your visualizations.
- The data properties table enables you to set data item properties.
- The workspace displays one or more visualizations.
- The right pane's tabs enable you to set properties and data roles, subset data, and use comments.
- 8 The dock contains any minimized visualizations.

# Specifying Preferences for SAS Visual Analytics Explorer

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# **Specifying Global Preferences**

See "Specifying Global Preferences" on page 16 for details about global preferences for SAS Visual Analytics.

# **Specify Preferences That Are Specific to SAS Visual Analytics Explorer**

Here are the steps to specify preferences that are specific to SAS Visual Analytics Explorer (the explorer):

- 1 Select **File** ▶ **Preferences** to open the Preferences window.
- 2 Select SAS Visual Analytics Explorer ▶ General.

- 3 Select a **Graph skin** to change the visual effects that are applied to your graphs. For example, many of the **Graph skin** settings apply lighting effects to the features of your graph to create a 3-D appearance.
- 4 Select **Visualization data threshold** to specify the amount of data values that your visualizations can process. The precise amount of data that is supported varies depending on the visualization type. See Appendix 3, "Data Limits," on page 503.
  - **Note:** A large value for **Visualization data threshold** might degrade your application performance or lead to time-out errors.
- **5** To return to the default settings, select **Reset to Defaults**.
- 6 Click **OK** to apply your changes. Your preferences persist between sessions.

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# Managing Explorations

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# What Is an Exploration?

An exploration (sometimes called a visual exploration) is a metadata object that contains all of the visualizations and data settings from a SAS Visual Analytics Explorer (the explorer) session. You can use explorations to save your session for later and to share it with others.

# **Create a New Exploration**

To create a new exploration, select **File** ▶ **New Exploration** from the menu bar. The Open Data Source window appears. Select your data source, and then click **Open**.

# **Saving Your Exploration**

To save your current exploration, select **File** ▶ **Save As**, and then select a location and a name.

# **Deleting Explorations**

To delete an exploration, use the SAS Visual Analytics home page. See "Managing Content on the Home Page" on page 20.

# **Exploration Comments**

# **About Exploration Comments**

The explorer enables you to create and share comments about your explorations. The comments can be viewed in the explorer and on the SAS Visual Analytics home page.

In addition to exploration comments, you can create comments for specific visualizations. See "Manage Visualization Comments" on page 175.

# **View Exploration Comments**

To view the comments for the current exploration, select **File** ▶ **Exploration Comments**. The comments are grouped by topic.

If there are many comments in a topic, then only the most recent comments are displayed. Click **Show All Comments** to view all of the comments for a topic.

To search the comments, enter a search term in the **Search within comments** field.

# **Create an Exploration Comment**

### **Create a Comment under an Existing Topic**

To create a comment under an existing topic:

- 1 Enter your comment text in the **Respond to topic** field that is beneath the topic that you want to comment on.
- (Optional) Click **l** to attach a file to the comment.
- 3 When you are finished with the comment, click Post. Your comment is saved and shared immediately.

### **Create a Comment under a New Topic**

To create a comment under a new topic:

- Enter the name of the topic in the **Enter a topic name** field.
- Enter your comment text in the **Enter a comment** field.
- (Optional) Click **l** to attach a file to the comment.
- 4 When you are finished with the comment, click **Post**. Your comment is saved and shared immediately.

# **Edit an Exploration Comment**

To edit a comment, select the comment that you want to edit, and then click Edit.

**Note:** To edit other users' comments, you must belong to the **Comments:Administrator** role.

### **Delete an Exploration Comment**

To delete a comment, select the comment that you want to delete, and then click **Delete**.

Note: To delete comments, you must belong to the Comments:Administrator role.

# 

# **Managing Data**

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# **Managing Data Properties**

# **Overview of Managing Data Properties**

At any time after you have loaded a data source for your exploration, you can modify the properties of the data items. The changes that you make are saved as part of the exploration, but do not affect the original data source.

You can manage the properties for all of your data items by using the Data Properties window.

You can manage the properties for individual data items by using the Data pane.

# **Manage Data Properties By Using the Data Properties Window**

To access the Data Properties window, select **Data** ▶ **Data Properties** from the menu bar.

For each data item, you can specify the following properties:

#### Name

specifies the name of the data item.

### Role

specifies whether the data item is a category, a measure, or a geography.

### **Model Type**

specifies the type of data model for a measure or for a category with datetime data. Select whether the data model is continuous or discrete.

The model type that you specify determines the type of data filters that you can create for the data item.

Note: If you change the model type for a data item that is used in a filter, then the filter is removed.

#### **Format**

specifies the data format for the data item.

See "Select a Numeric Format" on page 137 and "Select a Date or Time Format" on page 138 for information about specifying formats.

### Aggregation (for measures only)

specifies the method that is used to aggregate values for the measure. Select one of the following aggregation types:

#### Sum

provides the sum of the values in the measure.

### Average

provides the average of the values in the measure.

### Maximum

provides the maximum value in the measure.

#### Minimum

provides the minimum value in the measure.

### Count

provides the number of nonmissing values in the measure.

# Manage Data Properties By Using the Data Pane

You can manage data properties for a specific data item by selecting the data item in the **Data** pane and then interacting with the properties table at the bottom of the **Data** pane.

For a selected data item, you can specify the following properties:

### Name

specifies the name of the data item.

#### Role

specifies whether the data item is a category, a measure, or a geography.

### Model type

specifies the type of data model for a measure or for a category with datetime data. Select whether the data model is continuous or discrete.

The model type that you specify determines the type of data filters that you can create for the data item.

**Note:** If you change the model type for a data item that is used in a filter, then the filter is removed.

### **Format**

specifies the data format for the data item.

See "Select a Numeric Format" on page 137 and "Select a Date or Time Format" on page 138 for information about specifying formats.

### Aggregation (for measures only)

specifies the method that is used to aggregate values for the measure. Select one of the following aggregation types:

### Sum

provides the sum of the values in the measure.

### Average

provides the average of the values in the measure.

### Maximum

provides the maximum value in the measure.

#### Minimum

provides the minimum value in the measure.

#### Count

provides the number of nonmissing values in the measure.

### **Select a Numeric Format**

Here are the steps to select a numeric format:

- 1 In the Data Properties window or in the property table in the **Data** pane, click the format for the data item. A window appears.
- Select the basic format type from the Format list.
- 3 Specify the **Width** parameter for the format. The width of the format specifies the maximum number of characters that a value can contain, including decimal points.
  - A preview of your format appears in the **Sample** field.
- 4 Specify the number of **Decimals** for the format. The **Decimals** value specifies the number of digits that appear to the right of the decimal place.
  - A preview of your format appears in the **Sample** field.
- Click **OK** to apply your format.

Note: You can restore the default format by clicking Reset to Default.

### **Select a Date or Time Format**

Here are the steps to select a date or time format:

- 1 In the Data Properties window or in the property table in the **Data** pane, click the format for the data item. A window appears.
- 2 Select the basic format type from the **Format** list.
- **3** If necessary, select a more specific format from the **Sample** list. The format names also represent sample values for the format.
- 4 Click **OK** to apply your format.

**Note:** You can restore the default format by clicking **Reset to Default**.

**Note:** Time and datetime values in the explorer ignore daylight-saving time.

### **Show and Hide Data Items**

If your exploration contains a large number of data items, you might want to hide the items that you are not interested in.

Here are the steps to select which data items that are shown in the **Data** pane:

- 1 Select **Data** ▶ **Show or Hide Items** from the menu bar. The Show or Hide Items window appears.
- 2 Click Select All to select or deselect all of the data items, or click the check box beside each data item to select whether that data item is shown.
- 3 Click **OK** to apply your changes.

### **Sort Data Items**

To sort your data items in the **Data** pane, select and then select **Sort Items**. Select Ascending by Name or Descending by Name.

### **Group Data Items**

To group your data items in the **Data** pane, select ₹, and then select **Group Items**. Select one of the following grouping types:

### By First Letter

groups by the first letter of the data item name.

### By Data Type

groups by data type (date, number, or text).

### By Model Type

groups by model type (continuous or discrete).

### **Bv Role**

groups by data role (category, geography, hierarchy, measure, or aggregated measure).

### By Format

groups by data format (for example, \$CHAR, Numeric, Percent, or MMMYYY).

### By Aggregation

groups by the default aggregation (Sum, Average, Count, Minimum, or Maximum).

**Note:** The default grouping is **By Role**.

# **Assigning Colors for Category Values**

### **About Colors**

By default, the explorer assigns colors dynamically to category values for grouped visualizations. You can assign specific colors to your category values to ensure that the category values are always represented by a specific color.

### **Assign Colors for a Category**

Here are the steps to set the colors for a category:

- 1 Right-click on a category from the **Data** pane, and then select **Colors**. A color selection window appears.
- 2 For each category value to which you want to assign a color, select the value from the Choose drop-down list, and then click the color box to select a color. Click Apply to save your selection.
- 3 (Optional) To automatically assign persistent colors for all of the unassigned category values, click Assign remaining. Colors are assigned to all of the remaining category values. These colors are used consistently in all of your visualizations.
- 4 Click **OK** to apply your changes.

### **Reset Colors for a Category**

Here are the steps to reset the colors for a category:

- 1 Right-click on a category from the **Data** pane, and then select **Colors**. A color selection window appears.
- 2 Click Reset all to clear all of the color assignments for the category.
- 3 Click **OK** to apply your changes.

### **Assign a Color for a Specific Category Value**

Here are the steps to assign the color for a specific category value:

- 1 Within a grouped visualization, right-click on a data value, and then select **Change Color**.
- 2 Click the color box to select the color.
- 3 Click **OK** to apply the new color. This color value is used consistently for the selected category value in all of your visualizations.

# **Open a Different Data Source as a New Exploration**

To explore a different data source, create a new exploration by selecting File ▶ New **Exploration**, and then select the data source that you want to explore.

# **Change the Data Source for Your Exploration**

At any time, you can change the data source for your exploration. All of your visualizations, filters, and settings are applied to the new data source.

Here are the steps to change the data source for your exploration:

- **1** Select **Data** ▶ **Change Data Source**.
- **2** From the Change Data Source window, select the data source that you want to use.
  - Note: If any data items in your current data source do not exist in the new data source, then a message appears. Any data items that do not exist in the new data source are removed from your exploration. Any filters, ranks, or calculated items that are based on the removed items are also removed.
- 3 Click Open to open the new data source.

#### **Refresh Your Data Source**

At any time, you can refresh your data source to include the latest changes.

To refresh your data, select **Data** ▶ **Refresh Data**.

Your visualizations are automatically updated with the refreshed data.

# **Creating Calculated Data Items**

#### **About Calculated Data Items**

The explorer enables you to calculate new data items from your existing data items by using an expression.

**Note:** All calculations are performed on unaggregated data. The calculation expression is evaluated for each row in the data source before aggregations are performed. To perform calculations on aggregated data, see "Creating Aggregated Measures" on page 144.

In addition to performing mathematical calculations on numeric values, you can use calculated data items to create date and time values. For example, if your data contains separate categories for month, day, and year, then you can calculate a date value from each category.

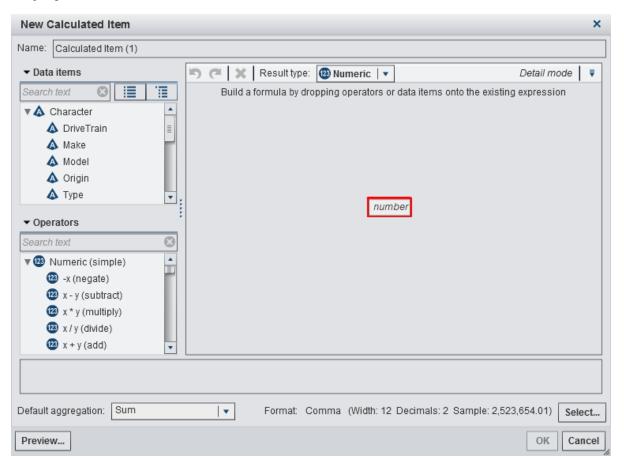
#### **Create a Calculated Data Item**

Here are the steps to create a calculated data item:

1 Select Data ▶ New Calculated Item.

#### The New Calculated Item window appears.

Display 21.1 The New Calculated Item Window



- Enter a **Name** for the calculated data item.
- Select the data type for the calculated data item from the **Result type** drop-down list.
- Build the expression for your calculated data item by dragging and dropping data items and operators onto the expression in the right pane. For each field in the expression, you can insert a data item, an operator, or a specific value.

**Note:** Derived data items are not supported for calculation expressions.

When you drag and drop data items and operators onto the expression, the precise location of the cursor determines where and how the new element is added to the expression. As you drag the new element over the expression, a preview appears, which displays how the expression would change if you drop the element at the current location.

For example, if your current expression is ( Profit / Revenue ), and you drag the x - y (subtract) operator over the open parenthesis symbol, then the expression changes to ( [number] - ( Profit / Revenue )). If you drag the operator over the division symbol, then the expression changes to ( Profit - Revenue ).

There are a large number of operator types available to perform mathematical functions, process datetime values, and evaluate logical processing such as IF clauses. See Appendix 1, "Operators for Calculated Data Items," on page 489.

- **5** When you are finished creating your expression, select the **Default aggregation** for the calculated data item, and then click **Select** to choose the data format.
- 6 Click **Preview** to see a preview of the calculated data item as a table. The table displays the values of the calculated item and any data items that are part of the calculation expression.
- 7 Click **OK** to create the new calculated data item. The new data item appears in the **Data Items** pane.

# **Creating Aggregated Measures**

# **About Aggregated Measures**

Aggregated measures enable you to calculate new data items by using aggregated values. For example, you might want to calculate a company's profits by subtracting expenses from revenues.

Note: To calculate data items by using unaggregated values, see "Creating Calculated Data Items" on page 142.

Aggregations are evaluated as part of the calculation expression. For each data item in your expression, you can select the aggregation type and the context for the aggregation.

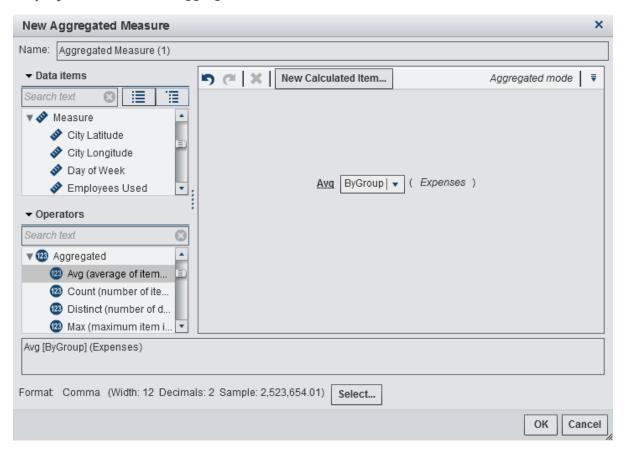
## **Create an Aggregated Measure**

Here are the steps to create an aggregated measure:

Select Data ▶ New Aggregated Measure.

The New Aggregated Measure window appears.

**Display 21.2** The New Aggregated Measure Window



- **2** Enter a **Name** for the aggregated measure.
- 3 Build the expression for your aggregated measure by dragging and dropping data items and operators onto the expression in the right pane. For each field in the expression, you can insert a data item, an operator, or a specific value.

**Note:** You can create a new calculated item to use in the aggregated measure expression. Click **New Calculated Item** to create the new calculate item.

When you drag and drop items and operators onto the expression, the precise location of the cursor determines where and how the new element is added to the expression. As you drag the new element over the expression, a preview appears, which displays how the expression would change if you drop the element at the current location.

There are a large number of operator types available to perform mathematical functions and evaluate logical processing such as IF clauses. See Appendix 1, "Operators for Calculated Data Items," on page 489.

- 4 For each data item in your expression, select an aggregation type. By default, **Sum** is used for measures and **Distinct** is used for categories. To select a new aggregation type, drag and drop an aggregated operator from the **Operators** list onto the aggregation type in the expression. See Appendix 1, "Operators for Calculated Data Items," on page 489 for a list of the aggregated operators that are available.
- **5** For each aggregation in your expression, select the aggregation context. A drop-down list beside each aggregation enables you to select one of the following context values:

#### **ByGroup**

calculates the aggregation for each subset of the data item that is used in a visualization. For example, in a bar chart, an aggregated measure with the **ByGroup** context calculates a separate aggregated value for each bar in the chart.

#### ForAll

calculates the aggregation for the entire data item (after filtering). For example, in a bar chart, an aggregated measure with the ForAll context uses the same aggregated value (calculated for the entire data item) for each bar in the chart.

By using the **ForAll** and **ByGroup** contexts together, you can create measures that compare the local value to the global value. For example, you might calculate the difference from mean by using an expression like the following:

```
Avg ByGroup(X) - Avg ForAll(X)
```

- 6 When you are finished creating your expression, click **Select** to choose the data format.
- 7 Click **OK** to create the new aggregated measure. The new data item appears in the Data Items pane.

# **Support for Aggregated Measures**

Aggregated measures can be used in the following visualization types:

- **Automatic Chart**
- Crosstab
- Bar Chart
- Bubble Plot (grouped bubble plots only)
- Line Chart
- Treemap
- Geo Map

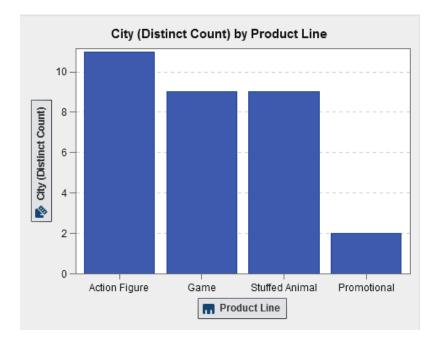
# **Using Distinct Counts**

#### **About Distinct Counts**

You can derive the distinct count of a category or a date as a new aggregated measure. The aggregated measure does not contain data values in itself, but when it is used in a visualization, it displays the number of distinct values for the data item on which it is based.

For example, you might derive the distinct count of a category that contains city names. If you create a bar chart of the aggregated measure and a category that contains product lines, then the bar chart shows the number of cities where each product line is produced.

Figure 21.1 A Bar Chart with a Derived Distinct Count



# **Derive the Distinct Count for a Category or** Date

To derive the distinct count for a category or date, right-click on a category or date in the Data pane, and then select Derive Distinct Count. The derived measure appears automatically in the **Data** pane. The name of the aggregated measure is the same as the category or date on which it is based, with the suffix "(Distinct Count)."

# **Support for Aggregated Measures**

Aggregated measures can be used in the following visualization types:

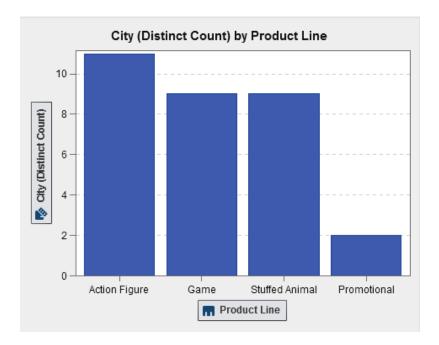
- **Automatic Chart**
- Crosstab
- **Bar Chart**
- Bubble Plot (grouped bubble plots only)
- Line Chart
- Treemap
- Geo Map

# **Explore Distinct Values in a Visualization**

For bar charts, line charts, treemaps, and geomaps, you can right-click on a data point in the visualization, and then select **Explore Distinct Values**. When you explore the distinct values, a new bar chart is created. The new bar chart displays the values and the frequency of each value.

For example, you might use a derived measure to create a bar chart that displays the number of cities where each product line is produced:

Figure 21.2 Bar Chart of Cities by Product Line



Then, you might want to explore the distinct values for City where Promotional items are produced. By right-clicking on the bar for Promotional, and then selecting **Explore Distinct Values**, you get a new bar chart that contains the cities where promotional items are produced and the frequency of data for each city.

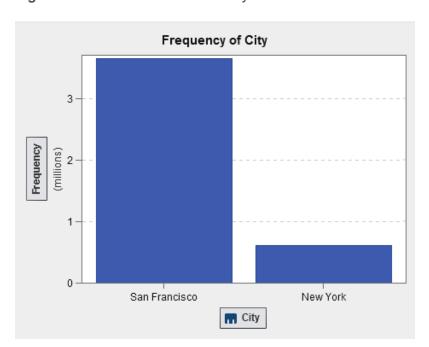


Figure 21.3 Distinct Values of City for the Promotional Product Line

# **Using Percentages of Total**

# **About Percentages of Total**

You can derive the percentage of the total for a measure as a new aggregated measure. The aggregated measure does not contain data values in itself, but when it is used in a visualization, it displays the percentage of the total value for the measure on which it is based.

Note: The percentage of total is relative to the subset of data that is selected by your filters and ranks.

For example, you might derive the percentage of the total for a measure that contains revenue values. If you create a bar chart of the aggregated measure and a category that contains product lines, then the bar chart shows the percentage of total revenue for each product line.

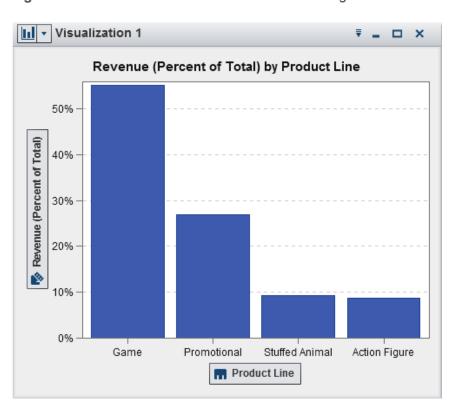


Figure 21.4 A Bar Chart with a Derived Percentage of Total

# **Derive the Percentage of Total for a Measure**

To derive the percentage of the total for a measure, right-click on a measure in the **Data** pane, and then select **Derive Percent of Total**. The derived measure appears automatically in the **Data** pane. The name of the aggregated measure is the same as the measure on which it is based, with the suffix "(Percent of Total)."

# **Support for Aggregated Measures**

Aggregated measures can be used in the following visualization types:

- Automatic Chart
- Crosstab
- Bar Chart

- Bubble Plot (grouped bubble plots only)
- Line Chart
- Treemap
- Geo Map

# **Edit a Calculated or Aggregated Data** Item

To edit a duplicate data item, an aggregated measure, a calculated data item, or a derived data item, select the item in the **Data** pane, and then select **Data** ▶ **Edit** Selected Item from the main menu.

# **Delete a Calculated or Aggregated Data** Item

To delete a duplicate data item, an aggregated measure, a calculated data item, or a derived data item, right-click on the data item in the **Data** pane, and then select **Delete**.

Note: If the deleted data item is used by a visualization, then a confirmation message appears. The deleted item is removed from the visualization.

**Note:** You cannot delete a data item that is included in a hierarchy. You must remove the data item from any hierarchies before you can delete it.

# **Duplicate a Data Item**

Duplicate data items enable you to use multiple copies of a measure that have different data formats or default aggregations. For example, you might want to use the Minimum and Maximum aggregations for a data item in the same visualization.

Here are the steps to duplicate a data item:

- 1 Right-click on a measure in the **Data** pane, and then select **Duplicate Data Item**. The New Duplicate Item window appears.
  - **Note:** You can also invoke the New Duplicate Item window by dragging and dropping the same data item onto a visualization more than once.
- 2 Enter a Name, a Format, and a Default aggregation for the duplicate data item.
- 3 Click OK to create the duplicate data item.

# **Define a Geography Data Item**

# **About Geography Data Items**

A geography data item is a category whose values are mapped to geographical locations or regions. Geography data items can be used with geo maps to visualize your data on a geographic map.

For example, if your data source contains a CountryName column that identifies countries, then you might create a geography data item for CountryName by using the predefined geographic role, **Countries**. See "Define a Geography Data Item By Using a Predefined Geographic Role" on page 155.

You might also create a customized geography data item to identify geographic information that is specific to your organization (for example, sales regions, warehouse

locations, oil platforms, and so on). See "Define a Geography Data Item By Using a Custom Geographic Role" on page 156.

**Note:** For predefined geographic roles, the values of your geography data items must match the lookup values that are used by SAS Visual Analytics. To view the lookup values, see http://support.sas.com/va62geo.

# **Define a Geography Data Item By Using a Predefined Geographic Role**

Here are the steps to define a geography data item by using a predefined geographic role:

- 1 In the **Data** pane or in the Data Properties window, locate a category that contains geographic information.
- 2 Change the role for the category to **Geography**. The Geography Role window appears.
- **3** Select the predefined geographic role for your category:

#### Countries

specifies country names.

#### **US States**

specifies the names of states and territories in the United States.

#### US States Abbreviated

specifies the two-letter postal codes for states and territories in the United States.

#### **US ZIP Codes**

specifies five-digit ZIP codes for the United States.

4 Click **OK** to apply your changes.

# Define a Geography Data Item By Using a Custom Geographic Role

Here are the steps to define a geography data item by using a custom geographic role:

- 1 In the **Data** pane or in the Data Properties window, locate a category that contains geographic information.
- **2** Change the role for the category to **Geography**. The Geography Role window appears.
- **3** Select **Custom**, and then specify the following:

#### Latitude

specifies a measure from your current data source that contains the latitude (Y) coordinate values for the geographic role that you want to define.

#### Longitude

specifies a measure from your current data source that contains the longitude (X) coordinate values for the geographic role that you want to define.

#### **Coordinate Space**

specifies the coordinate space (coordinate system) that is used to project the longitude and latitude coordinate values.

4 Click **OK** to apply your changes.

# 

# Working with Visualizations

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# **Overview of Visualizations**

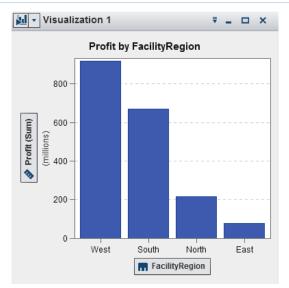
#### **About Visualizations**

SAS Visual Analytics Explorer (the explorer) displays data by using visualizations. A visualization is an interactive visual representation of your data. A visualization can be a table, a crosstab, a chart, a histogram, or a geographic map.

# **Visualization Types**

You can assign any of the following types to your visualizations:

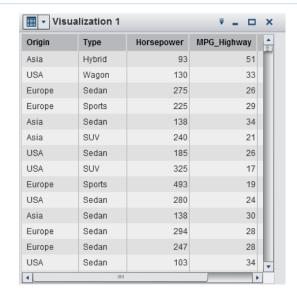
#### Automatic Chart



Automatically selects the chart type based on the data that is assigned to the visualization. When you are first exploring a new data set, automatic charts give you a quick view of the data.

For more information, see "Working with Automatic Charts" on page 186.

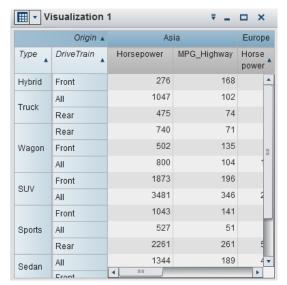
#### Table



Displays the data as a table. Tables enable you to examine the raw data for each observation in the data source. You can rearrange the data columns and apply sorting.

For more information, see "Working with Tables" on page 194.

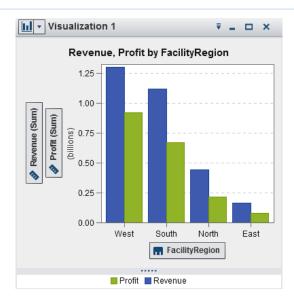
#### Crosstab



Displays the data as a crosstab. Crosstabs enable you to examine the data for intersections of hierarchy nodes or category values. You can rearrange the rows and columns and apply sorting. Unlike tables, crosstabs display aggregated data.

For more information, see "Working with Crosstabs" on page 195.

#### **Bar Chart**

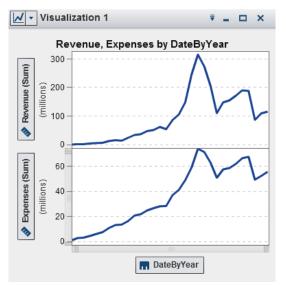


Displays the data as a bar chart. Bar charts are useful for comparing data that is aggregated by the distinct values of a category.

A bar chart consists of vertical bars or horizontal bars. You can apply grouping and create lattices.

For more information, see "Working with Bar Charts" on page 187.

#### Line Chart

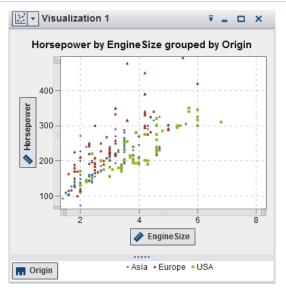


Displays the data as a line chart. A line chart is useful for data trends over time.

You can apply grouping and create lattices.

For more information, see "Working" with Line Charts" on page 190.

#### Scatter Plot



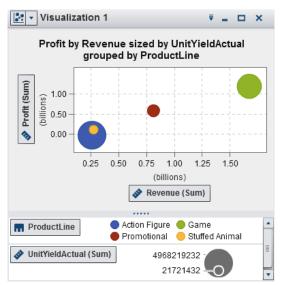
Displays the data as a scatter plot. Scatter plots are useful to examine the relationship between numeric data items.

In a scatter plot, you can apply statistical analysis with correlation and regression. Scatter plots support grouping.

When you apply more than two measures to a scatter plot, a scatter plot matrix compares each pairing of measures.

For more information, see "Working" with Scatter Plots" on page 197.

#### Bubble Plot

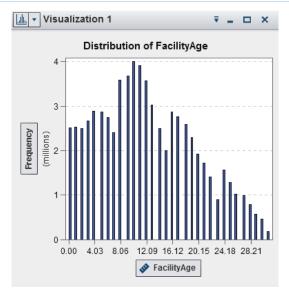


Displays the data as a bubble plot. A bubble plot displays the relationships among at least three measures. Two measures are represented by the plot axes, and the third measure is represented by the size of the plot markers.

You can apply grouping and create lattices. By assigning a datetime data item to the plot, you can animate the bubbles to display changes in the data over time.

For more information, see "Working with Bubble Plots" on page 199.

#### Histogram

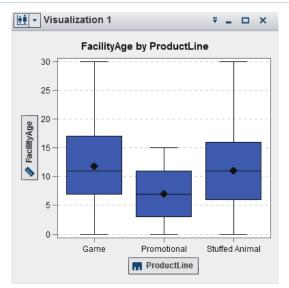


Displays the data as a histogram. A histogram displays the distribution of values for a single measure.

You can select the bar orientation, and you can select whether the values are displayed as a percentage or as a count.

For more information, see "Working with Histograms" on page 203.

#### Box Plot

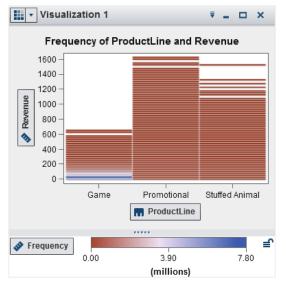


Displays the data as a box plot. A box plot displays the distribution of values for a single measure using a box and whiskers. The size and location of the box indicate the range of values that are between the 25th and 75th percentile. Additional statistical information is represented by other visual features.

You can create lattices, and you can select whether the average (mean) value and outliers are displayed for each box.

For more information, see "Working" with Box Plots" on page 204.

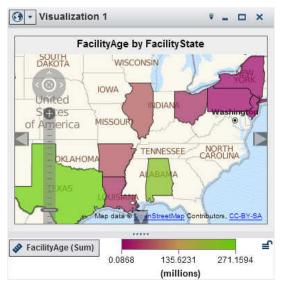
#### Heat Map



Displays the data as a heat map. A heat map displays the distribution of values for two data items using a table with colored cells. If you do not assign a measure to the Color data role, then a cell's color represents the frequency of each intersection of values. If you assign a measure to the Color data role, then a cell's color represents the measure value of each intersection of values.

For more information, see "Working" with Heat Maps" on page 207.

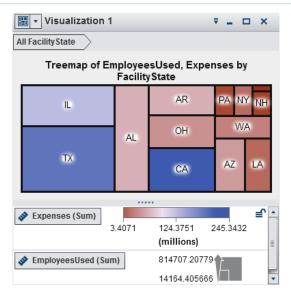
#### Geo Map



Displays the data as a geo map. A geo map displays your data as an overlay on a geographic map. You can display your data either as bubbles or as colored regions.

For more information, see "Working with Geo Maps" on page 210.

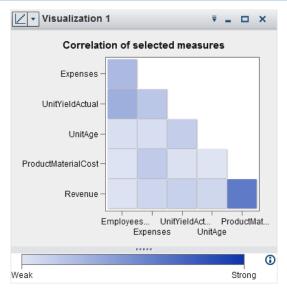
#### Treemap



Displays the data as a treemap. A treemap displays your data as a set of rectangles (called tiles). Each tile represents a category value or a hierarchy node. The size of each tile represents either the frequency of the category or the value of a measure. The color of each tile can represent the rectangles can indicate the value of an additional measure.

For more information, see "Working with Treemaps" on page 212.

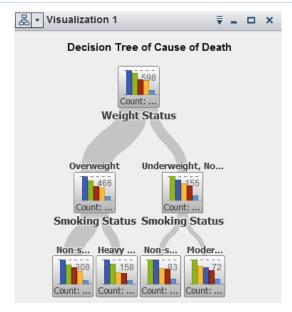
#### Correlation Matrix



Displays the data as a correlation matrix. A correlation matrix displays the degree of correlation between measures as a series of colored rectangles. The color of each rectangle indicates the strength of the correlation.

For more information, see "Working with Correlation Matrices" on page 214.

#### Decision Tree



Displays the data as a decision tree. A decision tree displays a series of nodes as a tree, where the top node is the target data item, and each branch of the tree represents a split in the values of a predictor data item.

The splits enable you to see which values of the predictor data item correspond to different distributions of values in the target data item.

For more information, see "Working with Decision Trees" on page 216.

# **Working with Visualizations**

#### **Create a New Visualization**

To create a new visualization, click on the toolbar, or select **Visualization** ▶ **New** from the menu bar.

# **Manage Visualizations**

#### **Delete a Visualization**

To delete a visualization, click the × button on the visualization, or select **Visualization**• **Delete** from the menu bar to delete the selected visualization.

You can delete all of your visualizations by selecting View ▶ Delete All Visualizations.

### **Duplicate a Visualization**

To duplicate a visualization, select **Visualization** ▶ **Duplicate** from the main menu, or select the <sup>▼</sup> drop-down list from the visualization toolbar, and then select **Duplicate**.

The new visualization is named "Copy of *visualization-name*". You can enter a new name on the **Properties** tab.

#### **Show and Minimize Visualizations**

To minimize a visualization, click in the visualization that you want to minimize. The visualization appears in the dock pane at the bottom of the workspace.

To restore a visualization, click the name of the visualization in the dock pane.

You can select which visualizations are visible by using the Manage Visualizations window.

To minimize all visualizations, select **View** ▶ **Minimize All Visualizations** from the menu bar.

To show all visualizations, select **View** > **Show All Visualizations** from the menu bar.

#### Maximize a Visualization

To maximize a visualization to fill the entire workspace, click in the visualization that you want to maximize. To return the visualization to its normal size, click .

# **Arrange the Visualizations in the Workspace**

#### Move the Position of a Visualization

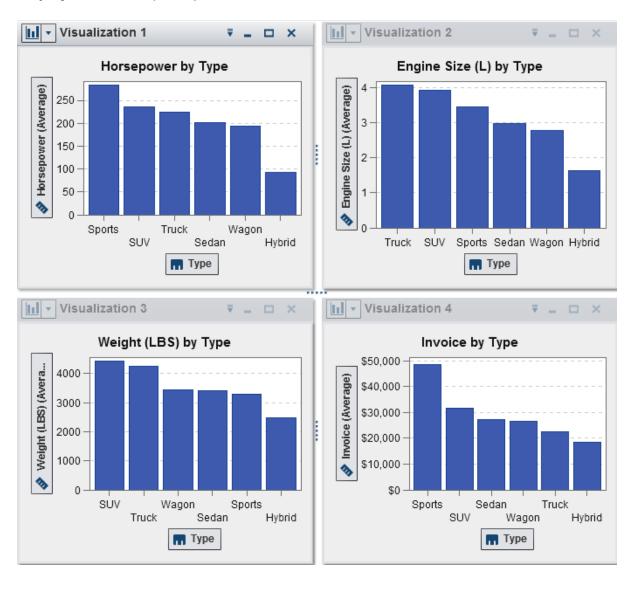
To move a visualization, drag and drop the title bar of the visualization on the location where you want to place the visualization.

When you drag and drop a visualization onto another visualization, the placement of the visualization is determined by the edge that is closest to the drop point.

Suppose your workspace contains two visualizations named "A" and "B". If you drag A to the left edge of B, then A is placed to the left of B. If you drag A to the bottom edge of B, then A is placed below B.

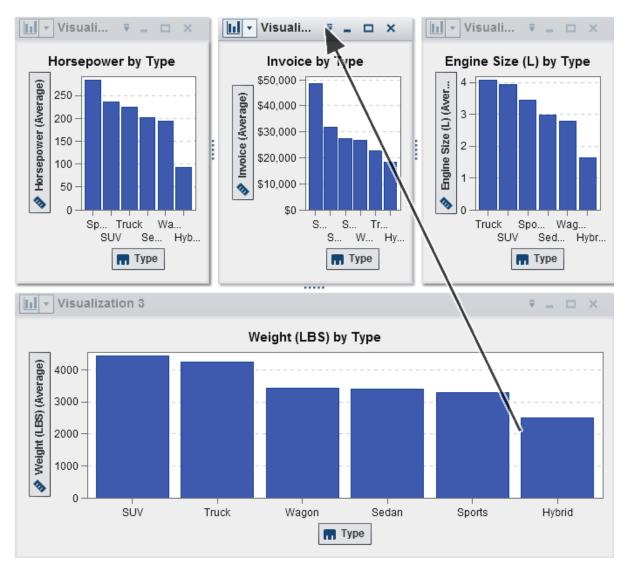
#### Display 22.1 shows an example layout with four visualizations.

**Display 22.1** Example Layout with Four Visualizations



Display 22.2 shows the effect of moving Visualization 4 to the right edge of Visualization 1.

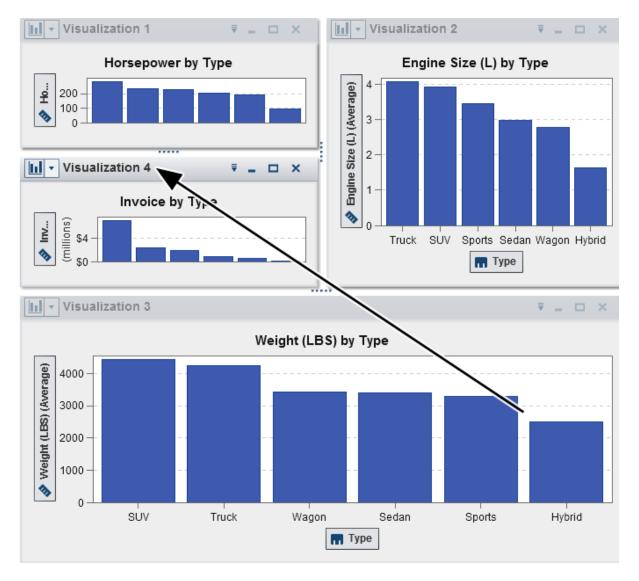
Display 22.2 Example Layout After Moving 4 to the Right Edge of 1



When your workspace contains visualizations in multiple rows, if you drag and drop a visualization onto the bottom edge or top edge of a visualization, then the target visualization and the moved visualization split the space that was previously occupied by the target visualization.

Display 22.3 on page 172 shows the effect of moving a visualization to the bottom edge of another visualization.

Display 22.3 Example Layout After Moving 4 to the Bottom Edge of 1



#### **Resize a Visualization**

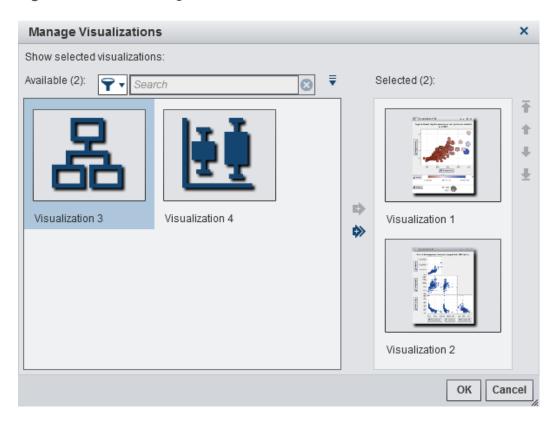
To resize a visualization in your workspace, drag the resizing tab ····· at the bottom edge or the right edge of the visualization that you want to resize.

# **Using the Manage Visualizations Window**

The Manage Visualizations window enables you to manage all of your visualizations together. Each visualization is represented by a thumbnail image or by an icon of the visualization type if the visualization has not been displayed in the current session.

To open the Manage Visualizations window, select View ▶ Manage Visualizations from the main menu bar.

Figure 22.1 The Manage Visualizations Window



The Manage Visualizations window enables you to perform the following tasks:

Task	Action
Add visualizations to the selection list. (Restore visualizations.)	Select a visualization from the <b>Available</b> list, and then click , or click to add all of the available visualizations.
Remove visualizations from the selection list. (Minimize visualizations.)	Select a visualization from the <b>Selected</b> list, and then click , or click to remove all of the visualizations.
Change the order of the selected visualizations.	In the <b>Selected</b> list, drag and drop the visualizations in the order that you want, or select a visualization and click the up and down arrows to move it.
Search the available visualizations.	In the <b>Search</b> field, enter a string to search for. A visualization matches the search if the string appears anywhere in the visualization name.  Only the matching visualizations appear in the <b>Available</b> list.
Filter the available visualizations.	Click , and then select your filter parameters. You can filter either on the visualization type or on the data items that are used in each visualization.  Only the matching visualizations appear in the <b>Available</b> list.
Rename a visualization.	Right-click on any visualization, and then select <b>Rename</b> . Enter a new name, and then click <b>OK</b> .
Delete a visualization.	Right-click on any visualization, and then select <b>Delete</b> .

# **Manage Visualization Comments**

#### **About Visualization Comments**

The explorer enables you to create and share comments about your visualizations.

In addition to visualization comments, you can create comments for the current visual exploration. See "Exploration Comments" on page 130.

#### **View Visualization Comments**

To view the comments for a visualization, select the **Comments** tab from the right pane. The comments are grouped by topic.

If there are many comments in a topic, then only the most recent comments are displayed. Click **Show All Comments** to view all of the comments for a topic.

To search the comments, enter a search term in the **Search within comments** field.

#### **Create a Visualization Comment**

#### **Create a Comment under an Existing Topic**

To create a comment under an existing topic:

- Enter your comment text in the **Respond to topic** field that is beneath the topic that you want to comment on.
- 2 (Optional) Click **l** to attach a file to the comment.
- 3 When you are finished with the comment, click **Post**. Your comment is saved and shared immediately.

#### **Create a Comment under a New Topic**

To create a comment under a new topic:

- 1 Enter the name of the topic in the **Enter a topic name** field.
- **2** Enter your comment text in the **Enter a comment** field.
- 3 (Optional) Click to attach a file to the comment.
- **4** When you are finished with the comment, click **Post**. Your comment is saved and shared immediately.

#### **Edit a Visualization Comment**

To edit a comment, select the comment that you want to edit, and then click **Edit**.

**Note:** To edit other users' comments, you must belong to the **Comments:Administrator** role.

#### **Delete a Visualization Comment**

To delete a comment, select the comment that you want to delete, and then click **Delete**.

Note: To delete comments, you must belong to the Comments: Administrator role.

# **Managing Visualization Data Roles**

#### Add a Data Item

For a visualization to display data, you must assign data items to it. You can assign data items to a visualization by performing any of the following actions:

Drag and drop the data item onto the center of the visualization. The data item is assigned to a role automatically. If the visualization already has data items assigned to the required roles, then you can choose how to assign the new data item.

- Drag and drop the data item onto a **Measure** or **Category** button in the visualization to assign the data item to a specific data role.
- From the visualization toolbar, select the ₹ drop-down list, and then select Add Category or Add Measure.
- Use the **Roles** tab in the right pane. Either drag and drop a data item onto a role, or select Add from the drop-down list, and then select a data item.

Each visualization requires a minimum number of each type of data item. The following table lists the requirements for each visualization:

 Table 22.1
 Required Data Items for Visualizations

Visualization Type	Requirements
Automatic Chart	one data item of any type
Table	one data item of any type (except aggregated measure)
Crosstab	one data item of any type
Bar Chart	one category or hierarchy
Line Chart	one category or hierarchy
Scatter Plot	one measure
Bubble Plot	three measures
Histogram	one measure
Box Plot	one measure
Heat Map	two data items of any type (except aggregated measure)
Geo Map	one geography
Treemap	one category or hierarchy

Visualization Type	Requirements
Correlation matrix	two measures
Decision tree	two data items of any type (except aggregated measure)

## Replace a Data Item

You can replace a data item by using any of the following methods:

- Drag and drop the new data item from the **Data** pane onto the data item in the visualization that you want to replace.
- Right-click on the data item that you want to replace in either the visualization or on the **Roles** tab, and then select **Replace** item-name ▶ new-item-name.

### **Remove a Data Item**

You can remove a data item by using any of the following methods:

- Drag and drop the data item from the visualization onto the Data pane.
- Select the **†** drop-down list from the visualization toolbar, and then select **Remove item-name**.
- Right-click on the data item that you want to delete in either the visualization or on the Roles tab, and then select Remove item-name.

### **Switch Data Roles**

To switch the data items that are assigned to two roles, drag and drop one data item onto another data item either by using the buttons in the visualization or by using the fields on the **Roles** tab.

For example, you can switch the axes of a scatter plot by dragging the measure on the X axis to the measure on the Y axis.

## **Working with Filters**

You can use the **Filters** tab to subset the data in your visualizations. See Chapter 23, "Working with Filters," on page 223.

## **Ranking Data**

## **Overview of Ranking**

You can use the Ranks tab to create ranks to subset the data in your visualizations. A rank selects either the top (greatest) or the bottom (least) aggregated value for a category.

A rank selects values for a category based on either the frequency of the category values or the aggregated value of a measure.

For example, you might create a rank of the top 10 countries by frequency to select the 10 countries that are most represented in your data source. As another example, you might create a rank of the top 10 countries by population to select the 10 countries with the greatest population.

**Note:** If the category for the rank is part of a hierarchy that is used in the current visualization, then the rank can be edited only when the hierarchy is drilled to the level of the rank category.

### **Create a New Rank**

To create a rank:

1 From the Data pane, select the data item that you want to use as the base of the rank. You can select any category or geography data item, regardless of whether it is assigned to the current visualization.

- 2 Either right-click on the data item, and select **Add as Rank**, or drag and drop the data item onto the **Ranks** tab.
- **3** Set the parameters for the rank:
  - a Select the type of rank from the drop-down list. **Top** specifies that the rank selects the greatest value. **Bottom** specifies that the rank selects the least value.
  - **b** Specify the number of values for the rank. For example, if you specify 5, and you select **Top** as the rank type, then the rank selects the five greatest values.
  - From the **By** drop-down list, select the measure that is used to create the rank. You can either select any measure, or select **Frequency** to use the frequency of the rank category.

**Note:** If you select a measure that is used in the current visualization, then the rank uses the same aggregation for the measure that is used by the current visualization.

**d** (Optional) Select **Ties** to include ties in the rank.

If you select **Ties**, then the rank selects as many values as necessary to include all of the ties. If you do not select **Ties**, then the rank selects only the number of values that are specified by the rank parameters.

For example, if your rank selects the top three values, but there are five values tied for the greatest value, then the number of values that are selected by the rank depends on the **Ties** option. If you select **Ties**, then the rank includes all five of the tied values. If you do not select **Ties**, then the rank includes only three of the tied values.

**Note:** If the ranking does not select all of the tied values, or if the number of tied values exceeds the maximum that is set by your administrator, then a message appears.

**Note:** By default, your filter changes are applied automatically to the current visualization. To apply multiple changes together, deselect **Auto**, and then click **Apply** when you are ready to apply your filter changes.

### **Delete a Rank**

To delete a rank, click \* on the rank on the **Ranks** tab.

## **Working with Visualization Data Ranges** and Color Gradients

## **Support for Customized Data Ranges and Color Gradients**

The following visualization types enable you to customize the data range and color gradient:

- Heat map
- Geo map (with the **Color** role assigned)
- Bubble plot (with continuous data assigned to the **Color** role)
- Treemap (with the **Color** role assigned)

## **Specify a Custom Color Gradient**

To specify a custom color gradient:

- 1 Right-click on the color gradient in the legend, and then select Configure Color Gradient.
- 2 From the Select Color Gradient window, select a color gradient from the Color gradient drop-down list.
- 3 Click **OK** to apply the new color gradient.

## **Specify a Custom Data Range**

To specify a custom data range:

- 1 Right-click on the color gradient in the legend, and then select **Configure Color**Gradient.
- 2 From the Select Color Gradient window, deselect Automatically adjust color range to data.
- 3 In the **Lower** field, specify the lower bound for the data range.
- 4 If the selected color gradient uses three colors, specify the inflection point of the gradient in the **Inflection** field, or select **Use midpoint** to use the midpoint between the lower and upper values as the inflection point. The inflection point is the point for the middle color in a three-color gradient.
- 5 In the **Upper** field, specify the upper bound for the data range.
- 6 Click **OK** to apply the new color gradient.

# Share a Color Gradient and Data Range between Visualizations

To share data ranges and color gradients between visualizations, all of the visualizations must support customized data ranges. See "Support for Customized Data Ranges and Color Gradients" on page 181.

To share a data range and color gradient between visualizations:

1 If the data range has not been customized, then right-click on the legend for the color gradient and data range that you want to share, and then select **Lock Data Range**.

- 2 Right-click on the legend for the color gradient and data range that you want to share, and then select **Transfer Configuration**. The Select compatible visualizations window appears.
- 3 Select the visualizations that you want to share the color gradient and data range with. The visualizations are sorted based on their similarity to the source visualization. Visualizations that use the same data items and visualizations that are the same type are shown at the top of the list.
- 4 When you are finished, click **OK** to apply the color gradient and data range to all of the selected visualizations.

## **Remove Customized or Shared Color Data** Ranges

To remove a customized or shared data range from a visualization, right-click on the legend, and select Remove Custom Data Range.

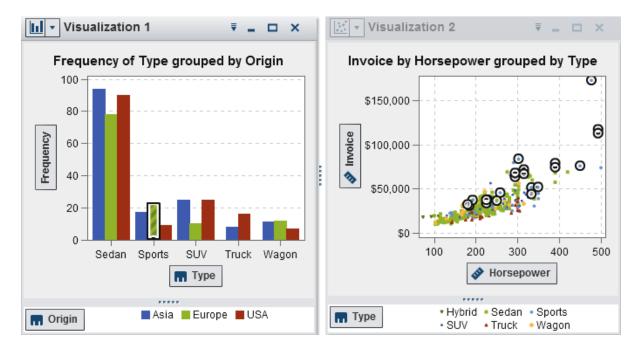
## **Working with Data Brushing**

## **Overview of Data Brushing**

Data brushing is a feature of some visualizations that enables you to select data values in one visualization and highlight the corresponding data values in all of your other visualizations.

For example, you might have a bar chart and a scatter plot in your exploration. If you enable data brushing, and you select a bar in the bar chart, then the markers in the scatter plot that correspond to the selected value in the bar are highlighted.

Figure 22.2 Data Brushing Example



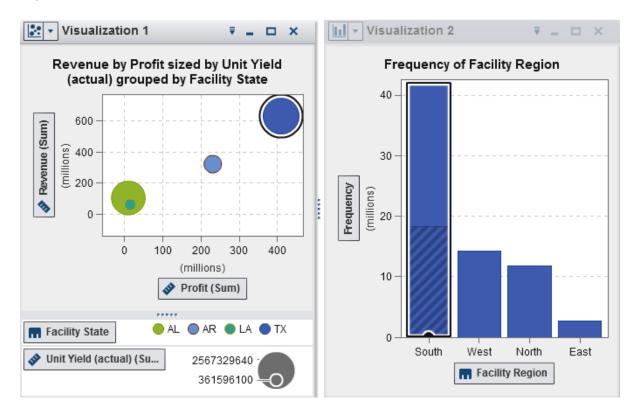
The following visualization types support data brushing:

- Bar chart
- Line chart
- Scatter plot
- Bubble plot (if the Group role is assigned)
- Histogram
- Heat map (if categories are assigned to both axes)
- Geo map
- Treemap

For histograms and for bar charts of frequency that are not grouped or latticed, data brushing can indicate the portion of a bar that corresponds to the brushed data. The bar is highlighted and then partially shaded to indicate the corresponding portion. The value for the shaded portion of the bar is included in the data tip for the bar.

In Figure 22.3, a selection in a bubble plot highlights a portion of the corresponding bar in a bar chart.

Figure 22.3 Data Brushing with Partial Shading



For bar charts that have a measure assigned or that are grouped or latticed, the entire bar is highlighted.

## **Enable Data Brushing**

To enable data brushing, select View ▶ Data Brushing.

## **Select Values in a Visualization**

You can select values in your visualization by using any of the following methods:

Click the data values. This is most useful for bar charts, histograms, and treemaps. To select multiple data values, hold down the Ctrl key while clicking each data value.

- Click and drag to select data values in a rectangular region. This is most useful for scatter plots and heat maps.
- Select data values in the table view for the visualization. Press Shift+click to select multiple adjacent values, or press Ctrl+click to select or deselect individual values.

## **Working with Automatic Charts**

Automatic charts display different types of charts automatically based on the data items that are assigned to the chart.

The type of chart can be any of the following:

Table 22.2 Automatic Chart Types

Data Items	Chart Type
One measure	Histogram
One category	Bar chart
One aggregated measure	Crosstab
One datetime category and any number of other categories or measures	Line chart
One geography and up to two measures	Geo map
One geography and three or more measures	Bar chart
Two measures	Scatter plot or heat map
Three or more measures	Scatter plot matrix or correlation matrix
One or more categories and any number of measures and geographies	Bar chart

Note: The Roles tab for an automatic chart always contains Categories and Measures. To set advanced data roles such as grouping and lattices, change the visualization type to select the specific chart type that you want. For example, if your automatic chart shows a bar chart, then change the type to **Bar Chart** to enable advanced data role settings.

## **Working with Bar Charts**

### **About Bar Charts**

A bar chart displays data by using bars. The height of each bar represents the value.

## **Specify Properties for a Bar Chart**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

## Show grid lines

displays grid lines for each tick on the response axis.

#### **Bar direction**

specifies whether the bars are vertical or horizontal.

## Frequency

specifies whether the frequency is displayed as a count (Count) or as a percentage (Percent).

**Note:** The frequency values are based on the data that is shown in the visualization (after filters and other data selections have been applied).

**Note:** This option has no effect if a measure is assigned to the visualization.

### Grouping style

specifies how grouped data is displayed. If you select **Stack**, then the values of the grouping variable are displayed as segments of each bar. If you select **Cluster**, then each value of the grouping variable is displayed as a separate bar.

**Note:** This option is disabled if no data item is assigned to the **Group** role.

### **Measure layout**

specifies whether the measures share a single response axis (**Shared axis**) or have separate response axes for each measure (**Separate axes**).

**Note:** The **Measure layout** option is disabled if your visualization contains exactly one measure.

#### Overview

specifies whether the chart overview is enabled.

#### Show data values

shows the data values as text in the visualization.

**Note:** You can always view a data value as a data tip when you position the cursor over a data value.

#### Rotate axis labels

displays the category labels at an angle.

**Note:** The **Rotate axis labels** option has no effect when you select a horizontal bar orientation.

### **Data Roles for a Bar Chart**

The basic data roles for a bar chart are categories and measures. You can assign one category only, and the category values are plotted on the category axis. You can assign many measures, and the measure values are plotted on the response axis. If a bar

chart contains no measures, then the frequency of the category values is plotted on the response axis.

In addition to the basic data roles, you can assign these roles:

### Group

groups the data based on the values of the category data item that you assign. Depending on the value that you selected for the **Grouping style** property, the group values are shown as either individual bars or as segments of each bar.

**Note:** Grouping is not available if you assign multiple measures to the visualization.

#### Lattice columns

creates a lattice of charts with a column for each value of the category data item that you assign.

#### Lattice rows

creates a lattice of charts with a row for each value of the category data item that you assign.

### Sort Data Values

By default, a bar chart is sorted in descending order by the value of the first measure. To change the sorting, right-click on the data item that you want to sort on, and then select **Sort** ▶ [sort-method]. For a grouped bar chart, the data is sorted by the category values in alphabetical order.

**Note:** If the visualization contains a rank, then, by default, the data is sorted based on the values of the rank.

## **Working with Line Charts**

## **About Line Charts**

A line chart displays data by using a line that connects the data values. If you assign multiple measures to a line chart, then you can create separate Y axes for each measure.

## **Specify Properties for a Line Chart**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

## Show grid lines

displays grid lines for each tick on the response axis.

### Frequency

specifies whether the frequency is displayed as a count (**Count**) or as a percentage (**Percent**).

**Note:** The frequency values are based on the data that is shown in the visualization (after filters and other data selections have been applied).

**Note:** This option has no effect if a measure is assigned to the visualization.

### Measure layout

specifies whether the measures share a single response axis (Shared axis) or have separate response axes for each measure (Separate axes).

**Note:** The **Measure layout** option is disabled if your visualization contains exactly one measure.

#### Overview

specifies whether the chart overview is enabled.

### Show markers

shows markers for the data points in the visualization.

#### Show data values

shows the data values as text in the visualization.

Note: You can always view a data value as a data tip when you position the cursor over a data value.

#### Rotate axis labels

displays the category labels at an angle.

### **Duration** (if forecasting is enabled)

specifies the number of data intervals to forecast.

**Note:** This option is available only if forecasting is enabled for the visualization.

### **Data Roles for a Line Chart**

The basic data roles for a line chart are categories and measures. You can assign one category only, and the category values are plotted on the category axis. You can assign many measures, and the measure values are plotted on the response axis. If the line chart contains no measures, then the frequency of the category values is plotted on the response axis.

In addition to the basic data roles, you can assign these roles:

### Group

groups the data based on the values of the category data item that you assign. A separate line is created for each data value.

**Note:** Grouping is not available if you assign multiple measures to the visualization.

#### Lattice columns

creates a lattice of charts with a column for each value of the category data item that you assign.

#### Lattice rows

creates a lattice of charts with a row for each value of the category data item that you assign.

### **Underlying factors**

if forecasting is enabled, adds additional measures to the forecast as underlying factors. The forecasting model evaluates the additional measures to determine whether they contribute to the accuracy of the forecast. If the additional measures do not increase the accuracy of the forecast, then they are not used. If the additional measures do increase the accuracy of the forecast, then the forecast line is adjusted, and the confidence bands are narrowed.

The measures that you add as underlying factors can also be used in a scenario analysis.

**Note:** Underlying factors are available only if your line chart contains a single measure in the **Measures** role.

## **Sort Data Values**

By default, for category data, a line chart is sorted in descending order by the value of the first measure. To change the sorting, right-click on the data item that you want to sort on, and then select **Sort \rightarrow** [sort-method].

**Note:** If the visualization contains a rank, then, by default, the data is sorted based on the values of the rank.

**Note:** Sorting is not available if a datetime data item is assigned to the **Category** role.

## **Forecasting**

## **About Forecasting**

Forecasting uses the statistical trends in your data source to predict future data values. Forecasting is available only if a date, time, or datetime data item is assigned to the visualization.

In addition to the predicted future data values, the forecast displays a confidence band. For more information, see "Forecasting" on page 264.

## **Enable Forecasting**

To add forecasting to a line chart, select the \* drop-down list from the visualization toolbar, and then select Show Forecast.

**Note:** The line chart must contain a date, time, or datetime data item to apply forecasting.

On the **Properties** tab for the line chart, you can adjust the number of data values to predict by using the **Duration** option.

On the **Roles** tab, you can add additional measures to the forecast as **Underlying** factors. The forecasting model evaluates the additional measures to determine whether they contribute to the accuracy of the forecast. If the additional measures do not increase the accuracy of the forecast, then they are not used. If the additional measures do increase the accuracy of the forecast, then the forecast line is adjusted, and the confidence bands are narrowed.

The measures that you add as underlying factors can also be used in a scenario analysis. For more information, see "Apply Scenario Analysis to a Forecast" on page 266.

## **Working with Tables**

### **About Tables**

A table displays data as text. The data value for each measure or category that is assigned to the table is displayed as a column. The data values in the table are not aggregated.

**Note:** For very large data sources, the table visualization displays only the first two billion (2,147,483,647) rows.

**Note:** If you sort the table, then the table displays only the first 5,000 sorted rows.

## **Specify Properties for a Table**

On the **Properties** tab, you can specify the following option:

#### Name

specifies the name of the visualization.

## **Data Roles for a Table**

The basic data role for a table is a column. A column can be any type of data item. You can add any number of columns to a table.

## **Managing Columns**

### **Sort Columns**

To sort the table by a column, click on the column heading. An arrow appears in the column heading to indicate the sorting. If the arrow points upward, then the sort is ascending. If the arrow points downward, then the sort is descending.

**Note:** If you sort the table, then the table displays only the first 5,000 sorted rows.

## **Rearrange Columns**

To rearrange your columns, drag and drop the column headings.

### **Resize Columns**

To resize a column, click, and then drag and drop the left or right edge of a column heading.

## **Working with Crosstabs**

### **About Crosstabs**

A crosstab displays the intersections of category values and measure values as text. If the crosstab contains measures, then each cell of the crosstab contains the aggregated measure values for a specific intersection of category values. If the crosstab does not contain measures, then each cell of the crosstab contains the frequency of an intersection of category values.

## **Specify Properties for a Crosstab**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Indented

selects the indented layout for the crosstab.

#### Show column subtotals

adds subtotals to each column for each node on the row axis after the first.

**Note:** For the indented layout, subtotals are always enabled.

#### Show column totals

adds totals to each column.

**Note:** Total values are aggregated based on the default aggregations for each measure.

#### Show row subtotals

adds subtotals to each row for each node on the column axis after the first.

**Note:** For the indented layout, subtotals are always enabled.

#### Show row totals

adds totals to each row.

**Note:** Total values are aggregated based on the default aggregations for each measure.

#### **Totals Placement**

specifies the location of totals and subtotals. Select **Before** to place the totals and subtotals before the axis headings. Select **After** to place the totals and subtotals after the axis headings.

**Note:** For the indented layout, totals are always placed before the axis headings.

## **Data Roles for a Crosstab**

The basic data roles for a crosstab are columns, rows, and measures. You can assign either a single hierarchy or any number of categories to each column and row role. If you assign measures to the crosstab, then the measure values are displayed in the cells of the crosstab. If you do not assign measures, then the frequency of each intersection of values is displayed in the cells of the crosstab.

## **Managing Rows and Columns**

### **Sort a Row or Column**

By default, the crosstab is sorted alphabetically by the values of the first category that you assign to the **Rows** role. To change the sorting, right-click on the heading for the row or column that you want to sort by, and then select **Sort \rightarrow** [sort-method].

If you apply sorting to a measure, then the sorting for the rows is applied as a secondary sort. To remove measure sorting, select a sort for any category.

## **Rearrange Rows and Columns**

To rearrange your rows and columns, drag and drop the row headings and column headings.

#### Resize Columns

To resize a column, click, and then drag and drop the left or right edge of the column heading.

### Create Hierarchies from a Crosstab

Crosstabs enable you to create hierarchies from the categories on a crosstab axis. To create a hierarchy, right-click on a category heading, and then select **Create Hierarchy**. The categories are replaced with a new hierarchy.

The name of the new hierarchy is generated from the name of the outermost category, with the suffix "Hierarchy."

## **Working with Scatter Plots**

### About Scatter Plots

A scatter plot displays the values of measures by using markers. When you apply more than two measures, the visualization 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 visualization.

If you create a scatter plot that has a very large number of data values, then the scatter plot is rendered either as a heat map (for two measures) or as a correlation matrix for three or more measures

## **Specify Properties for a Scatter Plot**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

Note: The Title option is disabled if you select Generate graph titles.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

### **Show grid lines**

displays grid lines for each tick on the plot axes.

#### Marker size

specifies the size of each marker in pixels.

#### Fit Line

adds a fit line to the scatter plot. For information about the fit types that are available, see "Fit Lines" on page 263.

Note: Fit lines are not available if a grouping variable is assigned to the scatter plot.

## **Data Roles for a Scatter Plot**

The basic data role for a scatter plot is a measure. You can assign any number of measures. If you assign a single measure to a scatter plot, then the values are plotted along a line.

In addition to measures, you can assign a **Group** variable. The **Group** variable groups the data based on the values of the category data item that you assign. A separate set of scatter points is created for each value of the group variable.

You can add data items to the **Labels** role. The values for the data items in the **Labels** role are displayed in the data tips for the scatter plot.

## **Applying Data Analysis**

## **About Data Analysis**

For scatter plots, you can apply the following data analyses:

#### Correlation

identifies the degree of statistical correlation between the variables in the visualization. For more information, see "Correlation" on page 262.

#### Fit I ine

plots a model of the relationship between the variables in the visualization.

There are many types of fit lines, including linear fit, quadratic fit, cubic fit, and penalized B-spline. For more information, see "Fit Lines" on page 263.

Correlation is applied to your visualization automatically when you add a linear fit line. It is not available with other fit types.

## **Enable Data Analysis**

To add a fit line to your visualization, select the <sup>†</sup> drop-down list from the visualization toolbar, and then select **Fit Line** ▶ [fit-type]. For details about the fit types that are available, see "Fit Lines" on page 263.

## **Working with Bubble Plots**

### About Bubble Plots

A bubble plot displays the values of at least three measures by using differently sized plot markers (bubbles) in a scatter plot. The values of two measures are represented by the position on the plot axes, and the value of the third measure is represented by the marker size.

Note: Bubble sizes are scaled relative to the minimum and maximum values of the size variable. The minimum and maximum sizes are illustrated in the plot legend. The actual value for each bubble is displayed as a data tip and in the summary table.

You can create animated bubble plots to display changing data over time.

## **Specify Properties for a Bubble Plot**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

Note: The Title option is disabled if you select Generate graph titles.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

### **Show grid lines**

displays grid lines for each tick on the response axis.

### **Color gradient**

selects the gradient colors for the visualization.

You can click \(\sigma\) to select the values that are used to assign the colors. See "Specify a Custom Data Range" on page 182.

### **Data Roles for a Bubble Plot**

The basic data roles for a bubble plot are:

#### X axis

specifies the measure that is assigned to the X axis.

#### Y axis

specifies the measure that is assigned to the Y axis.

#### **Bubble size**

specifies the measure that determines the marker size.

In addition to the basic data roles, you can assign these roles:

### Group

groups the data based on the values of the category data item that you assign. A separate set of points is created for each value.

**Note:** You cannot assign both the **Group** role and the **Color** role at the same time.

#### Color

specifies a data item that determines the color of the bubbles. If you specify a category, then each value of the category is represented by a different bubble color. If you specify a measure, then the measure value is represented by the bubble color.

**Note:** You cannot assign both the **Group** role and the **Color** role at the same time.

#### Lattice columns

creates a lattice of charts with a column for each value of the category data item that you assign.

#### Lattice rows

creates a lattice of charts with a row for each value of the category data item that you assign.

#### **Animation**

specifies a datetime data item that is used to animate the bubble plot.

**Note:** The **Animation** role is enabled only if you assign a data item to the **Group** role.

## **Using Animated Bubble Plots**

### About Animated Bubble Plots

An animated bubble plot displays the changes in your data values over time. Each frame of the animation represents a value of the datetime data item that is assigned to the **Animation** data role.

For example, if you assign a category with the YEAR format to the **Animation** data role, then each frame of the animation displays a bubble plot of your data for a specific year.

### **Create an Animated Bubble Plot**

To create an animated bubble plot:

- 1 Select an existing bubble plot, or create a new bubble plot.
- 2 Assign a data item to the **Group** data role.
- 3 Assign a data item with a datetime format to the **Animation** data role.

## **Display an Animated Bubble Plot**

For an animated bubble plot, a set of animation controls appears at the bottom of the visualization.

**Table 22.3** Animation Control Tasks

Task	Action
Start the animation.	Click ▶.
Go to the previous animation frame.	Click ◀I.
Go to the next animation frame.	Click I▶.
Jump to a specific animation frame.	Use the slider.
Specify whether to repeat the animation.	Select or deselect <b>Loop</b> .
Select the animation speed.	Use the <b>Speed</b> slider.
Track the movement of a specific bubble.	Click the bubble that you want to track.

## **Working with Histograms**

## **About Histograms**

A histogram displays the distribution of values for a single measure. A series of bars represents the number of observations in the measure that match a specific value or value range. The bar height can represent either the exact number of observations or the percentage of all observations for each value range.

**Note:** If you use the default number of bins, then the minimum and maximum values on the histogram axis might not match the actual extent of your data values. If you specify the number of histogram bins, then the histogram axis matches your data values exactly.

## **Specify Properties for a Histogram**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization

## Show grid lines

displays grid lines for each tick on the response axis.

#### Bar direction

specifies whether the bars are vertical or horizontal.

### Frequency

specifies whether the frequency is displayed as a count (**Count**) or as a percentage (**Percent**).

**Note:** The frequency values are based on the data that is shown in the visualization (after filters and other data selections have been applied).

#### Use default bin count

specifies whether to use the default number of bins (value ranges) for the histogram. The default number of bins is determined by the number of data values in your histogram.

### Bin count

specifies the number of bins (value ranges) for the histogram.

## **Data Roles for a Histogram**

The basic data role for a histogram is a measure. You can assign only one measure to a histogram.

## **Working with Box Plots**

## **About Box Plots**

A box plot displays the distribution of data values by using a rectangular box and lines called "whiskers."

Figure 22.4 Parts of a Box Plot

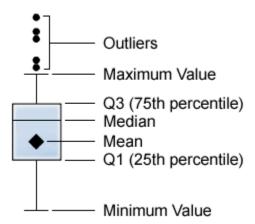


Figure 22.4 on page 205 shows a diagram of a box plot. The bottom and top edges of the box indicate the interquartile range (IQR). That is, the range of values that are between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line inside the box indicates the median value.

You can enable outliers, which are data points whose distances from the interquartile range are greater than 1.5 times the size of the interguartile range.

The whiskers (lines protruding from the box) indicate the range of values that are outside of the interquartile range. If you do not enable outliers, then the whiskers extend to the maximum and minimum values in the plot. If you enable outliers, then the whiskers indicate the range of values that are outside of the interquartile range, but are close enough not to be considered outliers.

If there are a large number of outliers, then the range of outlier values is represented by a bar. The data tip for the bar displays additional information about the outliers. To explore the outliers, double-click on the outlier bar to view the values as a new histogram visualization.

## **Specify Properties for a Box Plot**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

## **Show grid lines**

displays grid lines for each tick on the response axis.

#### **Box direction**

specifies whether the boxes are vertical or horizontal.

#### Overview

specifies whether the chart overview is enabled.

### Measure layout

specifies whether the measures share a single response axis (**Shared axis**) or have separate response axes for each measure (**Separate axes**).

**Note:** The **Measure layout** option is disabled if your visualization contains exactly one measure.

### Show averages

displays the mean value as a marker inside the box.

#### Show outliers

shows outliers outside of the whiskers. Outliers are data points whose distances from the interquartile range are greater than 1.5 times the size of the interquartile range.

#### Rotate axis labels

displays the category labels at an angle.

**Note:** The **Rotate axis labels** option has no effect if the box plot contains no categories.

## **Data Roles for a Box Plot**

The basic data roles for a box plot are categories and measures. You can assign one category only, and the category values are plotted on the category axis. You can assign many measures, and the measure values are plotted on the response axis. At least one measure is required.

In addition to the basic data roles, you can assign these roles:

#### Lattice columns

creates a lattice of charts with a column for each value of the category data item that you assign.

#### Lattice rows

creates a lattice of charts with a row for each value of the category data item that you assign.

## **Working with Heat Maps**

## **About Heat Maps**

A heat map displays the distribution of values for two data items by using a table with colored cells. If you do not assign a measure to the Color data role, then a cell's color represents the frequency of each intersection of values. If you assign a measure to the **Color** data role, then a cell's color represents the aggregated measure value for each intersection of values

## **Specify Properties for a Heat Map**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

#### Bin count

specifies the number of value ranges that are represented as cells. **Bin count** affects only measures.

#### Show borders

specifies that the borders between cells are visible.

#### Rotate axis labels

displays the category labels at an angle.

**Note:** The **Rotate axis labels** option affects only the values on the X axis.

**Note:** The **Rotate axis labels** option has no effect if the heat map contains no categories.

## **Color gradient**

selects the gradient colors for the visualization.

You can click to select the values that are used to assign the colors. See "Specify a Custom Data Range" on page 182.

#### Fit line

adds a fit line to the heat map. For information about the fit types that are available, see "Fit Lines" on page 263.

**Note:** Fit lines are not available if a category is assigned to the heat map.

## **Data Roles for a Heat Map**

The basic data roles for a heat map are:

#### X axis

specifies the data item that is assigned to the X axis.

#### Y axis

specifies the data item that is assigned to the Y axis.

#### Color

specifies a measure that determines the cell color. If you do not assign the Color role, then the cell color indicates frequency.

## **Applying Data Analysis**

## **About Data Analysis**

For heat maps, you can apply the following data analyses:

#### Correlation

identifies the degree of statistical correlation between the variables in the visualization. For more information, see "Correlation" on page 262.

#### Fit Line

plots a model of the relationship between the variables in the visualization.

There are many types of fit lines, including linear fit, quadratic fit, cubic fit, and penalized B-spline. For more information, see "Fit Lines" on page 263.

Correlation is applied to your visualization automatically when you add a linear fit line. It is not available with other fit types.

## **Enable Data Analysis**

To add a fit line to your visualization, select the <sup>₹</sup> drop-down list from the visualization toolbar, and then select **Fit Line** ▶ [fit-type]. For information about the fit types that are available, see "Fit Lines" on page 263.

**Note:** Fit lines are not available if your heat map contains categories or hierarchies.

## **Working with Geo Maps**

## **About Geo Maps**

A geo map overlays your data on a geographic map. You can display your data either as bubbles or as colored regions on the geo map.

To display a geo map, you must define one or more of the categories as geography data items. For more information, see "Define a Geography Data Item" on page 154.

## **Specify Properties for a Geo Map**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### **Title**

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

### Frequency

specifies whether the frequency values are displayed as the number of values (**Count**) or as the percentage of values (**Percent**).

### Map style

specifies the type of data overlay for the map. Select one of the following values:

#### **Bubbles**

displays your data as a series of bubbles. Each bubble is located at the center of a geographic region or at the coordinates of a location.

### Regions

displays your data as colored regions on the map.

**Note:** The **Regions** map style is not available for custom geographic roles.

Note: The Map style option is disabled if both the Bubble size role and Color role are assigned.

### Show map navigation control

specifies whether the map zoom and pan controls are visible.

### Color gradient

selects the gradient colors for the visualization.

You can click \(\sigma\) to select the values that are used to assign the colors. See "Specify" a Custom Data Range" on page 182.

## **Transparency**

specifies the amount of transparency for the data overlay.

## **Data Roles for a Geo Map**

The basic data roles for a bubble plot are:

### Geography

specifies the geography data item that identifies geographic regions for your map.

Geography data items are identified by the ## icon.

#### **Bubble size**

for the **Bubbles** map style, specifies the measure that determines the bubble size.

#### Color

for the **Regions** map style, specifies the measure that determines the regions' colors.

for the **Bubbles** map style, specifies a measure that determines the bubble color.

## Zoom a Geo Map

You can zoom the map by using any of the following controls:

- click the zoom bar to select your zoom level
- press the + and buttons on the zoom bar
- scroll the mouse wheel to zoom in or zoom out at the location of the cursor

## Pan (Scroll) a Geo Map

You can pan (scroll) the map by using any of the following controls:

- click and drag the map
- click the arrows on the pan control

## **Working with Treemaps**

## **About Treemaps**

A treemap displays a hierarchy or a category as a set of rectangular tiles. Each tile represents a category value or a hierarchy node. The size of each tile represents either the frequency count or the value of a measure. If you assign a measure to the **Color** role, then the color of each tile represents the value of that measure.

## **Specify Properties for a Treemap**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

#### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

#### Show data labels

shows a text label for each tile in the treemap.

#### Frequency

specifies whether the frequency values are displayed as the number of values (Count) or as the percentage of values (Percent).

#### **Arrangement**

specifies the layout of the tiles in the treemap. Select one of the following values:

#### Standard

arranges the tiles into squares, with the largest tiles generally at the bottom left.

#### Flow

arranges the tiles from largest to smallest, with the largest tile at the top 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.

#### Additional levels

specifies the number of levels that are displayed beneath the current level.

#### Color gradient

selects the gradient colors for the visualization.

You can click \( \subseteq \text{to select the values that are used to assign the colors. See "Specify" a Custom Data Range" on page 182.

# **Data Roles for a Treemap**

The basic data roles for a treemap are:

#### Tile

specifies categories or a hierarchy that are used to create the tiles in the treemap. If you specify categories for the **Tile** role, the order of the categories determines the level of each category. Drag and drop the categories to place them in the order that you want.

#### Size

specifies a measure that determines the size of each tile. If you do not specify the **Size** role, then the tile size is determined by the frequency count.

**Note:** If any of the aggregated values for the **Size** role results in a negative size value or a value of zero, then an error appears.

#### Color

specifies a measure that determines the color of the tiles.

# **Create a Hierarchy from a Treemap**

If your treemap contains categories in the **Tile** role, then you can create a new hierarchy by using the categories.

On the **Roles** tab, click on the drop-down list for the **Tile** role, and then select **Create Hierarchy**. A new hierarchy is created with the name of the first category in the hierarchy.

# **Working with Correlation Matrices**

#### **About Correlation Matrices**

A correlation matrix displays the degree of correlation between multiple intersections of measures as a matrix of rectangular cells. Each cell in the matrix represents the

intersection of two measures, and the color of the cell indicates the degree of correlation between those two measures.

A correlation matrix can either compare within a single set of measures or it can compare between two sets of measures.

The correlation values are calculated by using Pearson's product-moment correlation coefficient. Correlation values are identified as weak, moderate, or strong as follows:

#### Weak

0.3 or lower

#### Moderate

greater than 0.3 and less than or equal to 0.6

#### Strong

greater than 0.6

# **Specify Properties for a Correlation Matrix**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

**Note:** The **Title** option is disabled if you select **Generate graph titles**.

#### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

#### Show borders

specifies that the borders between cells are visible.

#### Rotate axis labels

displays the axis labels at an angle.

#### **Color gradient**

selects the gradient colors for the visualization.

#### **Data Roles for a Correlation Matrix**

The basic data role for a correlation matrix is a measure. You must assign at least two measures.

**Note:** The maximum number of measures is 60.

The **Show Correlations** option specifies whether the correlation matrix uses a single set of measures (**Within one set of measures**) or two sets of measures (**Between two sets of measures**.)

If you select **Between two sets of measures**, then assign measures to the **X axis** and **Y axis** roles.

#### **Sort Correlation Values**

For a correlation matrix between two sets of measures, you can sort by the correlation values for a measure.

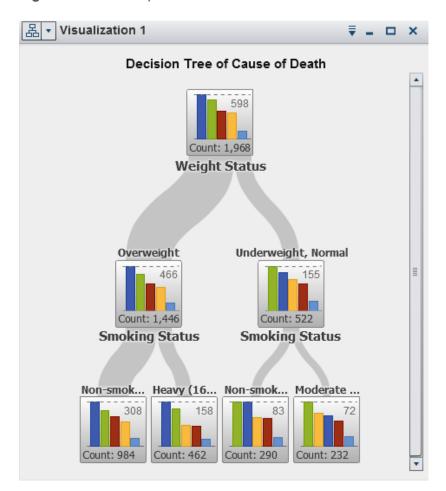
To apply sorting, right-click the **Measures** button on the axis that you want to sort, and then select **Sort**. You can select any of the measures on the selected axis, and you can select whether to sort the correlation values in ascending or descending order.

# **Working with Decision Trees**

#### **About Decision Trees**

A decision tree uses the values of one or more predictor data items to predict the values of a target data item. A decision tree displays a series of nodes as a tree, where the top node is the target data item, and each branch of the tree represents a split in the values of a predictor data item. Decision trees are also known as classification and regression trees.

Figure 22.5 Example Decision Tree



Each branch of the tree displays the name of the predictor for the branch at the top of the split. The thickness of the branch indicates the number of values that are associated with each node. The predictor values for each node are displayed above the node.

Each node in the tree displays the data for the node either as a histogram (if the target contains continuous data) or as a bar chart (if the target contains discrete data). The histogram or bar chart in each node displays the values of the target data item that are selected by the splits in the tree. The number at the top right of the node indicates the greatest value for the bar chart or histogram. At the bottom of each node, the total number of data values (count) is displayed.

Decision trees in SAS Visual Analytics use a modified version of the C4.5 algorithm.

The table view for a decision tree contains two additional data columns, Node ID and Parent ID. Node ID specifies a unique value for each node in the tree. Parent ID specifies the ID of the parent node.

### **Specify Properties for a Decision Tree**

On the **Properties** tab, you can specify the following options:

#### Name

specifies the name of the visualization.

#### Title

specifies the title that appears above the graph.

Note: The Title option is disabled if you select Generate graph titles.

#### Generate graph titles

specifies that the graph title is generated automatically based on the data items in the visualization.

#### **Growth strategy**

specifies the parameters that are used to create the decision tree. Select one of the following values:

#### Basic

specifies a simple tree with a maximum of two branches per split and a maximum of six levels. For details, see Table 22.4 on page 219.

#### Advanced

specifies a complex tree with a maximum of four branches per split and a maximum of six levels. For details, see Table 22.4 on page 219.

#### Expert

enables you to select the values for each of the expert parameters.

If you select **Expert** as the value for **Growth strategy**, then the following additional options appear:

#### Maximum branches

specifies the maximum number of branches for each node split.

#### Maximum levels

specifies the maximum number of levels in the tree.

#### Leaf size

specifies the minimum number of values (count) for each node.

#### **Target bins**

specifies the number of bins that are used for the target data item.

**Note:** This option has no effect if the target data item contains discrete data.

#### **Predictor bins**

specifies the number of bins that are used for predictor data items.

**Note:** This option has no effect if the predictor data items contain discrete data.

#### **Pruning**

specifies the level of pruning that is applied to the tree. Pruning removes leaves and branches that contribute the least to the predictive accuracy of the tree. A more **Lenient** pruning value specifies that fewer leaves and branches are removed from the tree. A more **Aggressive** pruning value specifies that more leaves and branches are removed from the tree.

#### Include missing

specifies whether missing values are included in the tree.

#### **Reuse predictors**

specifies that predictors can be used more than once in the tree.

The following parameter values are used for the **Basic** and **Advanced** growth strategies:

Table 22.4 Parameter Values for the Basic and Advanced Growth Strategies

Property	Basic Value	Advanced Value
Maximum branches	2	4
Maximum levels	6	6
Leaf size	1	1

Property	Basic Value	Advanced Value
Target bins	10	10
Predictor bins	2	2
Include missing	No	Yes
Reuse predictors	No	Yes

#### **Data Roles for a Decision Tree**

The basic data roles for a decision tree are:

#### **Target**

specifies the target for the decision tree. You can specify any category or measure. The decision tree attempts to predict the values of the target data item. The bar chart or histogram inside each node of the tree displays the frequency of values for the target data item.

#### **Predictors**

specifies predictors for the decision tree. You can specify one or more categories or measures as predictors. The values of predictor data items are displayed above the nodes in the tree. The order of the data items in the **Predictors** list does not affect the tree.

**Note:** If a predictor does not contribute to the predictive accuracy of the tree, then it is not used in the tree.

### **Explore a Node as a New Visualization**

For each node in the tree, you can explore the data values as a new histogram or bar chart visualization. To create a new visualization for a node, right-click on the node, and then select **Create Visualization from Node**. A new visualization appears.

**Note:** If you create a visualization from a node that displays a histogram, then the new histogram might have visual differences from the histogram that is displayed in the

decision tree. For example, the bins and the extent of data on the X axis might be different. However, the two histograms use exactly the same data.

#### Calculate a Data Item from a Decision Tree

You can create a calculated data item to represent the results of a decision tree. The calculated data item creates values that correspond to the node IDs that can be seen in the table view for the decision tree.

You can use the calculated data item in filters to select the values for a decision tree node in other types of visualizations.

To calculate a data item from a decision tree:

- Calculated Item.
- 2 In the New Calculated Item window, enter a **Name** for the new calculated item.
- 3 Click OK to create the new item.

### **Display the Overview**

For large decision trees, the overview enables you to select the portions of the tree that are visible.

To display the overview, select the \* drop-down list from the visualization toolbar, and then select Show Overview.

#### Zoom a Decision Tree

You can zoom a decision tree by using either of the following controls:

- in the overview, select the part of the decision tree that you want to view
- scroll the mouse wheel over the visualization to zoom in or out at the location of the cursor

# Pan (Scroll) a Decision Tree

You can pan (scroll) the decision tree by using any of the following controls:

- in the overview, drag the selection box
- hold down the Shift key and drag the decision tree

# 

# Working with Filters

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# **About Filters in SAS Visual Analytics Explorer**

In SAS Visual Analytics Explorer (the explorer), you can create filters to subset your data.

Three types of filters are available:

#### Basic filters

subset the data for your visualizations by using a single data item. Basic filters can be adjusted by using visual filter controls, or by using the Edit Filter window.

For information about basic filters, see "Working with Basic Filters" on page 225.

#### Advanced filters

subset the data for your visualizations by using any number of data items. Visual filter controls are not available for advanced filters.

For information about advanced filters, see "Working with Advanced Filters" on page 231.

#### Data source filters

subset the data for the entire exploration. Data source filters can use any number of data items to select data.

For information about data source filters, see "Working with Data Source Filters" on page 239.

All of your filters are saved when you save your exploration.

# **Working with Basic Filters**

#### **About Basic Filters**

For all visualization types, you can subset your data by using the **Filters** tab in the right pane. You can base your filters on any data item, regardless of whether the data item is assigned to the current visualization.

Your filters can be either local filters that apply only to the current visualization, or global filters that apply to all of the visualizations in the current exploration. For more information, see "Set the Scope of a Basic Filter (Global or Local)" on page 230.

The total percentage of values that are selected by your filters is displayed at the bottom of the **Filters** tab. The tooltip for the percentage displays the exact number of data rows. The percentage is calculated after data source filters are applied.

You can perform the following tasks to manage basic filters:

- "Create a Basic Filter"
- "Create a Basic Filter from a Data Selection"
- "Edit a Filter By Using Visual Filter Controls"
- "Edit a Basic Filter By Using the Edit Filter Window"
- "Set the Scope of a Basic Filter (Global or Local)"
- "Delete a Basic Filter"
- "Reset a Basic Filter"

#### **Create a Basic Filter**

To create a basic filter:

- 1 From the **Data** pane, select the data item that you want to use as the base of the filter. You can select any data item, regardless of whether it is assigned to the current visualization.
- 2 For a local filter, either right-click on the data item, and select **Add as Local Filter**, or drag and drop the data item onto the **Local Filters** area of the **Filters** tab.
  - For a global filter, either right-click on the data item, and select **Add as Global Filter**, or drag and drop the data item onto the **Global Filters** area of the **Filters** tab.
  - **Note:** If a local filter exists for a data item in any of your visualizations, then you cannot create a new global filter for that data item. Remove the local filter, or change its scope to global. Similarly, if a global filter exists for a data item, then you cannot create a local filter for that data item.
- 3 Set the parameters for your filter. You can either create a basic filter by using visual filter controls, or you can create an advanced filter by using the Edit Filter window.
  - **Note:** By default, your filter changes are applied automatically to the active visualization. To apply multiple changes together, deselect **Auto**, and then click **Apply** when you are ready to apply your filter changes.

#### **Create a Basic Filter from a Data Selection**

When you select data values in a visualization, you can use the selected values to create a basic filter.

To create a new filter from a data selection:

- 1 Select one or more data values in a visualization.
- 2 Right-click on the visualization, and then select one of the following:

#### **Include Only Selection**

creates a filter that includes the selected values only.

#### **Exclude Selection**

creates a filter that excludes the selected values.

The new filter appears on the **Filters** tab.

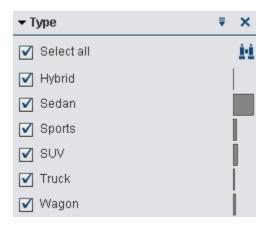
### **Edit a Filter By Using Visual Filter Controls**

#### **About Visual Filter Controls**

Visual filter controls are accessible directly from the **Filters** tab. The visual filter controls are different, depending on the model type of the filter data item.

#### **Filtering Discrete Data**

Display 23.1 A Visual Filter for a Discrete Data Item



Note: If your data contains a large number of discrete values, then visual filter controls are not available. Use the Edit Filter window instead.

For data items that use the discrete data model, the filter displays all of the distinct values for the data item. To the right of each value, a bar indicates the frequency.

Use the check boxes next to each value to select the values for the filter. You can search for a value by clicking !!. Enter a text string in the field. The search locates values that begin with your text string.

Click **Select all** to select or deselect all of the values. To invert your selection, open the drop-down list, and then select **Invert Selection**.

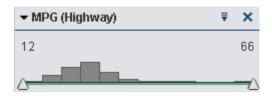
To exclude data observations in which the filter category has a missing value, deselect **Include missing values**.

**Note:** This option is available only if your data contains missing values.

By default, your filter changes are applied automatically to the active visualization. To apply multiple changes together, deselect **Auto**, and then click **Apply** when you are ready to apply your filter changes.

#### **Filtering Continuous Data**

Display 23.2 A Visual Filter for a Continuous Data Item



For measures that use the continuous data model, the filter shows the range of data values as a histogram. Sliders at each side of the histogram enable you to select the upper and lower limits of the data range that is selected by the filter.

You can enter the limits explicitly:

- For numeric data, click on an upper or lower limit value, and then enter a new value in the text field.
- For a continuous datetime data item, click in, and then select a date or time.

To exclude data observations in which the filter measure has a missing value, deselect **Include missing values**.

**Note:** This option is available only if your data contains missing values.

By default, your filter changes are applied automatically to the active visualization. To apply multiple changes together, deselect **Auto**, and then click **Apply** when you are ready to apply your filter changes.

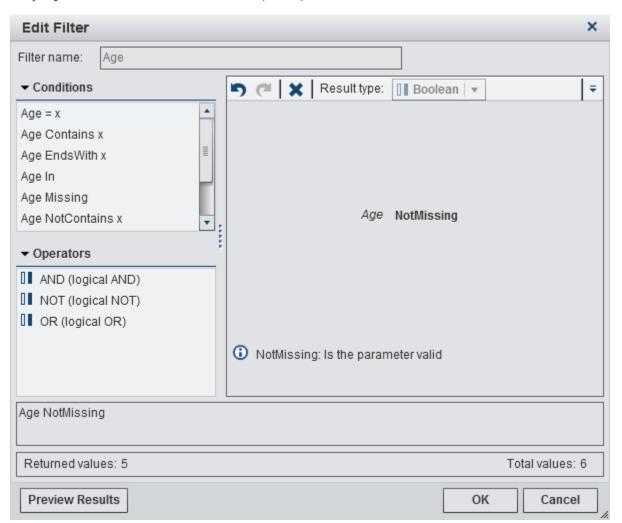
## **Edit a Basic Filter By Using the Edit Filter** Window

To edit a basic filter by using the Edit Filter window:

On the **Filters** tab, open the ₹ drop-down list for the filter that you want to edit, and then select Edit Filter.

The Edit Filter window appears.

Display 23.3 The Edit Filter Window (Basic)



2 Build the expression for your filter by dragging and dropping conditions and operators onto the expression in the right pane.

For information about the conditions and operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.

**Note:** The AND and OR operators can accept more than two conditions. To add a condition to the operator, drag and drop a condition onto the operator name in the right pane, or right-click the operator name, select **Add**, and then select **New Condition**.

- 3 (Optional) For discrete data, click **Preview Results** to preview the filter results.
- 4 When you are finished editing your filter, click **OK** to apply the filter.

# Set the Scope of a Basic Filter (Global or Local)

A filter can be either local (applies only to the current visualization) or global (applies to all of the visualizations in the exploration).

To set the scope of a filter, open the <sup>₹</sup> drop-down list, and then select **Global Filter** or **Local Filter**.

**Note:** If you change a global filter's scope to local, then a local filter is created for all of the visualizations in the exploration.

**Note:** If local filters exist in your other visualizations for the same data item, then converting your filter to a global filter will replace those local filters. A confirmation window enables you to continue or cancel.

#### **Delete a Basic Filter**

To delete a basic filter, click × on the filter on the **Filters** tab, or open the <sup>₹</sup> drop-down list on the filter menu and then select **Delete Filter**.

You can delete all of your filters by opening the drop-down list in the Global Filters area or in the Local Filters area of the Filters tab, and then selecting Delete All Filters.

**Note:** If you delete a global filter, then the filter is removed from all of your visualizations in the exploration.

#### Reset a Basic Filter

To restore a basic filter to its initial state, open the <sup>†</sup> drop-down list for the filter, and then select Reset Filter.

You can reset all of your filters by opening the <sup>₹</sup> drop-down list in the **Global Filters** area or in the Local Filters area of the Filters tab, and then selecting Reset All Filters.

# **Working with Advanced Filters**

#### About Advanced Filters

For all visualization types, you can create advanced filters to subset your data by using the **Filters** tab in the right pane.

Advanced filters enable you to create filters that use more than one data item.

Your advanced filters can be either *local filters* that apply only to the current visualization, or global filters that apply to all of the visualizations in the current exploration.

The total percentage of values that are selected by your filters is displayed at the bottom of the **Filters** tab. The tooltip for the percentage displays the exact number of data rows. The percentage is calculated after data source filters are applied.

You can perform the following tasks to manage advanced filters:

- "Create an Advanced Filter"
- "Edit an Advanced Filter"

- "Set the Scope of an Advanced Filter (Global or Local)"
- "Delete an Advanced Filter"

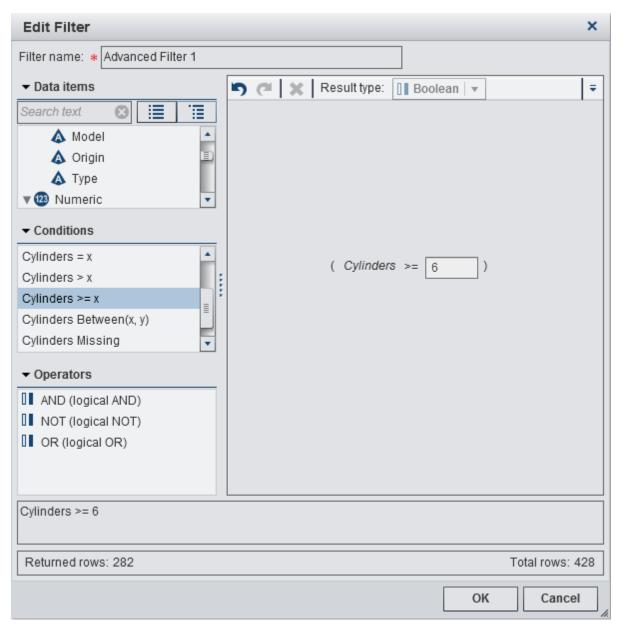
#### **Create an Advanced Filter**

To create an advanced filter:

1 Open the ▼ drop-down list in the Global Filters area or in the Local Filters area of the Filters tab, and then select New Advanced Filter.

#### The Edit Filter window appears:

**Display 23.4** The Edit Filter Window (Advanced)



2 Specify a Filter name. The filter name identifies the advanced filter on the Filters tab.

- 3 Create a condition for the filter:
  - From the Data Items list, select the data item on which the condition is based.
  - **b** From the **Conditions** list, select a condition. For a list of the conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
  - **c** Drag and drop the condition onto the expression in the right pane.
  - **d** For any required parameters, select the parameter, and enter a value, or right-click the parameter field, and select **Replace with** to select a data item.
- 4 (Optional) Add additional operators to the expression.
  - a From the **Operators** list, select an operator to join the conditions in your expression. For a list of the operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
  - **b** Drag and drop the operator onto the expression in the right pane.
  - c Add a new condition as described in step 2 above.

**Note:** The AND and OR operators can accept more than two conditions. To add a condition to the operator, drag and drop a condition onto the operator name in the right pane, or right-click the operator name, select **Add**, and then select **New Condition**.

**5** When you are finished creating your advanced filter, click **OK** to apply the filter.

#### **Edit an Advanced Filter**

#### **About Editing Advanced Filters**

You can perform the following tasks to edit an advanced filter:

- "Open the Edit Filter Window"
- "Specify the Filter Name"

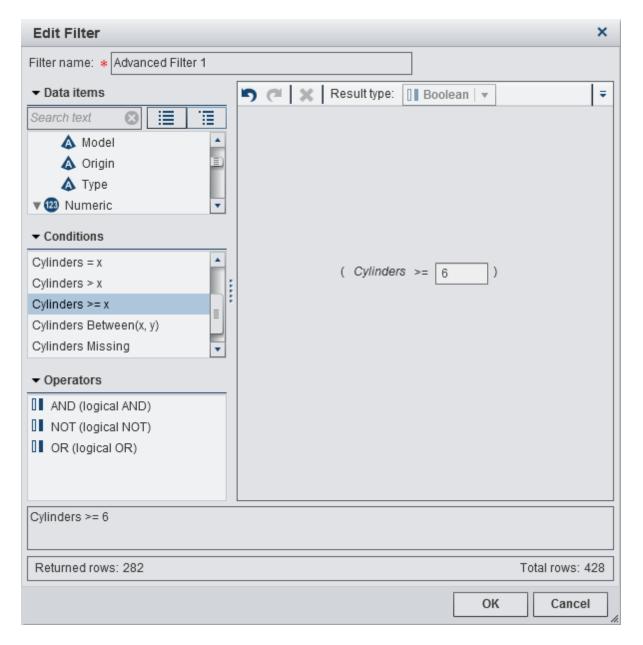
- "Edit a Parameter Value"
- "Add a Condition"
- "Add an Operator"
- "Replace a Condition"
- "Remove Part of an Expression"
- "Subset an Expression"

#### **Open the Edit Filter Window**

To open the **Edit Filter** window, on the **Filters** tab, open the <sup>₹</sup> drop-down list for the advanced filter that you want to edit, and then select Edit Filter.

#### The Edit Filter window appears.

Display 23.5 The Edit Filter Window (Advanced)



# **Specify the Filter Name**

To specify a name for the filter, enter a name in the **Filter name** field. The filter name identifies the advanced filter on the **Filters** tab.

#### **Edit a Parameter Value**

To edit a parameter value, select the parameter, and enter a new value, or right-click the parameter field, and select Replace with to select a data item.

#### Add a Condition

Note: If your filter expression contains an existing condition, then you must first Add an Operator to the expression.

To add a new condition:

- From the **Data items** list, select the data item on which the condition is based.
- 2 From the Conditions list, select a condition. For a list of the conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
- 3 Drag and drop the condition onto the expression in the right pane.
- 4 For any required parameters, select the parameter, and enter a value, or right-click the parameter field, and select **Replace with** to select a data item.

#### **Add an Operator**

To add an operator to the expression:

- 1 From the Operators list, select an operator to join the conditions in your expression. For a list of the operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
- 2 Drag and drop the operator onto the expression in the right pane.
- 3 Add a New Condition.

Note: The AND and OR operators can accept more than two conditions. To add a condition to the operator, drag and drop a condition onto the operator name in the right pane, or right-click the operator name, select **Add**, and then select **New Condition**.

#### Replace a Condition

To replace a condition, drag and drop a new condition onto the existing condition in the right pane.

#### **Remove Part of an Expression**

To remove a part of an expression, highlight the part of the expression that you want to remove, and then select **Delete** or **Clear**.

#### **Subset an Expression**

To subset an expression and delete the remainder:

- 1 Highlight the part of the expression that you want to keep.
- 2 Right-click, and select Keep Operand. The parts of the expression that were not selected are removed.

# **Set the Scope of an Advanced Filter (Global or Local)**

A filter can be either local (applies only to the current visualization) or global (applies to all of the visualizations in the current exploration).

To set the scope of a filter, open the <sup>▼</sup> drop-down list, and then select **Global Filter** or **Local Filter**.

**Note:** If you change a global filter's scope to local, then a local filter is created for all of the visualizations in the exploration.

**Note:** If local filters exist in your other visualizations for the same data item, then converting your filter to a global filter will replace those local filters. A confirmation window enables you to continue or cancel.

#### **Delete an Advanced Filter**

To delete an advanced filter, click × on the filter on the **Filters** tab, or open the <sup>₹</sup> drop-down list on the filter menu, and then select **Delete Filter**.

You can delete all of your filters by opening the <sup>▼</sup> drop-down list in the **Global Filters** area or in the **Local Filters** area of the **Filters** tab, and then selecting **Delete All Filters**.

**Note:** If you delete a global filter, then the filter is removed from all of your visualizations in the exploration.

# **Working with Data Source Filters**

#### About Data Source Filters

A data source filter enables you to subset the data in an entire exploration. A data source filter differs from a global advanced filter in the following ways:

- A data source filter updates the cardinality values that appear in the **Data** pane.
- A data source filter updates the total number of rows that is used in the filtered rows percentage at the bottom of the right pane.
- A data source filter is not shown on the **Filters** tab.
- An exploration can contain only one data source filter.

You can perform the following tasks to manage data source filters:

- "Create a Data Source Filter from a Global Filter"
- "Create a New Data Source Filter"
- "Edit a Data Source Filter"
- "Delete a Data Source Filter"

# Create a Data Source Filter from a Global **Filter**

To convert an existing global filter to a data source filter:

- On the **Filters** tab, select the global filter that you want to convert.
- 2 Open the ▼ drop-down list, and select Convert to Data Source Filter. The global filter disappears from the Filters tab.

You can convert all of your global filters together into a single data source filter by opening the <sup>₹</sup> drop-down list in the **Global Filters** area or in the **Local Filters** area of the **Filters** tab, and then selecting **Convert All to Data Source Filter**.

To view the data source filter settings, select **Data** ▶ **Data Source Details** from the main menu. The data source filter settings are displayed in the **Data source filter** field.

#### **Create a New Data Source Filter**

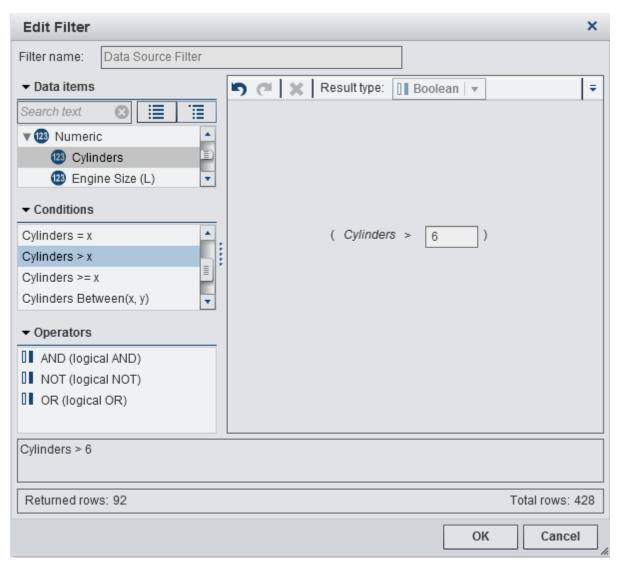
To create a data source filter:

- 1 Select Data ▶ Data Source Details from the main menu.
- 2 Click New to create a data source filter.

**Note:** If the current exploration contains an existing data source filter, then click **Edit** to add conditions to the existing data source filter.

#### The Edit Filter window appears:

**Display 23.6** The Edit Filter Window (Data Source)



- Create a condition for the filter:
  - **a** From the **Data items** list, select the data item on which the condition is based.
  - **b** From the **Conditions** list, select a condition. For a list of the conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.

- **c** Drag and drop the condition onto the expression in the right pane.
- **d** For any required parameters, select the parameter, and enter a value, or right-click the parameter field, and select **Replace with** to select a data item.
- 4 (Optional) Add additional operators to the expression.
  - a From the **Operators** list, select an operator to join the conditions in your expression. For a list of the operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
  - **b** Drag and drop the operator onto the expression in the right pane.
  - c Add a new condition as described in step 2 above.

**Note:** The AND and OR operators can accept more than two conditions. To add a condition to the operator, drag and drop a condition onto the operator name in the right pane, or right-click the operator name, select **Add**, and then select **New Condition**.

**5** When you are finished creating your filter, click **OK** to apply the filter.

#### **Edit a Data Source Filter**

#### **About Editing Data Source Filters**

You can perform the following tasks to edit a data source filter:

- "Edit a Data Source Filter By Using the Edit Filter Window"
- "Edit a Parameter Value"
- "Add a Condition"
- "Add an Operator"
- "Replace a Condition"
- "Remove Part of an Expression"

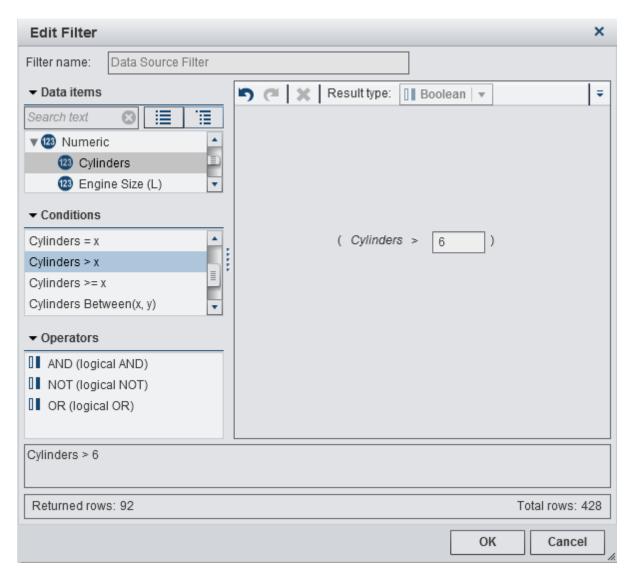
#### "Subset an Expression"

#### **Edit a Data Source Filter By Using the Edit Filter Window**

To open the Edit Filter window, select **Data** ▶ **Data Source Details** from the main menu, and then click Edit.

The Edit Filter window appears:

**Display 23.7** The Edit Filter Window (Data Source)



#### **Edit a Parameter Value**

To edit a parameter value, select the parameter, and enter a new value, or right-click the parameter field, and select **Replace with** to select a data item.

#### Add a Condition

**Note:** If your filter expression contains an existing condition, then you must first Add an Operator to the expression.

To add a new condition:

- **1** From the **Data items** list, select the data item on which the condition is based.
- **2** From the **Conditions** list, select a condition. For a list of the conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
- **3** Drag and drop the condition onto the expression in the right pane.
- **4** For any required parameters, select the parameter, and enter a value, or right-click the parameter field, and select **Replace with** to select a data item.

#### **Add an Operator**

To add an operator to the expression:

- 1 From the **Operators** list, select an operator to join the conditions in your expression. For a list of the operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
- **2** Drag and drop the operator onto the expression in the right pane.
- 3 Add a New Condition.

**Note:** The AND and OR operators can accept more than two conditions. To add a condition to the operator, drag and drop a condition onto the operator name in the right pane, or right-click the operator name, select **Add**, and then select **New Condition**.

#### **Replace a Condition**

To replace a condition, drag and drop a new condition onto the existing condition in the right pane.

#### **Remove Part of an Expression**

To remove a part of an expression, highlight the part of the expression that you want to remove, and then select **Delete** or **Clear**.

#### **Subset an Expression**

To subset an expression and delete the remainder:

- Highlight the part of the expression that you want to keep.
- 2 Right-click, and select **Keep Operand**. The parts of the expression that were not selected are removed.

#### **Delete a Data Source Filter**

To remove a data source filter, select **Data** ▶ **Data Source Details**, and then click Delete.

# **Exporting Content**

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# **Overview of Exporting Content**

You can export your data and your visualizations from SAS Visual Analytics Explorer (the explorer) by using the following tasks:

- "Export a Visual Exploration as a Report"
- "Export a Visual Exploration as a PDF"
- "Save a Visualization as an Image File"
- "Export Data from a Visualization"
- "E-mail a Visual Exploration as a Link"

# **Export a Visual Exploration as a Report**

You can export your visual exploration as a report, which can be refined in the designer interface or viewed directly on a mobile device or in SAS Visual Analytics Viewer (the viewer).

To export your current visual exploration as a report:

1 Select File ▶ Export ▶ Exploration as Report.

**Note:** If you have only one visualization in your exploration, the Save As window is displayed at this point. Select the location where you want to save the report, and then click **Save** to export it as a report.

2 In the Export as Report window, select the visualizations that you want to include in the report.

**Note:** The following types of visualizations are not available to include in the report:

- visualizations that do not contain any data
- animated bubble plots
- treemaps that display additional levels
- line charts with forecasting analysis are not available if the visualization has not been displayed during the current session
- decision trees

**Note:** If your scatter plot or heat map contains correlation data, the correlations are not included in the report.

The Export to Report window enables you to perform the following tasks:

Task	Action
Add visualizations to the selection list. (Restore visualizations.)	Select a visualization from the <b>Available</b> list, and then click , or click to add all of the available visualizations.
Remove visualizations from the selection list. (Minimize visualizations.)	Select a visualization from the <b>Selected</b> list, and then click ( or click ( to remove all of the visualizations.
Change the order of the selected visualizations.	In the <b>Selected</b> list, drag and drop the visualizations in the order that you want, or select a visualization and click the up and down arrows to move it.
Search the available visualizations.	In the <b>Search</b> field, enter a string to search for. A visualization matches the search if the string appears anywhere in the visualization name.  Only the matching visualizations appear in the <b>Available</b> list.
Filter the available visualizations.	Click , and then select your filter parameters. You can filter either on the visualization type or on the data items that are used in each visualization.  Only the matching visualizations appear in the <b>Available</b> list.

When you have finished selecting your visualizations, click **OK**.

- 3 Select the location where you want to save the report, and then click **Save**.
- 4 Click **OK** to return to the explorer, or select **Open the report and close the current exploration**, and click **OK** to view the report in the designer.

# **Export a Visual Exploration as a PDF**

To export your current visual exploration as a PDF:

- 1 Select File ▶ Export ▶ Exploration as PDF.
- In the Export as PDF wizard, enter a Title and a Description for the PDF document. Then, select the following options:

#### Page numbers

specifies that the PDF document contains page numbers.

#### **Summary data**

specifies whether the PDF document contains summary data tables for each visualization.

#### Filter descriptions

specifies whether each visualization includes a description of its active filters.

Click Next.

3 Select the visualizations that you want to include in the PDF document.

**Note:** The following types of visualizations are not available to include in the PDF document:

- visualizations that do not contain any data
- crosstabs
- tables that contain more than 1,000 rows

The Export as PDF window enables you to perform the following tasks:

Task	Action
Add visualizations to the selection list. (Restore visualizations.)	Select a visualization from the <b>Available</b> list, and then click , or click to add all of the available visualizations.

Task	Action
Remove visualizations from the selection list. (Minimize visualizations.)	Select a visualization from the <b>Selected</b> list, and then click <b>(=</b> , or click <b>(d)</b> to remove all of the visualizations.
Change the order of the selected visualizations.	In the <b>Selected</b> list, drag and drop the visualizations in the order that you want, or select a visualization and click the up and down arrows to move it.
Search the available visualizations.	In the <b>Search</b> field, enter a string to search for. A visualization matches the search if the string appears anywhere in the visualization name.
	Only the matching visualizations appear in the <b>Available</b> list.
Filter the available visualizations.	Click , and then select your filter parameters. You can filter either on the visualization type or on the data items that are used in each visualization.
	Only the matching visualizations appear in the <b>Available</b> list.

#### Click Next.

- Click Finish to open a download window for your browser.
- Select the location where you want to save the PDF document.

Note: If the legend for a visualization is too large, then it is not included in the PDF document.

# Save a Visualization as an Image File

To save your current visualization as an image file:

- 1 Select the visualization that you want to save as an image.
- 2 If your visualization contains hierarchies, drill down to the hierarchy levels that you want to show in the image.
- 3 Select the ▼ drop-down list from the visualization toolbar, and then select **Export** Image.
- 4 If necessary, scroll and zoom the visualization to show the data items that you want to include in the image. If your visualization contains filters, legends, or hierarchy breadcrumbs, select whether to include these elements.
- 5 Click Save to open a download window for your browser.
- 6 Select the location where you want to save the image.

# **Export Data from a Visualization**

You can export the data from a visualization in comma-separated values (.csv) format. You can open .csv files in other software such as SAS Enterprise Miner, SAS Enterprise Guide, or Microsoft Excel.

To export data for a visualization:

- 1 Select the visualization for which you want to export data.
  - **Note:** Table visualizations do not support exporting data. For crosstab visualizations, a data summary is exported instead of a full data table.
- 2 If your visualization contains hierarchies, drill down to the hierarchy levels that you want to export.
- 3 Select the ▼ drop-down list from the visualization toolbar, and then select **Export**Data to open a download window for your browser.

Note: For a crosstab visualization, select Export Data Summary instead of Export Data.

4 Specify a filename and select the location where you want to save the file.

### E-mail a Visual Exploration as a Link

To e-mail your visual exploration as a link:

- Select **File** ▶ **E-mail**. The E-mail window appears.
- 2 Enter the following information:

#### To

specifies the e-mail destination. To enter multiple addresses, separate the addresses by using commas, semicolons, or spaces.

#### From

specifies the e-mail address that is shown as the sender of the e-mail. This email address is used for notifications if the e-mail cannot be delivered to the addresses in the **To** field.

#### **Subject**

specifies the subject line of the e-mail.

#### Message

specifies the text for the e-mail message body. This field is optional.

Note: The message body of the e-mail automatically includes a link to the current visual exploration. If you specify text for the Message field, then your text appears before the link in the e-mail.

Click **OK** to send the e-mail.

# Managing Hierarchies

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# Overview of Hierarchies in SAS Visual Analytics Explorer

### What Is a Hierarchy?

A hierarchy is an arrangement of category columns that is based on parent-child relationships. The levels of a hierarchy are arranged with more general information at the top and more specific information at the bottom.

For example, you might create a hierarchy of date-time columns with Year as the top level, Month as the next level, and Day as the bottom level.

Creating hierarchies enables you to add drill-down functionality to your visualizations. For example, if you use a date-time hierarchy, you can drill down to the data for a specific year. Then, you can drill down to the data for a specific month.

When you drill down a hierarchy, a set of breadcrumb links at the top of your visualization enables you to drill back up the hierarchy.

### **Hierarchy Management Tasks**

In SAS Visual Analytics Explorer (the explorer), you can perform the following tasks to manage hierarchies:

- "Create a New Hierarchy"
- "Derive a Hierarchy from a Date, Time, or Datetime Data Item"
- "Edit a Hierarchy"
- "Delete a Hierarchy"

# **Create a New Hierarchy**

To create a new hierarchy:

- 1 Select **Data** ▶ **New Hierarchy**. The New Hierarchy window appears.
- 2 In the **Name** field, enter a name for the hierarchy.
- 3 Select the categories that you want to include in the hierarchy, and then click → to add them to the hierarchy.

**Note:** You can also drag and drop categories.

To change the order of the categories in your hierarchy, select the category that you want to move. Then, click **↑** to move the category up, or click **↓** to move the category down.

To remove a category from the hierarchy, select the category that you want to remove. Then, click .

4 Click **OK** to finish creating the hierarchy.

Note: You can create a hierarchy from within a crosstab visualization. See "Create Hierarchies from a Crosstab" on page 197.

### Derive a Hierarchy from a Date, Time, or **Datetime Data Item**

For date, time, and datetime data items, you can derive a hierarchy automatically. To derive a hierarchy, right-click on a date, time, or datetime data item in the **Data** pane, and then select one of the following values:

#### Create Date Hierarchy

creates a hierarchy with levels for year, quarter, month, and day. Depending on the format of the data item, some of the levels might not be created.

#### **Create Date and Time Hierarchy**

creates a hierarchy with levels for year, quarter, month, day, hour, minute, and second. Depending on the format of the data item, some of the levels might not be created.

#### **Create Time Hierarchy**

creates a hierarchy with levels for hour, minute, and second. Depending on the format of the data item, some of the levels might not be created.

New calculated items are created for each level in the hierarchy. By default, the new calculated items are hidden in the **Data** pane. If you delete a derived hierarchy, then a window appears. The window enables you to delete the calculated items that are associated with the hierarchy.

# **Create a Hierarchy from a Treemap Visualization**

You can create a hierarchy from a treemap visualization. See "Create a Hierarchy from a Treemap" on page 214.

# **Edit a Hierarchy**

To edit an existing hierarchy:

- 1 From the **Data** pane, right-click on the hierarchy that you want to edit, and then select **Edit**. The Edit Hierarchy window appears.
- 2 In the **Name** field, enter a name for the hierarchy.
- 3 To add a category to the hierarchy, select the category, and then click .

Note: You can also drag and drop categories.

To change the order of the categories in your hierarchy, select the category that you want to move. Then, click ↑ to move the category up, or click ↓ to move the category down.

To remove a category from the hierarchy, select the category that you want to remove. Then, click .

4 Click **OK** to save the changes to your hierarchy.

# **Delete a Hierarchy**

To delete a hierarchy:

From the **Data** pane,, right-click on the hierarchy that you want to delete, and then select **Delete**. Click **Yes** to confirm that you want to delete the hierarchy.

# Performing Data Analysis

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# Overview of Data Analysis in SAS Visual Analytics Explorer

### **Types of Data Analysis**

SAS Visual Analytics enables you to perform three basic types of data analysis:

#### Correlation

identifies the degree of statistical relationship between measures.

#### Fit Line

plots a model of the relationship between measures. There are many types of fit lines, including linear fit, quadratic fit, cubic fit, and penalized B-spline.

#### Forecasting

estimates future values for your data based on statistical trends.

#### **Correlation**

Correlation identifies the degree of statistical relationship between measures. The strength of a correlation is described as a number between -1 and 1. A value that is close to -1 implies a strong negative correlation, a value that is close to 0 implies little or no correlation, and a value that is close to 1 implies a strong positive correlation.

To apply correlation to a visualization, add a linear fit line, or select the correlation matrix visualization type.

For a heat map or a simple scatter plot, the correlation is identified by a text label in the visualization legend. Select ① to view additional details about the correlation, including the exact correlation value.

For a scatter plot matrix, the correlation for each plot is identified by a colored border around the plot. The visualization legend displays a key for the color values. Select ① to view additional details about the correlation, including the exact correlation values for each plot.

**Note:** For nonlinear fit types, a scatter plot matrix displays additional plots to show each intersection of variables in two orientations. For example, if a scatter plot matrix plots the variables A, B, and C, then plots are created for both A \* B and B \* A when a nonlinear fit line is applied.

For a correlation matrix, the correlation for each cell is identified by the color of the cell background. The visualization legend displays a key for the color values. The data tip for each cell displays the correlation value.

#### **Fit Lines**

A fit line plots a model of the relationship between measures. You can apply fit lines to scatter plots and heat maps.

You can apply the following types of fit line to your visualization:

#### Best Fit

tests the cubic, quadratic, and linear fit methods against your data, and selects the fit method that produces the best result. To see which fit method was used, select 10 from the visualization legend.

#### Linear

creates a linear fit line from a linear regression algorithm. A linear fit line produces the straight line that best represents the relationship between two measures. For more information about the linear fit line, select ① from the visualization legend.

For a linear fit, correlation is automatically added to the visualization. Correlation is not available with other fit types.

#### Quadratic

creates a quadratic fit line. A quadratic fit produces a line with a single curve. A quadratic fit line often produces a line with the shape of a parabola. For more information about the quadratic fit line, select ① from the visualization legend.

#### Cubic

creates a cubic fit line. A cubic fit line produces a line with two curves. A cubic fit line often produces a line with an "S" shape. For more information about the cubic fit line, select (i) from the visualization legend.

#### **PSpline**

creates a penalized B-spline. A penalized B-spline is a smoothing spline that fits the data closely. A penalized B-spline can display a complex line with many changes in its curvature. For more information about the penalized B-spline, select 1 from the visualization legend.

### **Forecasting**

Forecasting estimates future values for your data based on statistical trends. Forecasting is available only for line charts that contain date or time data items.

A forecast adds a line with a predicted values to your visualization and a colored band that represents the 95% confidence interval. The 95% confidence interval is the data range where the forecasting model is 95% confident that the future values will be.

The explorer automatically tests multiple forecasting models against your data, and then selects the best model. To see which forecasting model was used, select ① from the visualization legend.

The forecast model can be any one of the following:

- Damped-trend exponential smoothing
- Linear exponential smoothing
- Seasonal exponential smoothing
- Simple exponential smoothing
- Winters method (additive)
- Winters method (multiplicative)

# Add a Fit Line to an Existing Visualization

To add a fit line to a scatter plot or heat map, select the <sup>₹</sup> drop-down list from the visualization toolbar, and then select **Fit Line** ▶ [*fit-type*]. For information about the fit types that are available, see "Fit Lines" on page 263.

## Add Forecasting to an Existing **Visualization**

To add data analysis to a line chart, select the <sup>†</sup> drop-down list from the visualization toolbar, and then select Show Forecast.

**Note:** To apply forecasting, the line chart must contain a date, time, or datetime item.

On the **Properties** tab for the line chart visualization, you can adjust the number of data points to predict by using the **Duration** option.

On the **Roles** tab, you can add measures to the forecast as **Underlying factors**. The forecasting model evaluates the additional measures to determine whether they contribute to the accuracy of the forecast. If the additional measures do not increase the accuracy of the forecast, then they are not used. If the additional measures do increase the accuracy of the forecast, then the forecast line is adjusted, and the confidence bands are narrowed.

If your forecast includes underlying factors, then you can apply scenario analysis to the forecast. For more information, see "Apply Scenario Analysis to a Forecast" on page 266.

# **Forecast Measures as a New** Visualization

To create a visualization that forecasts multiple measures:

- Select **Analysis** ► **Forecast**. The Forecast window appears.
- 2 From the **Date category** drop-down list, select the date, time, or datetime data item for the forecast.

- **3** From the **Forecast** area, select the measures that you want to include in the forecast.
- 4 (Optional) If you selected a single measure for Forecast, then you can also select additional measures to use as Underlying factors in the forecast. The forecasting model evaluates the additional measures to determine whether they contribute to the accuracy of the forecast. If the additional measures do not increase the accuracy of the forecast, then they are not used. If the additional measures do increase the accuracy of the forecast, then the forecast line is adjusted, and the confidence bands are narrowed.
- 5 In the **Forecast duration** field, enter the number of data values that you want to predict for the forecast.
- 6 Click **OK** to create the visualization. The visualization is created as a line chart.

# **Apply Scenario Analysis to a Forecast**

If the forecast for a line chart contains underlying factors, then you can apply scenario analysis to explore hypothetical scenarios.

To apply scenario analysis:

- 1 If the table view for the line chart is not shown, then select the ₹ drop-down list from the visualization toolbar, and then select **Show table view**.
- 2 In the table view, select the **Scenario Analysis** tab. For each of the measures that are assigned to the forecast as underlying factors, a line displays the values of the measure, and a series of points enables you to set the future values for the measure.
- **3** Use the check box beside each measure to choose which measures are used in the scenario analysis.

- 4 For each measure in the scenario analysis, set the future data values. You can set the values by using any of the following methods:
  - drag each data point upward or downward on the line plot on the **Scenario Analysis** tab. To select the accuracy of the points, select the ₹ icon beside the measure name, and select **Snap interval**.
  - enter the value for each data point. Right-click on each data point, and select **Set** point value.
  - set all of the values for the measure. Right-click on a data point, and select Set series values. The Change future values window enables you to set all of the values to a specific value or to adjust the future values relative to the most recent observed value of the measure.

To reset any data point to its original value, right-click on the data point, and then select Reset point.

To reset all of the data points for a measure, right-click on any data point for the measure, and then select Reset entire series.

- 5 When you are finished setting the future data values for the scenario, click **Update** to apply the scenario to the forecast.
  - The forecast is updated to show the results of the scenario. The original forecast is displayed as an additional line that is labeled (Baseline).

To remove the scenario analysis from a forecast, click Reset to forecast on the Scenario Analysis tab.



# **Designing Reports**

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# Overview of SAS Visual Analytics Designer

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# About the SAS Visual Analytics Designer

The SAS Visual Analytics Designer (the designer) enables users to easily create reports or dashboards that can be saved and viewed on either a mobile device or in the viewer. The designer is part of the SAS Visual Analytics product that enables a user with either the SAS Visual Analytics: Analysis role or the SAS Visual Analytics:

**Administration** role can view, interact with, and create reports. Simply open an existing report and interact with the information based on your current needs. Report authors can easily point and click to query central sources of data. You can drag and drop tables, graphs, and gauges to create a well-designed report. You can also add text, images, stored processes, and controls to reports. All of this is accomplished by using

the designer, which runs in a web browser. You do not need to understand a programming language to create reports.

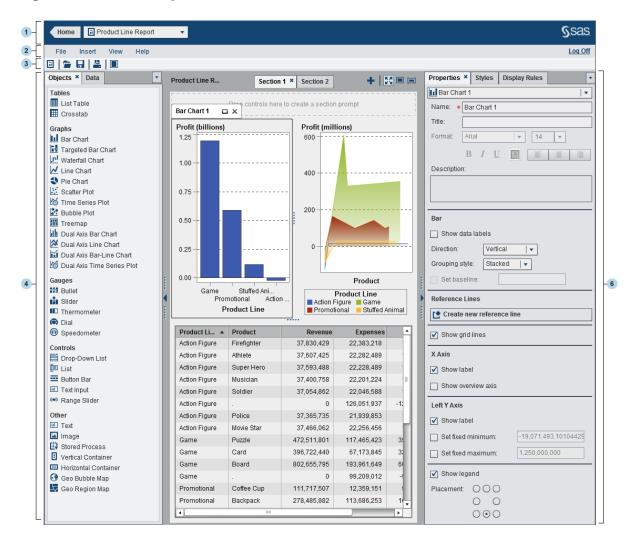
Report authors can easily create reports and dashboards based on data sources that have been provided by a system administrator. They can update reports that were created from visual explorations. Report authors can create reports by importing objects or visual explorations from other reports. They can also define interactions (either filtering or brushing) for report objects, and then include SAS analytical results in a single report.

# **Your First Look at the Designer**

When you are designing reports in SAS Visual Analytics, you see the designer. In general, data-related tasks are initiated from the leftmost pane, and presentation-related tasks are initiated from the rightmost pane.

#### Here are the features of the designer:

Figure 27.1 The Designer



The application bar enables you to return to the SAS Visual Analytics home page and access your recently created or viewed reports. You can also access recently used visual explorations, stored processes, or visual data builder queries in your recent history. When you select a visual exploration, the application takes you to the explorer. When you select a stored process, the application takes you to SAS Visual Analytics Viewer (the viewer). When you select a visual data builder query, the application takes you to SAS Visual Data Builder (the data builder).

- 2 The menu bar provides menu items that apply to the entire report or to the currently displayed report section. Actions include creating a new report, adding a new section, inserting new report objects, adding interactions, and launching the viewer without returning to the home page. You can also log off from SAS Visual Analytics.
- The toolbar contains icons that enable you to manage your reports. You can click to hide the left and right panes. Or, you can click to display the left and right panes. You can access the report views by clicking ➡, ■, or on the menu bar.
- 4 The Objects, Data, Imports, and Shared Rules tabs are in the left pane. The Objects and Data tabs are displayed by default. You can choose to display icons instead of names on the tabs. To display the icons on the tabs, click ▼ after the last tab name, and select Show icons only. From this menu, you can also choose which tabs are displayed.

The **Objects** tab provides a list of the tables, graphs, gauges, and controls that can be used in a report or dashboard.

The **Data** tab enables you to select a data source (or data sources) and the data items for your report. You can add, refresh, or remove a data source using the icons above the list of data items. Using the menu, you can change the data source, define a hierarchy, define a calculated item, define an aggregated measure, and show or hide data items. You can check the details for the measures in the data set. For more information, see "Working with Data Items in a Report" on page 355.

The data item table on the **Data** tab provides information about a selected data item, including the name, role, format, aggregation, and sort options. These data item properties can be modified, which impacts all of the report objects that use the data item. For more information, see "Modify Data Item Properties" on page 368.

The **Imports** tab provides a list of reports and report objects that have been created in the designer or exported from the explorer. This enables you to create reports from multiple data sources and create full-featured reports. You can choose objects or sections in these reports to include in either a new or an existing report.

The **Shared Rules** tab enables you to create a new display rule for a gauge, which is used by other gauges to designate intervals and colors for ranges. You can edit or

- delete an existing shared display rule. These display rules are shared across multiple gauges and can be created at any time.
- 5 The canvas is the workspace for building a report. You can modify the canvas using the report view icons on the toolbar. For more information, see "Creating a New Report" on page 288. The appearance of the canvas is affected by the report theme. For more information, see "Report Themes" on page 279.
  - A report can have multiple sections, which can be accessed by using the tabs at the top of the canvas. For more information, see "Maintaining Multi-Section Reports" on page 461.
  - There is an area at the top of the canvas where you can drop filter controls and then categories to create section prompts.
- **6** The tabs in the right pane enable you to work with details about the report and report objects. The **Properties**, **Styles**, and **Display Rules** tabs are displayed by default. You can choose to display icons instead of tab names on the tabs. To display the icons on the tabs, click \* after the last tab name, and select **Show icons only**. From this menu, you can also choose which tabs are displayed.
  - The **Properties** tab lists the properties for the currently selected report or report object. The report's title and description are listed. The object's name, title, and description are listed. Information that is specific to the report object type, such as the axes and legend, are listed. If a report object is not selected on the report canvas, then the properties are for the section and the report.

The **Styles** tab enables you to specify the data styling, frame styling, text styling, and data colors for a selected report object. You can specify the report theme for the report.

The **Display Rules** tab enables you to populate, add intervals, or color-mapped values for an object that is currently selected on the report canvas. You can edit or delete an existing display rule for the selected table, graph, gauge, or control. For more information, see "Overview of Display Rules" on page 395.

The Comments tab enables you to add comments to the report after you save it. For more information, see "Adding Comments to Reports" on page 345.

The **Filters** tab enables you to add a filter (or filters) to the selected report object. For more information, see "About Report Filters" on page 411.

The **Interactions** tab enables you to add or update filter or brush interactions with the report objects in a section. For more information, see "Creating Interactions" on page 434.

The **Ranks** tab enables you to add rankings to report objects. For example, you might want to see the top 10 products that sold last year. For more information, see "Overview of Ranking in Reports" on page 455.

The **Roles** tab enables you to add or update data role assignments in a selected report object that has a data source. For more information, see "Modifying Data Role Assignments in Report Objects" on page 386.

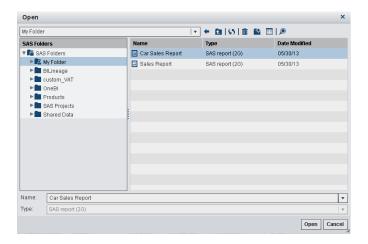
# **Open Window**

### **About the Open Window**

Click **=** on the menu bar or select **File** ▶ **Open** to display the Open window.

The Open window enables you to search for and open saved reports. In addition, the Open window enables you to create new folders and perform many other tasks on selected reports and folders.

#### Display 27.1 Open Window



### **Working with Folders in the Open Window**

You can work with folders in the Open window. Icons in the Open window are located to the right of the drop-down list of folder names, as shown in Display 27.1 on page 277.

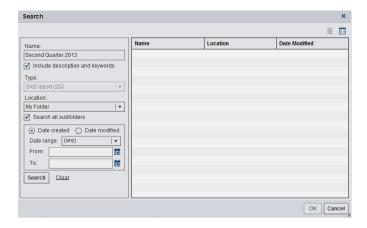
lcon	Action
+	Navigates back one level.
<b>a</b>	Navigates up one level.
\$5	Refreshes the items in the current location.
â	Deletes the selected item.
\$	Creates a new folder.
	Specifies either the <b>Details</b> or <b>List</b> view.
P	Opens the Search window.

You can create a new folder when you copy a report, move a report, or save a report.

#### **Search Window**

The Search window in the designer enables you to find the report that you need. For example, you might need to navigate through multiple folders to find a report. In the Open window, click P to open the Search window.

Display 27.2 Search Window



#### To search for a report:

- 1 In the **Name** field, enter the text for which you want to search.
- 2 (Optional) To include descriptions in your search, select the Include description and keywords check box.
- 3 Select a **Location**. If you want to search multiple folders, make sure that the **Search** all **subfolders** check box is selected.
- 4 (Optional) To limit your search by time, select a **Date range**. You can also specify either **Date created** or **Date modified**.
- 5 Click Search.

### **Report Themes**

Report themes are available in the designer. You can select a report theme for each report using the **Styles** tab. By default, the choices are **SAS Light** or **SAS Dark**. Your site might also have custom report themes. Custom report themes are automatically created when a coordinating custom application theme is created in SAS Theme Designer for Flex.

Alternatively, you can set a preference for a default report theme. For more information, see "Specifying Your Preferences for the Designer" on page 281.

Users who have the **Theme Designer for Flex:Administration** role or a custom role that has the Customize Themes capability enabled will see a Customize Theme button on the Styles tab. Click Customize Theme to go to SAS Theme Designer for Flex. For more information about report styles and application themes, see SAS Theme Designer for Flex: User's Guide.

# Specifying Preferences for SAS Visual Analytics Designer

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# Specifying Global and General Preferences

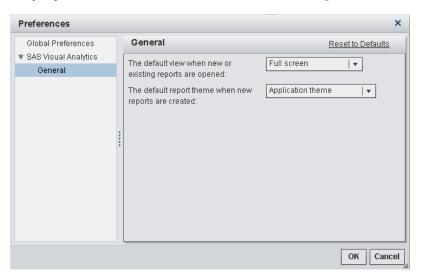
To specify global SAS preferences, see "Specifying Global Preferences" on page 16. To specify general preferences, see "Specifying the SAS Visual Analytics General Preferences" on page 17.

# **Specifying Your Preferences for the Designer**

To specify preferences that are specific to SAS Visual Analytics Designer (the designer):

- 1 Select **File** ▶ **Preferences** to open the Preferences window.
- 2 Select SAS Visual Analytics ▶ General.

Display 28.1 Preferences Window for the Designer



- 3 Specify your default view for new or existing reports. Select Full screen, Tablet (for mobile devices), or Wide-screen tablet. Full screen is the default.
- 4 Select your default report theme. Select **Application theme**, **SAS Light**, or **SAS Dark**. **Application theme** is the default.
- 5 Click **OK** to apply your changes.

# **Opening Reports**

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# **Opening Reports in the Designer**

Reports in SAS Visual Analytics Designer (the designer) are saved when you use either the Save window or the Save As window. A saved report contains at least one section. Typically, a section uses data items from a data source to perform queries. The section displays the results with one or more report objects (for example, a table, a graph, a gauge, a control, and so on).

A section is not required to contain any report objects. For example, you might have a report that you use as a template to create other reports. Your template-like report might contain data sources, calculated items, global data filters, and shared display rules, but it does not contain report objects.

#### To open a saved report:

- On the home page, select a report. In the details view, click Edit. Or, you can double-click on the report that you want to open.
- In the designer:
  - □ Select **File Recent**, and then select a report name.

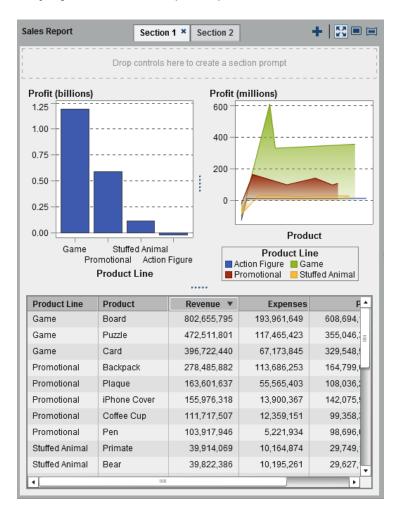
#### 284 Chapter 29 / Opening Reports

- □ Click ▼ beside the recent content drop-down list at the top of the window, and then select a report name.
- □ Click **a** on the menu bar to navigate to a report, and then select it.
- □ Select **File Den** to display the Open window.

# **An Example Report**

The following display shows a report in the designer. The report contains a bar chart, a line chart, and a list table. It has two sections.

Display 29.1 An Example Report



# Creating, Saving, E-Mailing, and Printing Reports

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# **About Reports**

You can drag and drop tables, graphs, gauges, and controls to create a well-designed report in SAS Visual Analytics Designer (the designer). You can add text, images, and other controls to reports. Reports can contain multiple sections.

When you design a report, keep in mind that it might look slightly different on a mobile device or in the viewer. For example, the layout of the tiles in the treemap is dependent on the size of the display area. This means that the same treemap might appear slightly

different in the designer than it does in the viewer or on a mobile device. For more information about treemaps, see "About Treemaps" on page 315.

Reports that are imported from SAS Visual Analytics Explorer (the explorer) might look slightly different in the designer.

The designer provides a report view that enables you to change the size of the canvas that you use for laying out reports. There are three report views: **Full Screen**, **Tablet**, or **Wide-Screen Tablet**. The default report view is **Full Screen**. You can access the report views from the **View** menu or by the icons ( $\Sigma$ ,  $\blacksquare$ , or  $\blacksquare$ ) on the menu bar.

Two report layouts are available in the designer: **Precision** and **Tiled**. For more information, see "Choosing a Report Layout" on page 291.

# **Creating a New Report**

There is no single process for creating a new report in the designer. For example, some users select their data source (or data sources) before they add the report objects while other users add report objects to the canvas and then select their data source (or data sources). Some users choose to update the properties and styles for their reports while other users choose not to. The following list of steps is one way that you can create a new report in the designer.

To create a new report:

- 1 Select a data source with the associated data items. For information about selecting data, see Chapter 32, "Selecting Data for Reports," on page 349.
- 2 (Optional) Select the layout (precision or tiled) for the report. For more information, see "Choosing a Report Layout" on page 291.
- 3 Select the report object (or report objects) that you want to use in the report. For information about selecting report objects, see "Using Tables, Graphs, Gauges, Controls, and Other Report Objects" on page 300.

- 4 Add report objects by dragging and dropping them onto the canvas or by doubleclicking the report object on the **Objects** tab. You can tab over a report object, and press Enter to add the report object to the canvas.
- 5 Add data items to report objects by dragging and dropping them onto the canvas or by right-clicking on the report object (or report objects) and using the context menu.
- 6 (Optional) Update the properties for the report and the report objects. For information about properties, see "Using Tables, Graphs, Gauges, Controls, and Other Report Objects" on page 300.
- 7 (Optional) Update the styles for the report objects. For information about selecting styles, see "Using Tables, Graphs, Gauges, Controls, and Other Report Objects" on page 300.
- 8 (Optional) Modify data role assignments. For more information, see "Modifying Data" Role Assignments in Report Objects" on page 386.
- 9 (Optional) Create or modify display rules. For more information, see "Adding Display Rules to a Gauge" on page 408.
- 10 (Optional) Add filters to the report. For more information, see "About Report Filters" on page 411.
- 11 (Optional) Add interactions between the report objects in a section. For more information, see "Overview of Interactions" on page 433.
- 12 (Optional) Add a rank to a report object (or report objects). For more information, see "Adding a New Rank" on page 456.
- 13 (Optional) Add a new section (or sections) to the report. For more information, see "Overview of Report Sections" on page 461.
- 14 Save your report. For more information, see "Saving a Report" on page 294.
- **15** (Optional) E-mail your saved report. For more information, see "E-mailing a Report" on page 295.

**16** (Optional) Add comments to your saved report. For more information, see "Adding Comments to Reports" on page 345.

You can create a new report based on an existing report or on existing report objects from a report that you have imported. For more information, see "Basing a New Report on Report Objects Imported from One or More Existing Reports" on page 292.

# **Specify Report Properties**

You can view or update report properties using the **Properties** tab in the right pane. For example, you can view a report title and specify a description.

To view the report's title and update the description:

- 1 In the right pane, click the **Properties** tab.
- 2 Click ▼ to open the object inventory list, and then select the report name.

Here is an example of an object inventory list for a report:

Display 30.1 Object Inventory List on the Properties Tab

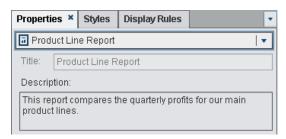


**Note:** You can use the object inventory list to navigate to different sections or report objects.

3 (Optional) Update the **Description** for the report.

Here is an example of the title and the description for a report:

Display 30.2 Report Properties



You can use the **Properties** tab to update the properties for individual report objects. The available properties depend on the selected report object. For information about updating report object properties, see "Using Tables, Graphs, Gauges, Controls, and Other Report Objects" on page 300.

# **Choosing a Report Layout**

The following report layouts are available in the designer:

#### Precision

enables you to place, align, and size report objects. The precision layout allows report objects to overlap, and lets users control the depth order of these overlapping objects by sending objects backward or bringing them forward. (For example, you might want your company logo to display behind a bar chart and a pie chart in your report).

This layout option is keyboard accessible.

#### Tiled

provides you a quick way to place report objects directly next to other report objects. The report objects cannot overlap. All report objects in the section are sized to fit in one screen. If you adjust the size of an object, then the other objects automatically resize to ensure that all objects continue to fill the entire screen.

**Note:** You can switch from the tiled layout to the precision layout after you have added report objects to your report. However, this action can change the size and the position of the report objects.

To choose your report layout:

- Select a section tab.
- 2 In the right pane, click the **Properties** tab.
- 3 For Layout, select either Precision or Tiled. The Tiled layout is the default.
  Here is an example of the Precision layout on the Properties tab:

Display 30.3 Properties Tab for Precision Layout



4 (Optional) If you select **Precision**, then you can specify **Fit to screen**. The **Fit to screen** option prevents objects from being sized too wide or too tall, which can cause the report viewing area for the section to scroll.

# Basing a New Report on Report Objects Imported from One or More Existing Reports

If there is an existing saved report that closely matches the report that you want to create, then you can open the existing report that contains the report objects that you want to reuse. The report objects can be from either a report that has been saved in the designer or from a report that has been exported from the explorer. (For example, you might want to reuse calculated data items or hierarchies from an existing report in your

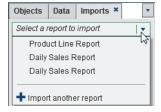
current report.) You can immediately save the report with a new name, or you can customize the existing report, and then save it.

To base a new report on report objects that have been imported from one or more existing reports:

- Open or import the existing report by doing one of the following:
  - On the home page, double-click on the report that you want to open.
  - In the designer, do one of the following:
    - Select **File** ▶ **Recent**, and then select the report name.
    - Click vertex beside the recent content drop-down list at the top of the window, and then select a report name.
    - Click on the menu bar to navigate to a report, and then select it.
    - □ Select **File Den** to display the Open window and select a report.
    - □ Click Imports in the left pane. If the Imports tab is not visible, select View > Imports.

Select a report name from Select a report to import, or click Import another **report** to display the Open window, where you can select a report.

Display 30.4 Imports Tab with a Report List



In the tree view on the left, a list of sections and report objects appears. Drag a single report object, multiple report objects, or an entire section that you want to include in the new report, and drop it onto the canvas.

Display 30.5 Imports Tab with a List of Report Objects



**Note:** Report objects that cannot be imported from the explorer are not displayed on the **Imports** tab.

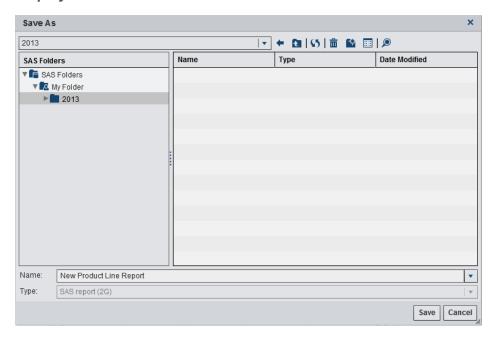
- 2 (Optional) Modify the report objects, properties, styles, roles, filters, and display rules.
- 3 Select **File** ▶ **Save**, or click **,** which displays the Save As window. Enter a **Name**. Report names cannot use these characters: / \
- 4 Click Save.

# **Saving a Report**

To save a report:

- 1 Select **File** ▶ **Save**, or click ... If you are saving a new report, then the Save As window is displayed.
- 2 For a new report, enter a **Name**. Report names cannot use these characters: / \ If you are saving an existing report, then the name of that report is listed. You can either leave the name as it is and overwrite the existing report, or you can change the name to create a new report.

Display 30.6 Save As Window



Click Save.

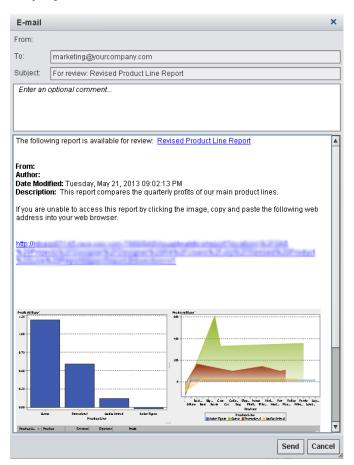
# E-mailing a Report

You can e-mail a report to someone. If the recipient opens the e-mail message on a PC or Mac with a Flash-enabled viewer, and then clicks the e-mail link, then the report is displayed in the viewer. If the recipient opens the e-mail message on a mobile device, and then clicks the e-mail link, then the report is displayed using the SAS Mobile BI app if the user has it installed.

To e-mail a report from the designer:

- Select **File** ▶ **E-mail**. The E-mail window is displayed. The URL for the report is automatically generated, and a preview appears in the e-mail message.
- Enter the recipient's e-mail address.

Display 30.7 E-mail Window



- 3 (Optional) Enter a comment for the report.
- 4 Click Send.

# **Printing a Report**

This is a pre-production feature.

Note: You must save a report before you can print it.

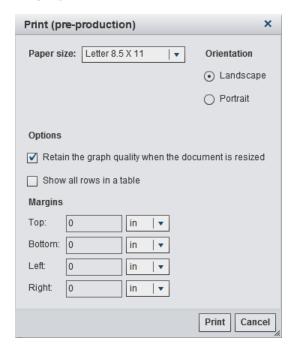
#### To print a report:

- Select **File** ▶ **Print**, or click **!**. The Print window is displayed.
- Select the Paper size, Orientation, Options, and Margins.

Clearing the Retain the graph quality when the document is resized check box means that the quality of the report will be compromised if you look at the report at a zoom percentage greater than 100%.

Selecting the Show all rows in a table check box means that the data in the table will not be truncated. Specifying this option can impact the layout of the table.

Display 30.8 Print Window



Click Print.

# Displaying Results Using Report Objects

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# Using Tables, Graphs, Gauges, Controls, and Other Report Objects

After selecting your data source and data items, add one or more report objects to display the results. The SAS Visual Analytics Designer (the designer) provides report objects for all of your reports. (You can also select data after you add report objects to the canvas.) Report objects in the designer are grouped into these types on the **Objects** tab in the left pane and in the **Insert** menu: **Tables**, **Graphs**, **Gauges**, **Controls**, and **Other**.

The following table types are available in the designer:

- list tables
- crosstabs

For more information, see "Using Tables to Display Results" on page 303.

The following graph types are available in the designer:

- bar charts
- targeted bar charts
- waterfall charts
- line charts
- pie charts
- scatter plots
- time series plots
- bubble plots
- treemaps
- dual axis bar charts
- dual axis line charts
- dual axis bar-line charts
- dual axis time series plot

For more information, see "Using Graphs to Display Results" on page 310.

The following gauges types are available in the designer:

- bullet
- slider
- thermometer
- dial

speedometer

For more information, see "Using Gauges to Display Results" on page 321.

The following control types are available in the designer:

- drop-down lists
- lists
- button bars
- text input fields
- range sliders

For more information, see "Using Controls to Display Results" on page 327.

These other objects are also available in the designer:

- text
- image
- stored processes
- vertical containers
- horizontal containers
- geo bubble maps
- geo region maps

For more information, see "Using Other Object Types in Reports" on page 332.

In the designer, you have access to report with report objects from SAS Visual Analytics Explorer (the explorer). You can open a histogram, heat map, box plot, or correlation matrix in a report that has been exported from the explorer. However, you cannot create new histograms, heat maps, box plots, or correlation matrices in the designer.

# **Using Tables to Display Results**

# **Overview of the Table Types**

#### **About List Tables**

A list table is a two-dimensional representation of data in which the data values are arranged in unlabeled rows and labeled columns. List tables can use any data items from a data source. A list table cannot use a hierarchy or a percentage of total item.

By default, a list table contains aggregated data with one row for each distinct combination of category values. However, if the **Show detail data** check box has been selected, then all of the data is not aggregated.

You can add sparklines to a column (if the data source contains a date data item) when aggregated data is displayed in the list table.

**Display 31.1** A List Table

Product Line	Revenue	Expenses	Profit ▼	Profit Trend
Game	1,671,890,035	477,809,929	1,194,080,107	
Promotional	813,699,290	223,822,374	589,876,916	~
Stuffed Animal	276,990,966	159,548,680	117,442,285	
Action Figure	262,318,761	281,390,254	-19,071,493	

#### **About Crosstabs**

A crosstab (also known as a crosstabulation table) shows an aggregate metric for the intersections of two or more categories. Crosstabs often have two or more categories assigned to both the rows and columns, forming a matrix. Crosstabs can be easier to read than list tables because they often use less space, and they always collapse repeating values for outer category data items into one unique value, which is known as grouping. You can choose to show subtotals and totals by selecting the appropriate check box (or check boxes) on the **Properties** tab for the crosstab. A crosstab can use a hierarchy.

You cannot add a sparkline or display rules to a crosstab.

You should consider placing lower cardinality (fewer distinct values) categories on the columns and higher cardinality (more distinct values) categories on the rows. Crosstabs can help you improve readability especially when there are several category data items to include in your table.

Display 31.2 A Crosstab

		Date by Year ▲	2011	
Product Brand	Product Line	Product	Profit	Profit (Percent of Total)
☐  ☐ Novelty		ıl	13,791,102	0.73%
			-8,891,742	-0.47%
		Athlete	572,411	0.03%
		Firefighter	582,670	0.03%
□ <b>1</b> Toy	□ ① Action Figure	Movie Star	593,903	0.03%
		Musician	563,443	0.03%
		Police	528,432	0.03%
		Soldier	536,218	0.03%
		Super Hero	578,688	0.03%
			49,058,060	2.61%
		mal	2,054,767	0.11%
			4	

**Note:** By default, frequency is displayed only when there are no measures in the crosstab.

## **Insert a Table into a Report**

- 1 To insert a table into a report, choose one of the following methods:
  - Drag the table icon from the **Objects** tab in the left pane and drop it onto the report canvas.

Select **Insert** ▶ **Tables**, and then select the table object that you want to insert. The table is automatically placed in the report canvas. If you want the table to appear in a different location, then drag and drop it in a new location.

Note: For list tables only, you can press the Ctrl key to select multiple data items, and then drag and drop them onto the table in the report canvas.

The following table lists the available table objects:

lcon	Table Type
	List Table
<b></b>	Crosstab

- To insert the data items that you want to use in the table:
  - Drag and drop data items onto the table.
  - Use the Roles tab in the right pane, and then specify the Category and Frequency roles.

# **Specify Table Properties**

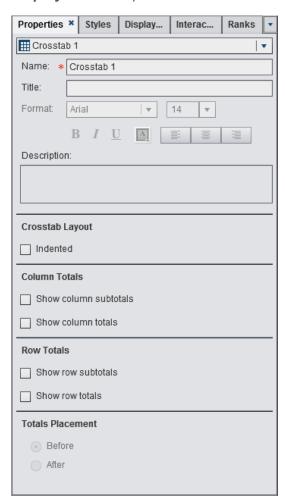
To specify the properties for tables:

- If it is not already selected, select the table in the report canvas that you want to update.
- In the right pane, click the **Properties** tab.
- 3 Update the general properties for the table. You can update the **Name**, **Title**, Format, and Description.
- Update the object-specific properties for the table.
  - For a list table, you can specify that you want to enable sorting and that you want to show detail data, headings, and totals.

For a crosstab, you can specify that you want an indented layout and totals and subtotals for columns, rows, or both. You can specify the placement of the totals and subtotals. For more information, see "Add Percentage of Total or Percentage of Subtotals to a Crosstab" on page 308.

Here is an example of the properties for crosstabs:

Display 31.3 Properties for a Crosstab



# **Specify Table Styles**

To specify styles for tables:

- If it is not already selected, select the table in the report canvas that you want to update.
- 2 In the right pane, click the **Styles** tab.
- 3 Update the styles for the table.

For a list table, you can customize the colors of Cells, Column headings, and Totals.

For a crosstab, you can customize the colors of Cells, Row headings, Column headings, Measure headings, Totals, and Subtotals.

### Add Sparklines to a List Table

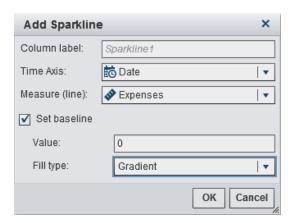
A sparkline is a small line graph that presents a single trend over time. A sparkline is about the size of one or two words, so it fits in a single cell and repeats for each row in a column. A sparkline does not have axes or labels. They are frequently used to present stock trends or production rates over time. A sparkline is intended to be both succinct and noteworthy.

In the designer, you can add sparklines to a column in a list table. The data source for the list table must include a date, datetime, or time data item before you can add a sparkline.

To add sparklines:

- 1 If it is not already selected, select the list table in the report canvas that you want to update.
- 2 Right-click the list table and then select **Add Sparkline**. The Add Sparkline window is displayed.

Display 31.4 Add Sparkline Window



- 3 Enter a Column label.
- 4 For **Time Axis**, select a date, datetime, or time data item in the current data source.
- 5 Select a Measure (line).
- 6 (Optional) Select the Set baseline check box. Enter a Value and select a Fill type. Your choices are Gradient or Solid.
- 7 Click **OK**. The sparkline is added to the last column in the list table. You can move the sparkline to another location in the table.

To edit a sparkline, right-click in the sparkline column in the list table, and then select **Edit Sparkline**. The Edit Sparkline window is displayed. Update the information, and then click **OK** to save your changes.

To delete a sparkline, right-click in the sparkline column in the list table, and then select **Remove Sparkline**.

# Add Percentage of Total or Percentage of Subtotals to a Crosstab

You can add a percentage of total, a percentage of column total, a percentage of column subtotal, a percentage of row total, and a percentage of row subtotal to a

crosstab in the designer. You can create these percentages only when the source data item has an aggregation of Sum or Count.

**Note:** The percentage of total or percentage of subtotals is relative to the subset of data that is selected by your filters and ranks.

For example, you might derive the percentage of total for a measure that contains revenue values

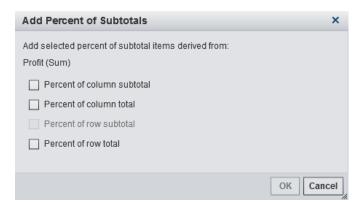
To add a percentage of total to a crosstab:

- If it is not already selected, select the crosstab in the report canvas that you want to update.
- 2 Right-click on a measure in the crosstab, and then select Add Percent of Total. The new percentage of total is added to right of the original measure in the crosstab.

To add a percentage of subtotals to a crosstab:

- If it is not already selected, select the crosstab in the report canvas that you want to update.
- 2 Right-click on a measure in the crosstab, and then select Add Percent of **Subtotals**. The Add Percent of Subtotals window is displayed.

**Display 31.5** Add Percent of Subtotals Window



- Select the check box (or check boxes) for the subtotal items.
  - Percent of column subtotal

- Percent of column total
- Percent of row subtotal
- Percent of row total

The available check boxes depend on the number of categories on rows or categories on columns for the measure that you selected.

- **4** Click **OK**. The new percentage of subtotals is added to the right of the original measure the crosstab. The default names are as follows:
  - <MeasureName> (Percent of Column Total) or <MeasureName> (Count Percent of Column Total), depending on whether the aggregation of the source measure was Sum or Count.
  - <MeasureName> (Percent of Column Subtotal) or <MeasureName> (Count Percent of Column Subtotal), depending on whether the aggregation of the source measure was Sum or Count.
  - <MeasureName> (Percent of Row Total) or <MeasureName> (Count Percent of Row Total), depending on whether the aggregation of the source measure was Sum or Count.
  - <MeasureName> (Percent of Row Subtotal) or <MeasureName> (Count Percent of Row Subtotal), depending on whether the aggregation of the source measure was Sum or Count.

# **Using Graphs to Display Results**

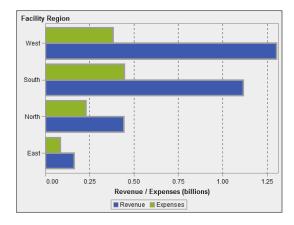
### **Overview of the Graph Types**

#### **About 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.

You can apply grouping and create lattices. You can filter or rank your data based on a specified number of top or bottom values.

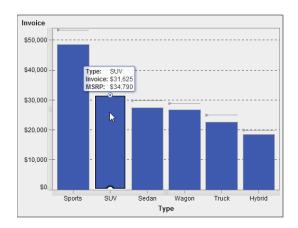
Display 31.6 A Bar Chart



#### **About Targeted Bar Charts**

A targeted bar chart is a variation of the bar chart that has pointers to target values. In this example, the pointers appear above each bar.

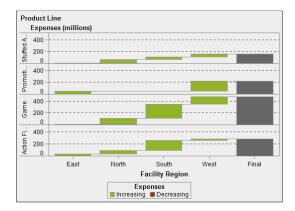
Display 31.7 A Targeted Bar Chart



#### **About 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..

Display 31.8 A Waterfall Chart

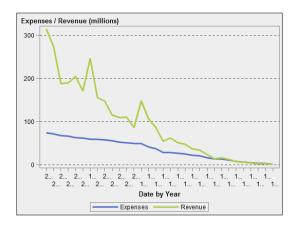


#### **About Line Charts**

A *line chart* shows the relationship of one or more measures over some interval, such as time or a series of ranges. You can measure a single measure (univariate analysis), or you can show the relationships among multiple measures (multivariate analysis), such as the leading or lagging relationship between advertising and sales over time. The category on the X axis of a line chart is discrete; the category on the X axis of a time series plot is continuous.

You can apply grouping and create lattices.

Display 31.9 A Line Chart

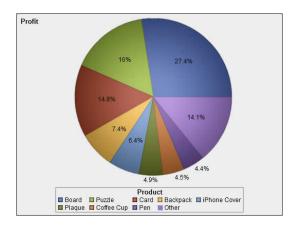


#### **About Pie Charts**

A pie chart displays a part-to-whole relationship in a circle divided into multiple slices for each value of a category data item based on a single measure data item. Each slice represents the relative contribution of each part to the whole. In a pie chart, the legend is sorted by contribution.

Effective pie charts limit the number of slices to 5 or 6. In the designer, you can use a rank to reduce the number of slices in a pie chart. For more information, see "Adding a New Rank" on page 456.

Display 31.10 A Pie Chart

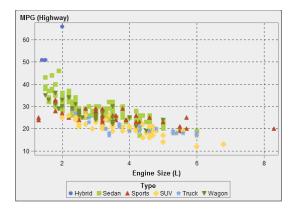


#### **About Scatter Plots**

A *scatter plot* is a two-dimensional plot that shows the relationship of two measure data items. Each marker (represented by a symbol such as a dot, a square, or a plus sign) represents an observation. The marker's position indicates the value for each observation. Use a scatter plot to examine the relationship between numeric data items. You can apply grouping by assigning a category to the **Color** role.

Scatter plots do not use aggregated data.

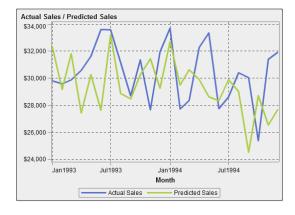
Display 31.11 A Scatter Plot



#### **About Time Series Plots**

A *time series plot* shows an ordered sequence of values that are observed at equally spaced time intervals. A time series plot requires a date, datetime, or time data item that is continuous.

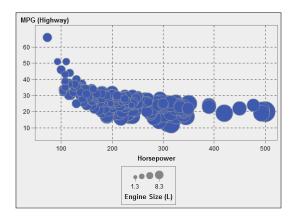
Display 31.12 A Time Series Plot



#### **About Bubble Plots**

A bubble plot is a variation of a scatter plot in which the markers are replaced with bubbles. A bubble plot displays the relationships among at least three measures. Two measures are represented by the plot axes, and the third measure is represented by the size of the plot markers. Each bubble represents an observation. A bubble plot is useful for data sets with dozens to hundreds of values. You can add categories to the **Grouping** and **Lattice** roles.

Display 31.13 A Bubble Plot



Note: A bubble's size is scaled relative to the minimum and maximum values of the size variable. The minimum and maximum sizes are illustrated in the plot legend. The actual value for each bubble is displayed as a data tip. For example, the legend that is displayed in Display 31.13 on page 315, the minimum size is 1.3 and the maximum size is 8.3.

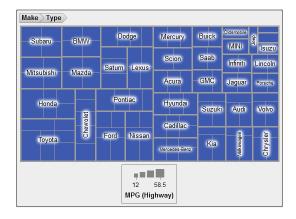
#### **About Treemaps**

A treemap displays your data as a set of rectangles (called tiles). Each tile represents a category or a hierarchy node. The color of each tile represents the value of the first measure. The size of each tile represents the value of the second measure. (There are two data roles for measures in a treemap—Size and Color.) For example, a sales data treemap might have tile sizes that represent the number of orders, and it might have tile colors that are derived from color gradients that represent sales.

Treemaps can display a large number of category values that might be hierarchical in a relatively small amount of space, so it is easy to see small changes or exceptions.

The layout of the tiles in the treemap is dependent on the size of the display area. This means that the same treemap might appear slightly different in the designer than it does in the viewer or on a mobile device.

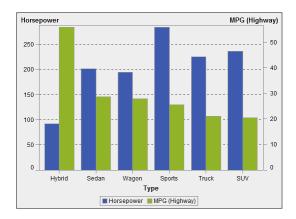
Display 31.14 A Treemap



#### **About Dual Axis Bar Charts**

A *dual axis bar chart* is a variation of the bar chart that has two measures. A measure is on each axis.

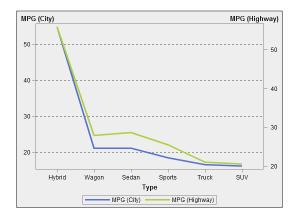
Display 31.15 A Dual Axis Bar Chart



#### **About Dual Axis Line Charts**

A *dual axis line chart* is a variation of the line chart that has two measures. A measure is displayed on both the left and right side of the Y axis. The relationship between two measures can be examined on two different scales in a dual axis line chart.

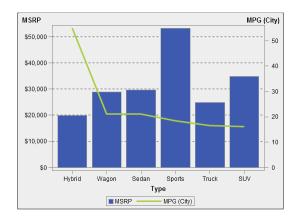
**Display 31.16** A Dual Axis Line Chart



#### **About Dual Axis Bar-Line Charts**

A dual axis bar-line chart is a variation of the bar chart that has two measures. A measure is on each axis, and the bar chart is overlaid by a line chart.

**Display 31.17** A Dual Axis Bar-Line Chart

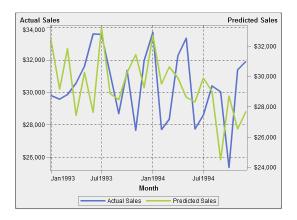


#### **About Dual Axis Time Series Plots**

A dual axis time series plot is a variation of the time series plot that has two measures. A measure is displayed on both the left and right side of the Y axis.

For example, a dual axis time series plot can be useful when you need to display two measures that have the same unit of measurement and different scales, such as quantity ordered and returns, or when you need to display two measures that have different units of measurement, such as sales and quantity ordered.

Display 31.18 A Dual Axis Time Series Plot



## **Insert a Graph into a Report**

- 1 To insert a graph into a report, choose one of the following:
  - Drag the graph icon from the **Objects** tab in the left pane and drop it onto the report canvas.
  - Select Insert ➤ Graphs and then select the menu item for the graph object that you want to insert. The graph is automatically placed in the report canvas. If you want the graph to appear in a different location, then drag and drop it in a new location.

The following table lists the available graph objects:

Icon	Graph Type
Ш	Bar Chart
16	Targeted Bar Chart
<u>pl</u>	Waterfall Chart
~	Line Chart
4	Pie Chart

Icon	Graph Type
***	Scatter Plot
ର	Time Series Plot
<b>*</b> :	Bubble Plot
H	Treemap
<u>.th</u>	Dual Axis Bar Chart
<b>×</b>	Dual Axis Line Chart
М	Dual Axis Bar-Line Chart
<b>6</b>	Dual Axis Time Series Plot

- **2** To insert the data items that you want to use in the graph:
  - Drag and drop data items onto the graph.
  - Use the Roles tab in the right pane, and then specify the Category and Frequency roles.

## **Specify Graph Properties**

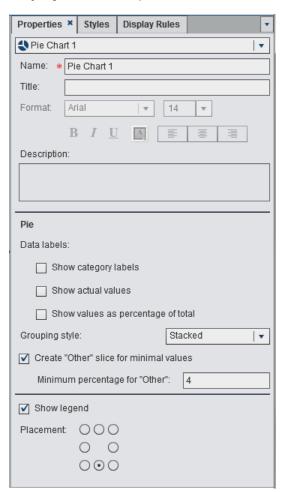
To specify the properties for graphs:

- If it is not already selected, select the graph in the report canvas that you want to update.
- 2 In the right pane, click the **Properties** tab.
- 3 Update the general properties for the graph. You can update the Name, Title, Format, and Description.

4 Update the specific properties for the graph. The available properties depend on the selected graph type. For example, for a pie chart, you can specify **Data Labels**, **Group Style**, and **Legend** properties.

Here is an example of the properties for a pie chart:

Display 31.19 Properties for a Pie Chart



## **Specify Graph Styles**

To specify styles for graphs:

- If it is not already selected, select the graph in the report canvas that you want to update.
- 2 In the right pane, click the **Styles** tab.
- 3 Update the styles for the graph. The available styles depend on the selected graph type. For example, for a pie chart, you can specify **Data Styling**, **Frame Styling**, Text Styling, and Data Colors.

# **Using Gauges to Display Results**

A gauge is a dashboard indicator (also known as a KPI) that displays the status or measure of a variable or variables in relation to a target, goal, or interval. Gauges are designed to achieve this goal in a way that is familiar to users. Many real-life objects use gauges, such as cars and machines. Gauges can be used to display a quantity, range, variable, or status. They often appear in business intelligence dashboards. Qualitative ranges are required for all gauges in the designer. You can populate the range intervals manually, or you can have them generated for you based on the range of the actual data. Gauges in the designer support high cardinality.

## **Overview of the Gauge Types**

## **About Bullet Gauges**

A bullet gauge is a horizontal dashboard indicator that compares an actual value to a target value and compares them in intervals. The actual value of the primary measure is indicated by an inset horizontal bar.

Note that the scale of a bullet gauge often begins at zero, but it can contain both positive and negative values if both types of values apply to the primary measure, such as profit. The inset horizontal bar should always begin at zero so that comparing multiple bullet graphs is not confusing.

The bullet gauge requires a primary measure and a range display rule, and the target measure is optional. The default orientation is horizontal with an option to display the gauge vertically.

Display 31.20 A Bullet Gauge



## **About Slider Gauges**

A slider gauge is a horizontal dashboard indicator that compares an actual value to a target value and compares them in intervals. The actual value of the primary measure is indicated by a downward-facing arrow. The target value is indicated by a small upward-facing arrow.

Like a bullet gauge, a slider gauge is oriented horizontally by default, but you can change the gauge's orientation to vertical. You should use a slider gauge when the numeric scale does not start at zero.

The slider gauge supports dates (which are continuous) and numeric categories.

Display 31.21 A Slider Gauge



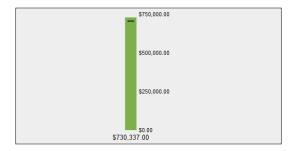
## **About Thermometer Gauges**

A thermometer gauge is a vertical dashboard indicator that compares an actual value to a target value and compares them in intervals. The actual value of the primary measure is indicated by a vertical bar. The target value is indicated by a small arrow that is facing the center of the thermometer.

The thermometer gauge requires a primary measure value and a range-based display rule. A target measure value is optional. The entire vertical bar is colored conditionally based on one color from the display rule.

The base of a thermometer bar should always start at zero. You can set this by defining your first range display rule to begin at zero. The designer always shows the base of the bar at the bottom of the thermometer.

**Display 31.22** A Thermometer Gauge



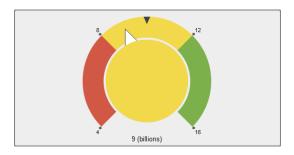
## **About Dial Gauges**

A dial gauge is an arc-shaped dashboard indicator that compares an actual value to a target value and compares them in intervals. The actual value of the primary measure is indicated by an arrow that points outward from the inner circle. The target value is indicated by an arrow that points inward from the outer arc. The color of the center circle is the color associated with the primary measure value's range interval.

The dial gauge requires a primary measure value and a range-based display rule. For more information, see "Adding Display Rules to a Gauge" on page 408.

A target measure value is optional.

Display 31.23 A Dial Gauge

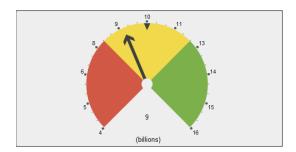


## **About Speedometer Gauges**

A speedometer gauge is a circular dashboard indicator that compares an actual value to a target value and compares them in intervals. The actual value of the primary measure is indicated by the larger pointer. The target value is indicated by a small triangle along the quantitative scale, either pointing inward or outward, depending on the **KPI skin** option for the gauge.

A speedometer gauge requires a primary measure value and a range-based display rule. A target measure value is optional.

Display 31.24 A Speedometer Gauge



## **Insert a Gauge into a Report**

- 1 To insert a gauge into a report, choose one of the following:
  - Drag the gauge icon from the **Objects** tab in the left pane and drop it onto the report canvas.

Select **Insert** ▶ **Gauges** and then select the menu item for the gauge object that you want to insert. The gauge is automatically placed in the report canvas. If you want the gauge to appear in a different location, then drag and drop it in a new location.

The following table lists the available gauge objects:

lcon	Gauge Type
***	Bullet
··	Slider
	Thermometer
(B)	Dial
<b>®</b>	Speedometer

- To insert the data items that you want to use in the gauge:
  - Drag and drop data items onto the gauge.
  - Use the Roles tab in the right pane, and then specify the Category and Frequency roles.

# **Specify Gauge Properties**

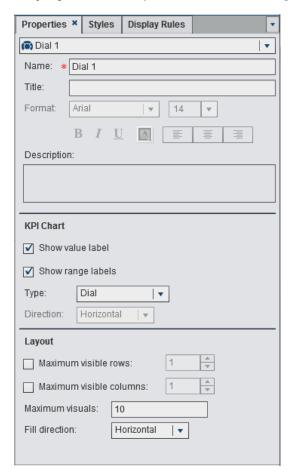
To specify properties for gauges:

- If it is not already selected, select the gauge in the report canvas that you want to update.
- 2 In the right pane, click the **Properties** tab.
- Update the general properties for the gauge. You can update the **Name**, **Title**, Format, and Description.

4 Update the specific properties for the gauge. The available properties depend on the selected gauge type. For example, for a dial gauge, you can specify KPI Chart and Layout options.

Here is an example of the properties for a dial gauge:

Display 31.25 Properties for a Dial Gauge



# **Specify Gauge Styles**

To specify styles for gauges:

1 If it is not already selected, select the gauge in the report canvas that you want to update.

- 2 In the right pane, click the **Styles** tab.
- 3 Update the styles for the gauge. The available styles depend on the selected gauge type. For example, for a dial gauge, you can specify Data Styling, Frame Styling, and Text Styling.

# **Using Controls to Display Results**

## **Overview of the Control Types**

A control is a report object that filters or narrows the scope of the data that you are currently viewing. A control enables you to group your data by a selected category, and then select which group you want to view. Controls can be used in a report with interactions.

Section prompts are the controls that are placed in the special row area at the top of the report canvas. Only the drop-down list, button bar, and text input controls can be used in section prompts. A section prompt automatically filters all of the other report objects in the same section, as long as the report object uses the same data source as the section prompt control.

You can place any control in the main area of the report canvas below the section prompt row. You must define explicit interactions (using either the Interactions tab or the Interactions view) between these controls (as the source report objects) and one or more target report objects. For more information, see "Overview of Interactions" on page 433.

The following controls are available in the designer:

drop-down lists

Display 31.26 A Drop-Down List Control

	Drop-Down List 1 ×	
	Facility Region	▼]
4	Clear Filter	
	East	2,695,755
	North	11,716,240
	South	42,019,795
Į	West	14,301,043

#### lists

Display 31.27 A List Control

List 1 🗆 X	
☐ East	2,695,755
☐ North	11,716,240
South	42,019,795
☐ West	14,301,043

#### button bars

Display 31.28 A Button Bar Control



## text input fields

Display 31.29 A Text Input Control



## range sliders

Display 31.30 A Range Slider Control



## **Insert Controls into a Report**

To insert a control into a report:

- Choose one of the following:
  - Drag the control icon from the **Objects** tab in the left pane and drop it onto the report canvas.
  - Select **Insert** ▶ **Controls** and then select the menu item for the control object that you want to insert. The control is automatically placed in the report canvas. If you want the control to appear in a different location, then drag and drop it in a new location.

The following table lists the available controls:

Icon	Control Type
	Drop-down List
Ī	List
<b>=</b>	Button Bar
al	Text Input
t  <b>=</b>  3	Range Slider

- **2** To insert the data item that you want to use in the control:
  - Drag and drop a category data item onto the control.
  - Use the Roles tab in the right pane, and then specify the Category and Frequency roles.

## **Use a Control to Create a Section Prompt**

The drop-down list, button bar, and text input controls are the only ones that can be used as section prompts.

To use a control to create a section prompt:

- 1 Drag the control icon from the **Objects** tab in the left pane and drop it onto the area above the report canvas. (Look for the hint text that says, "Drop controls here to create a section prompt.") The control appears above the report canvas.
- 2 Drop a category onto the control. For example, if you drag and drop a drop-down list control, then you can assign a category like *Facility City* or *Facility Sate*. Then the drop-down list is populated with the cities or states that are used in that category.
  You can also use the **Roles** tab in the right pane, and then specify the **Category** and **Frequency** roles.

If you use a control to create a section prompt, then the user can select a value (or values, if multi-selection is available) to filter the data. Note that for some control types, the user might need to press Ctrl + click to clear the value in the filter.

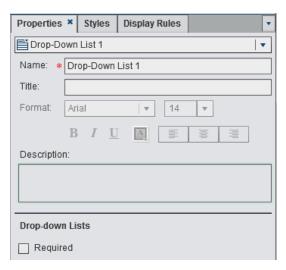
## **Specify Control Properties**

To specify the properties for a control:

- 1 If it is not already selected, select the control in the report canvas that you want to update.
- 2 In the right pane, click the **Properties** tab.
- 3 Update the general properties for the control. You can update the **Name**, **Title**, **Format**, and **Description**.
- **4** Update the specific properties for the control. The available properties depend on the selected control.

Here is an example of the properties for a drop-down list control:

**Display 31.31** Properties for a Drop-down List Control



## **Specify Control Styles**

To specify styles for controls:

- If it is not already selected, select the control in the report canvas that you want to update.
- In the right pane, click the **Styles** tab.
- Update the styles for the control. The available styles depend on the selected control type. For example, for a drop-down list, you can specify **Drop-down Styling** and Text Styling.

# **Using Other Object Types in Reports**

## **Overview of the Other Object Types**

## **About Text Objects**

Text objects display static text. You can use text to include company standards, such as text that indicates confidentiality, in your reports. You can have hyperlinks in text. You can also use text to annotate other objects in a report. For more information, see "Insert Text into a Report" on page 334.

## **About Images**

You can use images to include your corporate logo or other graphics in your reports. You can insert images from a repository or from your local machine. If you select an image from your local machine, it is saved to the repository. You can also add tooltip text to an image. For more information, see "Insert an Image into a Report" on page 334.

#### **About Stored Processes**

A *stored process* is a SAS program that is stored on a server and that can be executed as requested by client applications such as SAS Visual Analytics. The embedded SAS code can contain instructions for displaying report elements that include queries, prompted filters, titles, images, and statistical analyses. For more information, see "Insert Stored Processes into a Report" on page 336.

## **About Vertical or Horizontal Container Objects**

You can use a vertical or horizontal container to group other report objects. For more information, see "Insert Vertical or Horizontal Containers into a Report" on page 337.

### **About Geo Bubble Maps**

A geo bubble map is a bubble plot that is overlaid on a geographic map. Each bubble is located at a geographic location or at the center of a geographical region. The bubbles are automatically colored based on the location. You provide a measure data item that

determines the size of the bubble. A geo bubble map requires a data item that contains geographical information and is assigned to a geography role.

Many types of data have a spatial aspect, including demographics, marketing surveys, and customer addresses. For example, if a user needs to evaluate population data for U.S. Census tracts, a report designer could display the information in a table. However, it would be easier and more effective for the person using the report to see the information in the context of the geography of the tracts. When evaluating information that has a spatial component, users might find it easier to recognize relationships and trends in the data if they see the information in a spatial context.

You can add a geo bubble map only if the report uses data items from a data source that is enabled for geographic mapping. A geo bubble map requires a geography variable with the role type of geography. For more information, see "Insert Geo Bubble" Maps into a Report" on page 337.

You can create a filter or brush interaction between a geo bubble map and other report objects in your report or dashboard. When you click on a specific region or city, the other report objects filter or highlight to show the same location.

**Note:** Certain exported geo bubble maps (for example, geo maps that use custom roles or data sets that have centroids) cannot be fully modified in the designer.

## **About Geo Region Maps**

A geo region map (also known as a choropleth map) is a two-dimensional map that uses color and fill pattern combinations to represent different categories or levels of magnitude. You can fill geographical boundaries (for example, a country or a state) on a map with color, based on measure values that are aggregated to the level defined by a geographical boundary.

You can add a geo region map only if the report uses data items from a data source that is enabled for geographic mapping. A geo region map requires a geography variable with the role type of geography. However, it does not support custom geography data items.

You can create a filter or brush interaction between a geo region map and other report objects in your report or dashboard. When you click on a specific country or state, the other report objects filter or highlight to show the same location.

**Note:** Certain exported geo region maps (for example, geo maps that use custom roles or data sets that have centroids) cannot be fully modified in the designer.

## **Insert Text into a Report**

To insert text into a report:

- **1** Choose one of the following:
  - Drag in from the Objects tab in the left pane and drop it onto the report canvas.
  - Select Insert ➤ Other ➤ Text. The text object is automatically placed in the report canvas. If you want the text to appear in a different location, then drag and drop it in a new location.
- 2 Double-click inside the text object in the canvas and enter the text. You can use the floating toolbar to change the font, font size, text color, and text background color. You can also specify whether the text is bold, italic, or underlined and whether it is left-aligned, centered, or right-aligned.
  - You can use the context menu to cut, copy, and delete text. However, you have to use the keyboard (Ctrl +V) to paste text.

For information about creating a link from text, see "Creating Links" on page 449.

## **Insert an Image into a Report**

To insert an image into a report:

- 1 Choose one of the following:
  - Drag the Image Selection window is displayed.
  - Select Insert ➤ Other ➤ Image. The Image Selection window is displayed. The image object is automatically placed in the report canvas. If you want the image to appear in a different location, then drag and drop it in a new location.

**Display 31.32** Image Selection Window

Image Selection		×
Load from repository:		
	Browse	
O Load from local machine:		Preview
	Browse	
Save the local image to the repository:		
	Browse	
Scale type: None   ▼		
Tooltip text:		
		OK Cancel

2 Select the image from one of the following locations:

## Load from repository

Select this option to choose an image that is stored on the same server as the reports.

#### Load from local machine

Select this option to choose an image from your local machine. Click **Browse** to choose a file on your local machine. Specify a repository in the Save the local image to the repository field. If you click Browse, the Save As window is displayed. Select a folder and then click **OK** to return to the Image Selection window

A preview of the image is displayed.

3 (Optional) Specify the Scale type:

#### None

The actual size of the image is maintained. The image might or might not fill the entire area of the image's visual container. If the image is larger than the visual container, then scroll bars are displayed.

#### Stretch

The height and width of image are set to the height and width of the image's visual container. The image's original aspect ratio is not maintained.

#### Fit All

The image is modified to fit best into the image's visual container. The image's original aspect ratio is maintained.

#### Fit Width

The width of the image is set to the width of the image's visual container. The height maintains the image's original aspect ratio. Scroll bars are displayed if the set height of the image is greater than the height of the visual container.

#### Fit Height

The height of the image is set to the height of the image's visual container. The width maintains the image's original aspect ratio. Scroll bars are displayed if the set width of the image is greater than the width of the visual container.

#### Tile

The image is tiled in the visual container. The image's original size is maintained. There are no scroll bars.

- 4 (Optional) Specify the Tooltip text.
- 5 Click OK.

## **Insert Stored Processes into a Report**

To insert a stored process into a report:

- 1 Choose one of the following:
  - Drag from the Objects tab in the left pane and drop it onto the report canvas.
    The Open window is displayed.
  - Select Insert ➤ Other ➤ Stored Process. The Open window is displayed.
- 2 In the Open window, select a stored process. Click **Open**. The stored process is automatically placed in the report canvas.

**Note:** No styles are available for stored processes.

# **Insert Vertical or Horizontal Containers into a** Report

To insert a vertical or horizontal container into a report:

- Choose one of the following:
  - Drag I or I from the **Objects** tab in the left pane and drop it onto the report canvas.
  - Select either Insert ▶ Other ▶ Vertical Container or Insert ▶ Other ▶ **Horizontal Container**. The vertical or horizontal container is automatically placed in the report canvas. If you want the container to appear in a different location, then drag and drop it in a new location.
- Drag and drop other report objects onto the vertical container or horizontal container.

## **Insert Geo Bubble Maps into a Report**

To insert a geo bubble map into a report, choose one of the following:

- Drag from the **Objects** tab in the left pane and drop it onto the report canvas.
- Select Insert ▶ Other ▶ Geo Bubble Map. The geo bubble map object is automatically placed in the report canvas. If you want the geo bubble map to appear in a different location, then drag and drop it in a new location.

## **Insert Geo Region Maps into a Report**

To insert a geo region map into a report:

- Drag \square from the **Objects** tab in the left pane and drop it onto the report canvas.
- Select Insert ▶ Other ▶ Geo Region Map. The geo region map is automatically placed in the report canvas. If you want the geo region map to appear in a different location, then drag and drop it in a new location.

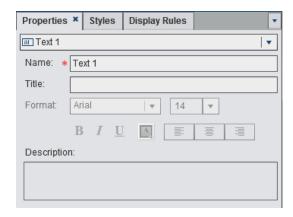
## **Specify Text Object Properties**

To specify the properties for a text object:

- If it is not already selected, select the text object in the report canvas that you want to update.
- In the right pane, click the Properties tab.
- 3 Update the general properties for the text. You can update the Name, Title, Format, and Description.

Here is an example of the properties for a text object:

Display 31.33 Properties for a Text Object



## **Specify Image Properties**

To specify the properties for an image:

- If it is not already selected, select the image in the report canvas that you want to update.
- 2 In the right pane, click the **Properties** tab.

- Update the general properties for the image. You can update the Name, Title, and Description.
- 4 Update the properties specific for the image. Your choices are Location, Scale type, and Tooltip text.

Here is an example of the properties for an image:

Display 31.34 Properties for an Image Object



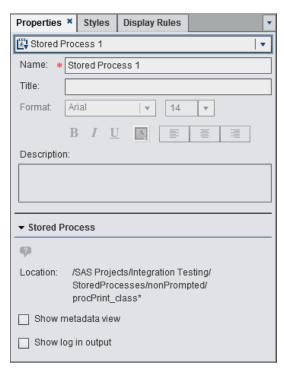
## **Specify Stored Process Properties**

To specify the properties for a stored process:

- If it is not already selected, select the stored process in the report canvas that you want to update.
- In the right pane, click the **Properties** tab.
- Update the general properties for the stored process. You can update the **Name**, Title, Format, and Description.

Here is an example of the properties for a stored process:

Display 31.35 Properties for a Stored Process

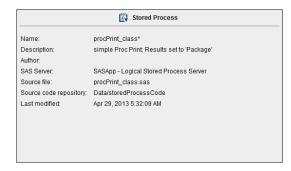


4 Update the properties specific to the stored process. Your choices are Show metadata view and Show log in output.

Selecting the **Show metadata view** check box can make it easier to work with the stored process in a report.

Here is an example of the metadata view for a stored process:

Display 31.36 Metadata View for a Stored Process



Selecting the Show log in output option means that both log output and the stored process output are displayed in the report. This can assist you in debugging any problems that might arise.

# **Specify Vertical or Horizontal Container Properties**

To specify the properties for a vertical or horizontal container:

- 1 If it is not already selected, select the vertical or horizontal container in the report canvas that you want to update.
- 2 In the right pane, click the **Properties** tab.
- 3 Update the general properties for the vertical or horizontal container. You can update the Name, Title, Format, and Description.

Here is an example of the properties for a vertical container:

**Display 31.37** Properties for a Vertical Container

Properties	×	Style	s	Display Rules			•
: Vertical (	Vertical Container 1					•	
Name: *	Ve	rtical C	Cont	ainer 1			
Title:							
Format:	Ari	al		▼ 14	v		
	В	I	U		= =		
Description	1:						
Container	_		_				_
Objects:							
						4	Α.
							1
							+

4 (Optional) Update the order in which the report objects appear inside the container.

# Specify Geo Bubble Map or Geo Region Map Properties

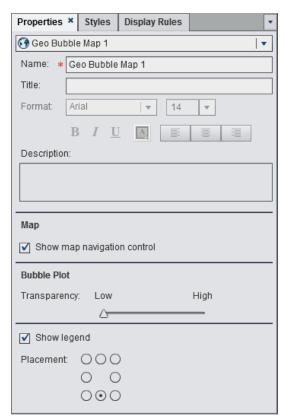
To specify the properties for a geo bubble map or geo region map:

- 1 If it is not already selected, select the geo bubble map or geo region map in the report canvas that you want to update.
- 2 In the right pane, click the **Properties** tab.
- 3 Update the general properties for the geo bubble map or geo region map. You can update the **Name**, **Title**, **Format**, and **Description**.
- 4 Update the properties that are specific to the geo bubble map or geo region map. You can update the Show map navigation control, Transparency, and Show legend.

**Note:** For a geo bubble map, you select the **Transparency** for the bubble plot. For a geo region map, you select the **Transparency** for the region map.

Here is an example of the properties for a geo bubble map:

Display 31.38 Properties for a Geo Bubble Map



# **Specify Styles for Geo Bubble Maps and Geo Region Maps**

To specify styles for a geo bubble map or a geo region map:

- If it is not already selected, select the geo bubble map or geo region map in the report canvas that you want to update.
- In the right pane, click the **Styles** tab.
- Update the styles for the geo bubble map or geo region map. The available styles depend on the selected geo map type.

# **Duplicating a Report Object**

Duplicating a report object in the designer enables you to use a copy of the same object in the same section or another section of your report.

To duplicate a report object:

- 1 On the report canvas, right-click the report object that you want to duplicate.
- 2 Select Duplicate <ReportObject>, where <ReportObject> is the name of the report object in the report. (For example, List Table 1, Bar Chart 1, and so on.) The duplicated report object is placed on the canvas with a name based on the original name. For example, if the original report object name is List Table 1, then the duplicate report object is displayed as List Table 1 (1). If you choose to duplicate the same report object again, then it is displayed as List Table 1 (2).
- 3 (Optional) Move the duplicate report object to another section. Right-click the report object that you want to move. Select Move <ReportObject> to Move <ReportObject> to ▶ <SectionName>, where <ReportObject> is the name of the report object and <SectionName> is the name of the section.
- **4** (Optional) If you want the report object to appear in a different location, then drag and drop it in a new location.
  - If you move an object to a section with precision layout, then you must manually move the object to its proper location. All objects are put in the top left corner by default.

# **Adding Comments to Reports**

If you have the Add or View Comments capability, then you can add or view comments. You can edit your own comments and respond to other comments. You must save a report before you can add comments.

In the designer, you can add comments to the whole report, but you cannot add comments to the individual report objects.

Note: If comments have been added to an individual report object using the home page, the explorer, or the viewer, then those comments cannot be displayed or edited in the designer.

To add a comment to a report:

Click the **Comments** tab in the right pane.

Here is an example:

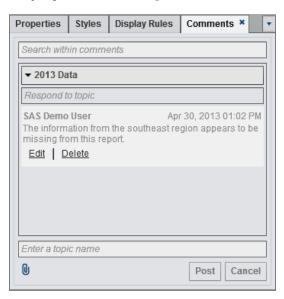
**Display 31.39** Comments Tab

Properties	Styles	Display Rules	Comments *	•
Search with	in comme	ents		
No commen	its were fo	ound.		
Entre e to e				
Enter a topi	c name			
0			Post Can	cel

2 Enter a topic name and a comment.

#### Here is an example:

**Display 31.40** Adding a Comment in the Designer



- 4 Click Post to add your comment. Your comment is added to the Comments tab in the right pane.

To respond to an existing comment:

- 1 Click the **Comments** tab in the right pane.
- Select an existing comment. Then, enter a reply.
- 3 (Optional) Click 🗓 to attach a file or image to your reply.
- 4 Click Post to add your comment.

**Note:** To edit another user's comments or to delete comments, you must belong to the predefined role **Comments:Administrator**.

## To search for a comment:

- Enter the word or phrase that you want to search for in the search box. Press Enter.
- 2 (Optional) To clear your search, click S. Then, you can enter another word or phrase in the search box.

# Selecting Data for Reports

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# Overview of Data Sources and Data Items

Data sources that are available in SAS Visual Analytics Designer (the designer) are prepared by a data administrator or analyst so that you can easily define a report. Data administrators load tables into memory using SAS Visual Analytics Administrator. Analysts can use SAS Visual Data Builder to design queries that load tables into memory too. All data sources contain data items, which can refer to calculations or columns in physical data (tables). Reports can include query results from more than one data source.

Each data source includes one or more data items that you can use in reports. For example, a data source named *Order Information* might include standard data items such as *Order ID*, *Product ID*, *Unit Cost*, *Order Date*, and *Order Amount*. You decide which data items to use. You can select all of the data items in the data source or a subset of the data items.

The designer can display data items using an existing user-defined format that has already been specified externally for a data column in a data source. However, you cannot specify a new or different user-defined format for a data item in the designer.

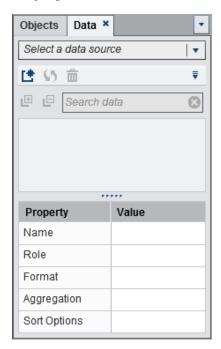
# **Adding a Data Source or Data Sources**

You can use one or more data sources for a report in the designer.

To add a data source for a report:

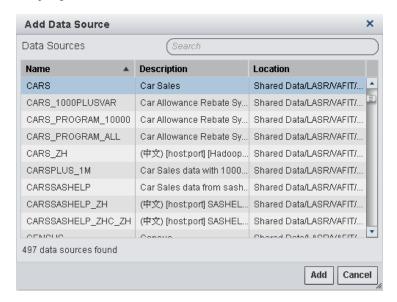
On the **Data** tab, click **v** beside the **Select a data source** text to display the Add Data Source window.

Display 32.1 Data Tab



In the Add Data Source window, select a data source.

Display 32.2 Add Data Source Window



TIP Use the **Search** field to narrow the list of data sources that are displayed in the Add Data Source window.

- 3 Click Add. The list of available data items is displayed in the Data tab.
- 4 To add another data source, click ★, which displays the Add Data Source window. Select the data source that you want, and then click **Add**. The **Data** tab is populated with a list of all of the data items that are in the data source.

# Refreshing a Data Source for a Report

You can refresh the columns in a data source in the designer at any time. Be aware that refreshing a data source means that all live report objects that are connected to that data source will have their queries re-run.

**Note:** Refreshing a data source adds any new columns that have been added to the table metadata. The default formats and names of existing columns will be updated the next time you open the report.

To refresh a data source for a report, on the **Data** tab, select the data source, and then click \square{1}. When you refresh a data source for a report, columns that have been deleted from the table metadata will automatically be removed if they do not impact any objects in the report. If deleted columns do impact objects in the report, then the Repair Report window is displayed so that you can repair the objects that are impacted by the deleted columns. For more information, see Appendix 4, "Troubleshooting in SAS Visual Analytics Designer," on page 509.

# **Removing a Data Source from a Report**

You can remove a data source from a report in the designer. Be aware that removing a data source means that all related data items are also removed from the report objects within the report.

To remove a data source for a report:

- On the **Data** tab, select the data source and then click  $\vec{\mathbf{m}}$ .
- Click **Yes** in the confirmation message that is displayed.

# **Changing a Data Source in a Report**

To change a data source for a report:

- 1 On the **Data** tab, click ₹ and then select **Change Data Source**. The Change Data Source window is displayed.
- In the Change Data Source window, select a data source.

Display 32.3 Change Data Source Window

Change Data Source		×
Data Sources	Search	
Name 🔺	Description	Location
CARS	Car Sales	Shared Data/LASR/VAFIT/
CARS_1000PLUSVAR	Car Allowance Rebate Sy	Shared Data/LASR/VAFIT/
CARS_JA	(にまんご) [host:port] Deta	Shared Data/LASR/VAFIT/
CARS_PROGRAM_10000	Car Allowance Rebate Sy	Shared Data/LASR/VAFIT/
CARS_PROGRAM_ALL	Car Allowance Rebate Sy	Shared Data/LASR/VAFIT/
CARS_ZH	(中文) [host:port] Detail C	Shared Data/LASR/VAFIT/
CARS_ZH	(中文) [host:port] [Hadoop]	Shared Data/LASR/VAFIT/
CARSPLUS_1M	Car Sales data with 1000	Shared Data/LASR/VAFIT/
CARSSASHELP	Car Sales data from sash	Shared Data/LASR/VAFIT/
570 data sources found		
		Change Cancel

#### 3 Click Change.

If a data item with the same name does not exist in the replacement data source, then it is automatically removed from the replacement data source if there are no report objects that use the data item. If there are report objects that use the data item, then those report objects will not work. The Repair Report window is displayed so that you can repair the objects that use the data item. For more information about repairing reports, see Appendix 4, "Troubleshooting in SAS Visual Analytics Designer," on page 509.

Data items in the replacement data source that have names that do not exist in the original data source are added to the **Data** tab automatically.

**Note:** For data item names, the case is ignored when data sources are compared by the designer.

# **Working with Data Items in a Report**

### **About Data Items**

Each data source in the designer includes one or more standard data items. You decide which data items to use to define a query for each report object. You can use all the data items in the data source or a subset of data items. Each data item is classified as either a category or a measure.

For information about filtering data items, see "Working with Data Item Filters in a Report" on page 421.

**Table 32.1** Data Items That Are Available in the Designer

Data Item	lcon	Description
Aggregate Measure	₩	A data item that represents special predefined operations, like distinct count, percentage of totals, percentage of subtotals, or frequency percent. Or the user can define their own aggregated measure calculations.
		Aggregate measures can be used in only some report objects. They cannot be used in filters, controls, spark lines, or time series graphs. Percentage of subtotal items (including row total, row subtotal, column total, and column subtotal) can be used in only in crosstabs. Some aggregate measure calculations cannot be used in a detail rank.

Data Item	Icon	Description
Calculated	or <b>∮</b>	A data item that is calculated from existing data items by using an expression. For example, you could create a calculated data item called <i>Profit</i> , which is created by using this expression: [Revenue] — [Cost], where <i>Revenue</i> and <i>Cost</i> are measures in a data source.
		Calculated dates and times are treated as categories with distinct values being governed by the date or time format that you have chosen. Numeric calculated items can be treated as measures (with an aggregation type such as Sum, which is applied to each distinct category combination). Or, you can change numeric calculated items into category data items with distinct values being governed by the number of decimal places in the numeric format.
Category	m	A data item whose distinct values are used to group and aggregate measures. There are five types of categories: alphanumeric, date, datetime, time, and numeric. Alphanumeric categories can be made up of all letters, all digits, or a combination of the two. Categories that have values that are all digits might be physically stored as character or numeric data. The data type affects how values are handled in relation to some functionality, such as filtering, sorting, and formatting.
		Examples of alphanumeric categories include data items such as <i>Product ID</i> , <i>Country</i> , <i>Employee Number</i> , and <i>Employee Name</i> . Alphanumeric categories sort lexically.
		Date, datetime, time, and numeric categories are sorted by their underlying numeric values.
		Category data items can also be numeric. A category data item sorts differently than an alphanumeric data item. Numeric category data items sort by number.
		<b>Note:</b> If you change a measure to a category, then it uses this category icon.
		The 🔽 icon indicates a filtered category data item.
		The kicon indicates a user-defined format category data item. User-defined format categories can be based on underlying numeric or character data.

Data Item	lcon	Description
Date and Time	脑	A category data item whose distinct values are used to group and aggregate measures. There are three types of date categories: date, datetime, and time.
		Examples of date, datetime, and time categories are <i>Order Year</i> , <i>Date of Sale</i> , and <i>Delivery Time</i> .
Geography	₩	A category data item whose values are mapped to geographical locations or regions. Geography data items can be used in reports to show your data on a geographic map. For example, a geography data item can identify geographic information that is specific to your organization (for example, sales regions, warehouse locations, oil platforms, and so on).  The ricon indicates a filtered geography data item.
Hierarchy	品	A data item whose values are arranged with more general information at the top and more specific information at the bottom. The first level in the hierarchy is the root level. For example, you might have a <i>Time</i> hierarchy, which includes the <i>Year</i> (the root level), the <i>Quarter</i> , and then the <i>Month</i> . You can also have geographic hierarchies.
Measure	di.	A data item whose values can be used in computations. These values are numeric. Examples of measures include <i>Sales Revenue</i> , <i>Units Sold</i> , and <i>Salary</i> .  The designer assigns a default aggregation method to every measure. Almost all measures are assigned sum. You can change the aggregation method.  The �icon indicates a filtered measure data item.

Note: Report objects that are imported from SAS Visual Analytics Explorer (the explorer) use either live or on-demand data. Therefore, you can update the properties and styles for these report objects in the designer, but you cannot change the data assigned to them.

#### Select Data Items

To select data items to use in queries for the current report section:

- 1 On the **Data** tab in the left pane, click the down arrow to display a list of available data sources. Select a data source and the **Data** tab is populated with a list of all of the data items that are in the data source.
  - If the data source that you want is not in the list, click , which displays the Add Data Source window. Select the data source that you want, and then click **Add**. The **Data** tab is populated with a list of all of the data items that are in the data source.
  - If you do not want to use the data source that you originally selected, click **Remove** data source. Click **Yes** in the confirmation message that is displayed.
  - **Note:** For list tables only, you can press the Ctrl key to select multiple data items, and then drag and drop them onto the table in the report canvas.
- 2 Select an existing report object that uses the same data source name or add a new report object to the section.
- 3 Drag and drop a report object onto the report canvas. Alternatively, you can rightclick on a data item and select **Add Data Item to <ReportObject>**, where <ReportObject> is the name of the report object in the report. (For example, List Table 1, Bar Chart 1, and so on.)
  - **Note:** For list tables only, you can press the Ctrl key to select multiple data items, and then drag and drop them onto the report canvas.
- 4 If the selected data item can replace a current data item in the report object or if the selected data item is valid for multiple data roles, then select the data assignment from the Assign <DataItemName> as window. A data assignment that is marked with a red asterisk (\*) is required before the query can be run.

Here is an example of the Assign <DataItemName> as window when a data item called Product Line is being dropped onto a bar chart.

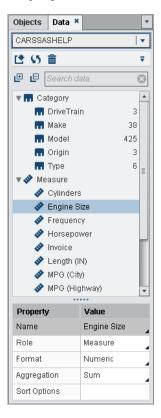
Display 32.4 Assign as Window



(Optional) To see more information about a data item, select it in the list. The **Name**, Role, Format, and Aggregation are displayed in the data item table below the list of data items. For a category data item with a user-defined format that has an underlying numeric value, you can specify Sort Options.

Here is an example of the details for a data item called *Engine Size*:

Display 32.5 Details about a Selected Measure Data Item



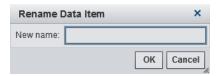
### **Rename Data Items**

You can rename data items in the data source using the **Data** tab.

To rename data items:

1 On the **Data** tab, right-click on a data item, and then select **Rename Data Item**. The Rename Data Item window is displayed.

Display 32.6 Rename Data Item Window



- Enter a new name. The name cannot be used by another data item in the same data source.
- Click OK.

Alternatively, you can use the data item table at the bottom of the **Data** tab to rename a data item. For the **Name** property, enter a new name for **Value**.

#### **Search for Data Items**

If your data source contains many data items, you can search for particular data items using the Data tab.

To search for data items:

Enter the name of a data item in the search field on the **Data** tab. The field is located above the list of data items.

**Display 32.7** Search Field in the Designer



- (Optional) Click 🗗 to collapse the list of data item groupings or click 🕒 to expand the list of data item groupings.
- Click \( \mathbb{\omega} \) to clear the search term and display all of the data items in the data source.

#### Sort Data Items on the Data Tab

To sort data items on the **Data** tab, click <sup>₹</sup>, and then select **Sort Items** ▶ **Ascending By Name** or **Sort Items** ▶ **Descending By Name**. The data items are sorted on the **Data** tab within each grouping. The default sort is **Ascending By Name**.

For information about sorting data values in report objects, see Chapter 33, "Sorting Data Items in Reports," on page 391.

## **Group Data Items on the Data Tab**

To group data items on the **Data** tab, click ₹, and then select one of the following:

- Group Items ➤ By First Letter
- Group Items ► By Data Type
- Group Items ► By Role
- Group Items ➤ By Format
- Group Items ➤ By Aggregation

The data items are grouped on the **Data** tab. The default is grouping **By Role**.

## **Duplicate Data Items**

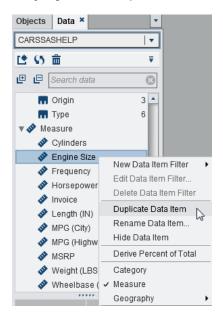
Duplicating measure data items in the designer enables you to see the aggregations of a data item (**Sum**, **Average**, **Minimum**, **Maximum**, and **Count**) side by side in a table. You can duplicate a numeric measure if you want to use it as a category to group other values in some tables or graphs. If you save a report with duplicate data items, then those data items are available when you edit the report the next time.

You can duplicate a calculated data item to make a variation of a calculation. For example, you might make similar calculations involving miles per gallon for a vehicle, but you create one calculation using MPG (City) and another using MPG (Highway). You can duplicate any data item if you want to use it with more than one format in your report. For example, you might change Month to Year for a date data item.

#### To duplicate a data item:

On the **Data** tab in the left pane, right-click the data item that you want to duplicate.





- Select **Duplicate Data Item**. All of the properties of the original data item are copied to the duplicate data item. The duplicate data item appears in the list of data items on the Data tab. For example, if the original data item name is Engine Size, then the duplicate data item is displayed as Engine Size (1). If you choose to duplicate the same data item again, then it is displayed as Engine Size (2).
- (Optional) Change the name, format, or aggregation for the duplicate item (or items).
- (Optional) Edit the calculation for a calculated data item or aggregate measure.
- (Optional) Change the sort options for a category data item with a user-defined format that is based on an underlying numeric value.
- (Optional) Change the role for the data item. For example, a numeric data item that has been duplicated and is not yet assigned to a report object can be a category or a measure.

7 (Optional) Rename the duplicate data item (or data items).

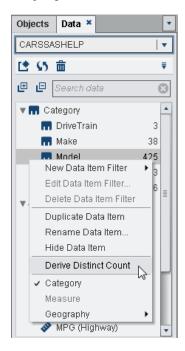
# **Derive a Distinct Count for a Category Data Item**

A distinct count query is useful in many ways. For example, you might want to know the number of distinct products that were purchased during a specific time period. Or, you might want to know which products have the most customers or which products have the most customers in a particular geographic region. You can derive a distinct count for category data items only.

To derive a distinct count data item:

- On the Data tab in the left pane, right-click the category data item that you want to use for the distinct count.
- 2 Select Derive Distinct Count.

Display 32.9 Derive Distinct Count Menu Selection



The distinct count data item appears in the list of data items with a name that is derived from the original name. For example, if the original data item name is Date, then the distinct count category data item is displayed as Date (Distinct Count). The vicon identifies the new distinct count category data item on the Data tab.

# **Derive a Percentage of Total for a Measure**

You can derive the percentage of total for a measure as a new aggregated measure in the designer. The aggregated measure does not contain data values in itself, but when it is used in a report object, it displays the percentage of the total value for the measure on which it is based.

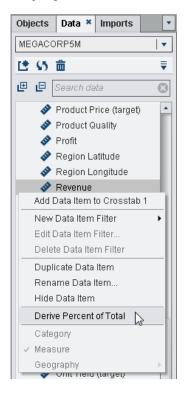
**Note:** The percentage of total is relative to the subset of data that is selected by your filters and ranks.

For example, you might derive the percentage of total for a measure that contains revenue values. If you create a bar chart of the aggregated measure and a category that contains product lines, then the bar chart shows the percentage of total revenue for each product line.

To derive a percentage of total from a measure data item:

- 1 On the **Data** tab in the left pane, right-click on the measure data item that you want to use for the percentage of total.
- 2 Select Derive Percent of Total.

Display 32.10 Derive Percent of Total Menu Selection



The percentage of total measure data item appears in the list of aggregated data items with a name that is derived from the original name. For example, if the original measure data item name is Revenue, then the percentage of total measure data item is displayed as Revenue (Percent of Total). The vicon identifies the new percentage of total measure data item on the **Data** tab.

# **Create Geography Data Items**

A geography data item can be useful if your data contains values that are mapped to geographical locations or regions. For example, a geography data item can identify geographic information that is specific to your organization (for example, sales regions, warehouse locations, oil platforms, and so on).

If you change a numeric measure to a geography data item, then it automatically becomes a category data item.

Starting with the 6.2 release, you do not have to use a custom geography data item. You can use the geography items that are available in SAS Visual Analytics. These geography data items are Countries, US States, US States Abbreviated, US ZIP Codes, and Custom. To access these geography data items, select the Data tab in the left pane. Right-click the data item that you want to use for the geography data item, and then select Geography.

**Note:** Calculated data items cannot be turned into geography data items.

To create a custom geography data item:

1 On the **Data** tab in the left pane, right-click the data item that you want to use for the geography data item. Select **Geography**, and then select **Custom**. The Geography window is displayed.

**Display 32.11** Geography Window

Geography	×
Latitude: Longitude:	Choose Column
Coordinate space:	World Geodetic System (WGS84)   ▼
	OK Cancel

- 2 Select a measure for the Latitude. You can also enter the first letter of the name of the latitude column to quickly search for it in the drop-down menu.
- 3 Select a measure for the **Longitude**. You can also enter the first letter of the name of the longitude column to quickly search for it in the drop-down menu.
- 4 Select a Coordinate space. The choices are World Geodetic System (WGS84), Web Mercator, and British National Grid (OSGB36). The default is World Geodetic System (WGS84).
- 5 Click **OK**. The  $\bigoplus$  icon identifies the new geography data item on the **Data** tab.

# **Modify Data Item Properties**

#### Rename a Data Item

To rename a data item:

- 1 Select a data item on the **Data** tab.
- 2 In the data item table, select the existing name for the data item, and then enter a new name. The name cannot be used by another data item in the same data source. Your change is saved automatically.

### **Modify a Data Item's Role**

You can modify a data item's role. For example, you might want to modify a measure data item to be a category data item. A data item's role cannot be changed if that data item is in use in the report. However, duplicating the data item allows the new data item to have a different role.

**Note:** You cannot change the role for the frequency data item or the frequency percent data item. You cannot change the role for an aggregate measure.

TIP For geography data items, use the context menu instead of the drop-down menu to change the role.

To modify a data item's role:

- 1 Select a data item on the **Data** tab.
- 2 In the data item table, select the existing role name for the data item.
- 3 Click ▼ to open the drop-down menu. Select **Measure** or **Category**. Your change is saved automatically.

Note: Category data items cannot be converted into measure data items.

**Note:** Calculated data items cannot be converted into geography data items.

## **Modify the Format of a Numeric Measure Data Item or a Date, Datetime, or Time Data Item**

You can modify the format of a numeric measure data item or a date, datetime, or time data item. You can also modify the format of a data item with a user-defined format, as long as the user-defined format is based on an underlying numeric value.

Note: You cannot modify the format of a data item that is being used in a filter or as part of a calculated or aggregated measure.

To change the format:

- Select a data item on the **Data** tab.
- In the data item table, select the existing format. A list is displayed with the **Format** type, Width, and Decimals (for numeric data items). Make your selections. A sample of your selection is displayed under the list.

Note: There are different format variations available for some format types for date, datetime, and time data items. Select the format variation based on the sample value displayed in the Format drop-down list.

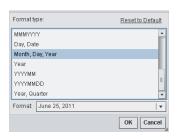
Here is an example of the list for a numeric data item:

**Display 32.12** Available Formats for a Numeric Data Item



Here is an example of the list for a date data item:

Display 32.13 Available Formats for a Date Data Item



**Note:** The **Reset to Default** option is displayed only if the format has been changed from the default.

**Note:** The **Reset to Default** option is available for user-defined format data items after they have been modified to a standard numeric format, as long as the data item is still a category data item.

3 Click OK to save your changes.

## **Modify User-Defined Formats**

In the designer, user-defined formats that are defined in the SAS LASR Analytic Server are applied to the results, even though the **Format** property of the data item does not display the name of the applied user-defined format. You can change the format for an underlying numeric data item, but you cannot change the format for an underlying character-based data item. If you change the numeric format, you can restore the user-defined format by selecting **Reset to Default**.

The **Format** property of the data item does not display the name of a character-tocharacter user-defined format, but it does display the base name for a numeric-tocharacter user-defined format.

The icon identifies a category data item with an active user-defined format on the **Data** tab.

## **Modify How a Measure Is Aggregated**

You can change the aggregation method for a measure in a data source using the **Data** tab or a report object in the canvas.

Note: You need to understand your data because some aggregation methods are not always appropriate. For example, an average of an average is not valid.

To change the aggregation method using the **Data** tab:

- Select a measure data item on the **Data** tab.
- In the data item table, select the existing aggregation. A drop-down list is displayed with aggregations. Sum, Average, Minimum, Maximum, and Count are the available aggregations. Select one, and your change is saved automatically.

**Note:** All report objects in the report that uses this data item are affected by this change unless you have selected a local aggregation override.

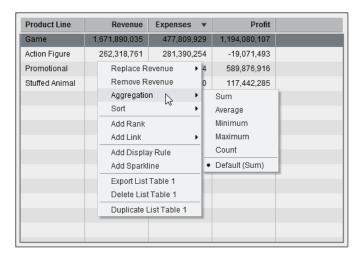
Display 32.14 Available Aggregations for a Data Item



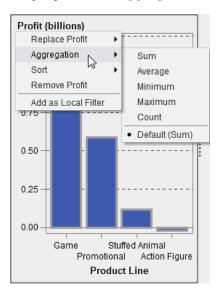
To change the aggregation method when you are working with a report object in the canvas:

- 1 Choose one of the following:
  - For a list table, right-click on a measure header in the report object.

Display 32.15 Aggregation Menu Items for a List Table



- For a crosstab, right-click on the header row with the measure.
- For a graph, right-click on the measure name hotspot. Or, you can right-click on a measure data item name on the Roles tab.



**Display 32.16** Aggregation Menu Items for a Graph

2 Select Aggregation ▶ aggregation name, where aggregation name is Sum, Average, Minimum, Maximum, or Count.

Your change is saved automatically.

Note: This is a local override for only this report object. It does not affect the default aggregation for this data item in other report objects.

### **Modify the Sort Options for a Category Data Item**

Using the data item table on the **Data** tab, you can change the **Sort Options** for a category data item with a user-defined format that is based on an underlying numeric value. The sort options are the following:

#### **Formatted**

Uses the formatted character output of the user-defined format and sorts lexically. (For example, the names of the months in the year would sort as April, August, December, February, and so on.) Formatted is the default.

#### Unformatted

Use the underlying numeric value and sorts numerically. (For example, if the underlying numeric value for January is 1, for February is 2, for March is 3, and for April is 4, then the months of the year would sort as January, February, March, April, and so on.)

#### **Delete Data Items**

You can delete data items that you have created in the designer (for example, calculated data items or duplicated data items) so that they no longer appear on the **Data** tab in the left pane.

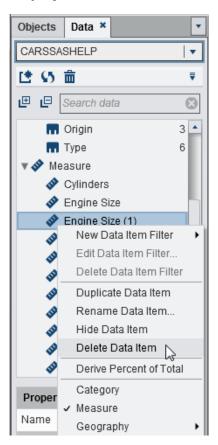
You cannot delete a data item that is inside a hierarchy if it reduces the hierarchy to a single level. You cannot delete a data item if it is the last or only reference to a column in the original data source. You cannot delete a data item if it is used in a calculated data item, aggregate measure, or a geography data item.

**TIP** You can hide a data item that you cannot delete by right-clicking on the data item name in the **Data** tab, and then selecting **Hide Data Item**. For more information, see "Showing or Hiding Data Items" on page 385.

To delete a data item (or data items):

1 On the **Data** tab in the left pane, right-click the data item that you want to delete.

Display 32.17 Delete Data Item Menu Selection



- 2 Select Delete Data Item.
- 3 Click Yes in the confirmation message that is displayed. The data item is removed from the list of data items, as well as from any report objects, filters, or ranks that were using it.

# **Working with Hierarchies in a Report**

#### **About Hierarchies**

Creating hierarchies enables you to add drill-down functionality to your reports. A hierarchy is an arrangement of category columns that is based on parent-child relationships. The levels of a hierarchy are arranged with more general information at the top and more specific information at the bottom. For example, you might create a hierarchy of date-time columns with *Year* as the top level, *Month* as the next level, and *Day* as the bottom level.

You can also have a geographic hierarchy. For example, you might have a hierarchy with *Region* as the top level, *State* as the next level, and *City* as the bottom level.

You can have a maximum of two hierarchies for a report object.

Note: List tables do not support hierarchies.

**Note:** Crosstabs can have either a hierarchy or categories on each row or column, but not both.

In the designer, you can:

- "Create New Hierarchies for a Report" on page 376
- "Edit Hierarchies for a Report" on page 377
- "Delete a Hierarchies for a Report" on page 378

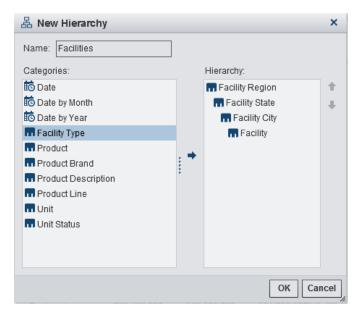
# **Create New Hierarchies for a Report**

To create a new hierarchy for a report:

- 1 On the **Data** tab, click **₹** and then select **New Hierarchy**. The New Hierarchy window is displayed.
- 2 Enter a Name.

3 Select at least two categories and drag them to the Hierarchy list.

Display 32.18 New Hierarchy Window



- 4 (Optional) Use the up and down arrows to arrange the data items in the **Hierarchy** list
- Click **OK** to save the new hierarchy. The  $\mathbb{R}$  icon identifies the new hierarchy in the list of data items on the **Data** tab.

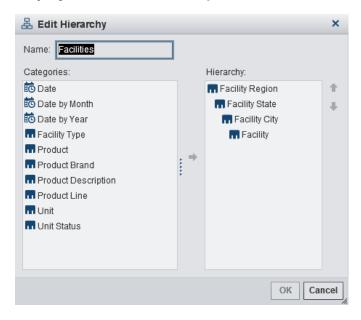
Crosstab report objects enable you to create hierarchies from the categories on a crosstab axis. To create a hierarchy, right-click a category heading and then select Create Hierarchy. The categories are replaced with a new hierarchy. The name of the new hierarchy is generated from the name of the outermost category, with the suffix Hierarchy.

# **Edit Hierarchies for a Report**

To edit a hierarchy:

Right-click the hierarchy name on the **Data** tab and select **Edit Hierarchy**. The Edit Hierarchy window is displayed.

Display 32.19 Edit Hierarchy Window



- 2 (Optional) Edit the Name.
- 3 Add and remove categories. There must be at least two categories.
- 4 Click **OK** to save the updated hierarchy.

# **Delete a Hierarchies for a Report**

To delete hierarchies:

- 1 Right-click the hierarchy name on the **Data** tab and select **Delete Hierarchy**.
- 2 Click **Yes** in the confirmation message that is displayed.

# **Working with Calculated Data Items in Reports**

#### **About Calculated Data Items**

The designer enables you to calculate new data items from your existing data items by using an expression. For example, you might want to calculate a company's profits by subtracting expenses from revenues.

In addition to performing mathematical calculations on numeric values, you can use calculated data items to create date and time values. For example, if your data contains separate categories for *month*, *day*, and *year*, then you can calculate a date value from those categories.

**Note:** All calculations are performed on unaggregated data. The calculation expression is evaluated for each row in the data source before aggregations are performed. To perform calculations on aggregated data, see "Add a New Aggregated Measure to a Report" on page 382.

A hierarchy can contain calculated data items.

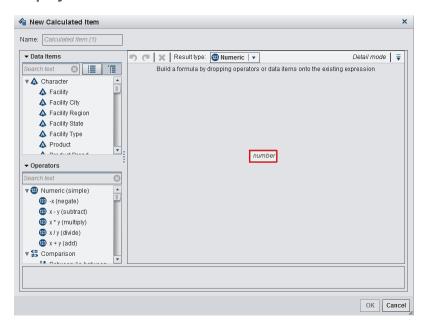
Using the designer, you can work with calculated data items or aggregated measures.

## Add a New Calculated Data Item to a Report

To add a new calculated item:

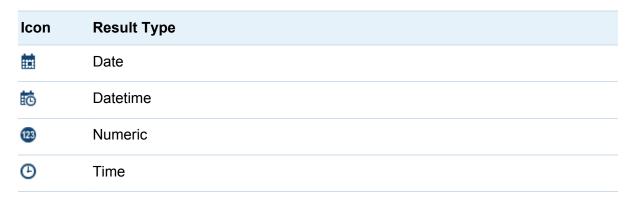
On the **Data** tab, click **₹**, and then select **New Calculated Item**. The New Calculated Item window is displayed.

Display 32.20 New Calculated Item Window



- 2 Enter a Name.
- 3 Select a **Result type** from the drop-down list. **Numeric** is the default data type.

The following table lists the available result types:



Calculated data items in the designer always default to the following formats, which are based on the data type:

Date: DATE9

Datetime: DATETIME10

Time: TIME8

Numeric: COMMA12.2

After you create the new calculated data item, you can change its format using the data item table on the **Data** tab.

SUM is the default aggregation for new numeric calculated items in the designer. You can change the aggregation for numeric calculated items using the data item table on the **Data** tab.

- **4** (Optional) Click **₹** to **Show all drop zones**. You can also choose to **Show scratch** area to build temporary expressions.
- 5 Build the expression for your calculated data item by dragging **Data items** and **Operators** onto the expression in the right pane. For each rectangular field in the expression, you can insert a data item, an operator, or a specific value.

When you drag items or operators onto your expression, the precise location of the cursor determines where and how the new element is added to the expression. As you drag the new element over the expression, a preview appears that displays how the expression changes if you drop the element at that location.

For example, if your current expression is ( Profit / Revenue ), and you drag and drop the x - y (subtract) operator inside the open parenthesis symbol, then the expression changes to ( [number] - ( Profit / Revenue )). If you drag and drop the operator over the division symbol, then the expression changes to ( Profit - Revenue ), and so on.

There are a large number of operator types available to perform mathematical functions, process datetime values, and evaluate logical processing such as "if" clauses. For more information, see Appendix 1, "Operators for Calculated Data Items," on page 489.

6 Click **OK**. The new calculated data item appears in the **Data** tab. The  $\P$ ,  $\P$ , or  $\P$ icons identify the new calculated data item on the **Data** tab.

Note: The icon is displayed only if you change a calculated numeric measure to a category data item.

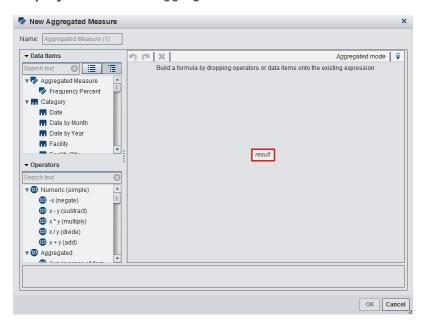
# Add a New Aggregated Measure to a Report

Aggregated measures enable you to calculate new data items by using aggregated values. For example, you might want to calculate a company's profit margin by region by taking the aggregated sum of the profit for all of the stores in a region group and dividing it by the aggregated sum of the revenue for all of the stores in that same region group. Aggregations are evaluated as part of a calculated expression.

To add an aggregated measure:

1 On the **Data** tab, click ▼, and then select **New Aggregated Measure**. The New Aggregated Measure window is displayed.





- 2 Enter a Name.
- 3 (Optional) Click ₹ to Show all drop zones. You can also choose to Show scratch area to build temporary expressions.

4 Build the expression for your aggregated measure by dragging and dropping Data **Items** and **Operators** onto the expression in the right pane. For each field in the expression, you can insert a data item, an operator, or a specific value.

When you drag and drop data items and operators onto the expression, the precise location of the cursor determines where and how the data item or operator is added to the expression. As you drag the new element over the expression, a preview appears, which displays how the expression would change if you drop the element at the current location.

There are a large number of operator types available to perform mathematical functions and evaluate logical processing such as IF clauses. See Appendix 1, "Operators for Calculated Data Items," on page 489.

- 5 For each data item in your expression, select an aggregation type. By default, **Sum** is used for measures and Distinct is used for categories. To select a new aggregation type, drag and drop an aggregated operator from the **Operators** list onto the aggregation type in the expression. See Appendix 1, "Operators for Calculated Data Items," on page 489 for a list of the aggregated operators that are available.
- 6 For each aggregation in your expression, select the aggregation context. A dropdown list beside each aggregation enables you to select one of the following context values:

# **ByGroup**

calculates the aggregation for each subset of the data item that is used in a visualization. For example, in a bar chart, an aggregated measure with the ByGroup context calculates a separate aggregated value for each bar in the chart.

#### ForAll

calculates the aggregation for the entire data item (after filtering). For example, in a bar chart, an aggregated measure with the ForAll context uses the same aggregated value (calculated for the entire data item) for each bar in the chart.

By using the ForAll and ByGroup contexts together, you can create measures that compare the local value to the global value. For example, you might calculate the difference from mean by using an expression such as the following:

Avg ByGroup(X) - Avg ForAll(X)

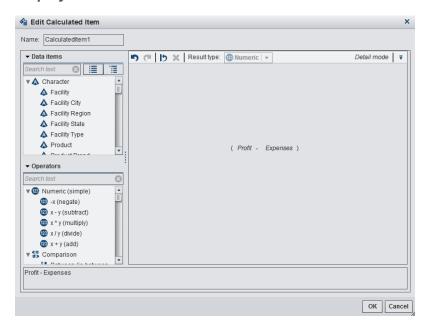
7 Click **OK**. The new aggregated measure appears on the **Data** tab. The **♠** icon identifies the new aggregated measure.

#### **Edit a Calculated Data Item**

To edit a calculated data item:

1 Right-click on a calculated data item on the Data tab and select Edit Calculated Item. The Edit Calculated Item window is displayed.

Display 32.22 Edit Calculated Item Window



- 2 Modify the **Data Items** and **Operators** for the calculated data item as needed. For information about the operators and conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
- 3 Click OK.

You can duplicate, rename, hide, and delete calculated data items using the same steps as any other data item. If a calculated data item is used inside another calculated data item, then it cannot be removed.

# **Viewing Measure Details**

To view the details about all of the measures in a data source:

On the **Data** tab, click **₹** and then select **Measure Details**. The Measure Details window is displayed.

Measure Details × Minimum Maximum Average Unit Capacity 16.00 212.00 174.35 12332370106.00 Unit Downtime 0.00 1.00 0.01 438120.00 Unit ID 3.00 184.00 67.52 4775908437.00 52864134.83 Unit Lifespan 0.25 1.00 0.75 Unit Lifespan Limit 0.10 0.50 0.29 20174690.56 Unit Reliability 0.40 0.99 0.88 62185415.69 Unit Yield (actual) 0.00 212.00 128.86 9114698643.00 0.90 63190937.01 Unit Yield (rate) 1.00 Unit Yield (target) 0.00 212.00 143.45 10146429199.00 ▼ More information Standard Deviation: 5.17 Distinct Count: 20 Missing Values: 612883 Total Rows: 70732833 Close

**Display 32.23** Measure Details Window

Click Close.

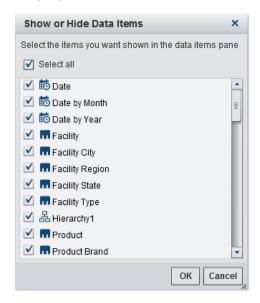
# **Showing or Hiding Data Items**

You can specify which data items you want to see for the data source in the **Data** tab.

#### To show or hide data items:

1 On the **Data** tab, click ₹ and then select **Show or Hide Items**. The Show or Hide Data Items window is displayed.

**Display 32.24** Show or Hide Data Items Window



- Select the data items that you want to appear on the **Data** tab. If there are data items that you do not want to see on the **Data** tab, then clear the check box (or check boxes) for that data item (or data items).
- 3 Click OK.

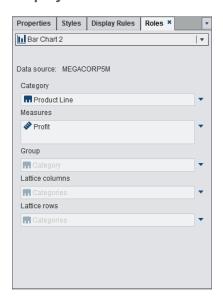
# Modifying Data Role Assignments in Report Objects

After you have selected a report object and a data source, the **Roles** tab in the right pane shows which data items have been assigned to which role.

To modify data role assignments:

- Select a report object in the canvas that has data items assigned.
- Click the **Roles** tab in the right pane.

Display 32.25 Roles Tab



Click ▼ beside the role that you want to edit. For data roles that allow multiple data items, the menu items that are available can vary.

If you select a data item in Roles, then the Aggregation, Add, Remove, and Replace menu items are displayed. You can also right-click on a data item, and the actions specific to that data item are displayed.

Different data roles are available for different report objects. In addition to the basic data roles, you can assign additional data roles.

For example, here are the data roles for a bar chart:

### Group

groups the data based on the values of the category data item that you assign.

#### Lattice columns

creates a lattice of charts with a column for each value of the category data item that you assign.

#### Lattice rows

creates a lattice of charts with a row for each value of the category data item that you assign.

For example, for the bar chart shown in Display 32.25 on page 387, you can replace or remove the **Category**. For the **Measure**, you can modify the aggregation, add another measure, replace the existing measure, or remove the measure. You can also modify the **Group**, the **Lattice columns**, or **Lattice rows**.

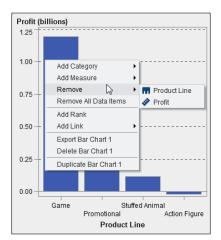
# Removing Data Role Assignments from Report Objects

To remove data items from their assigned data roles in a specific report object:

1 Right-click the report object in the canvas. A menu is displayed.

Here is an example of a bar chart with the object menu:

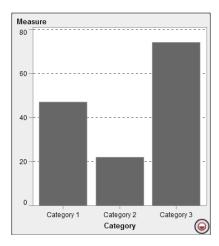
Display 32.26 Report Object Menu



2 Select **Remove All Data Items**. All data items are removed from the assigned data roles and the report object turns gray. The status icon appears in the lower right corner to let you know that the required data roles are not assigned.

Here is an example of what a bar chart looks like after all the data items have been removed from their assigned data roles:

**Display 32.27** Report Object with Missing Data Assignments



# Sorting Data Items in Reports

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# **How Sorting Can Help with Analysis**

Information can be easier to understand when it appears in an intentional order. Applying a sort order to one or more data items in SAS Visual Analytics Designer (the designer) enables you to arrange rows and columns in tables and axis labels on charts in some order, such as alphabetically or highest to lowest numerically. Interactively changing the order of data can provide you with a different perspective that often facilitates valuable insight. For example, in a report, sales employees who are initially arranged alphabetically can be re-sorted by sales amount.

Ranking can help reduce the amount of visible data and is often used in combination with sorting. For more information, see "Adding a New Rank" on page 456.

# **Sorting Data in a List Table**

To sort values in a list table, right-click on a column heading and select **Sort**. Then, select either **Ascending** or **Descending**.

Display 33.1 Sort Menu Items for List Tables

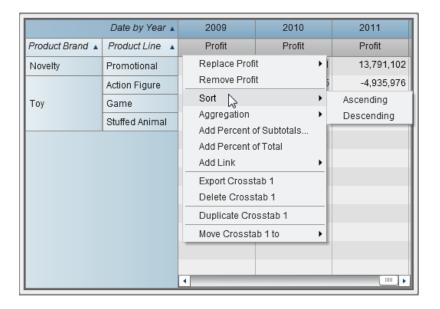
Product Line			Revenue	Expenses	Prot ^	
Action	-	ve Product Line	37,830,429	22,383,218	15,447,211	
Action	Sort	ve i Toduct Ellie	→ ✓ Ascendin	282,489	15,324,936	
Action		ank on Product Line		228 489	15,364,999	
Action	Add Link		37,400,758	22,201,224	15,199,534	
Action	Add Di	isplay Rule	37,054,862	22,046,588	15,008,274	
Action		parkline	0	126,051,937	-126,051,937	
Action	Export	List Table 1	37,365,735	21,939,853	15,425,882	
Action		List Table 1	37,466,062	22,256,456	15,209,606	
Game	Duplicate List Table 1		72,511,801	117,465,423	355,046,378	
Game		Card	396,722,440	67,173,845	329,548,595	
Game		Board	802,655,795	193,961,649	608,694,146	
Game			0	99,209,012	-99,209,012	
Promoti	ional	Coffee Cup	111,717,507	12,359,151	99,358,356	
Promoti	ional	Backpack	278,485,882	113,686,253	164,799,628	
Promotional			0	23,089,265	-23,089,265 🕶	
<b>↓</b>						

Note: You can also press the spacebar to sort a single column in a table.

# **Sorting Data in a Crosstab**

To sort by category or measure values in a crosstab, right-click on a column or row heading, and select **Sort**. Then, select either **Ascending** or **Descending**.

Display 33.2 Sort Menu Items for a Crosstab

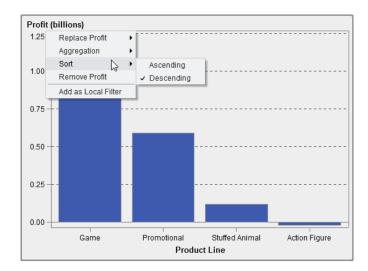


You can also sort categories, rather than measures, by clicking the category name.

## **Sorting Data in a Graph**

To sort by values in a graph, right-click on a measure name or category name, and select Sort. Then, select either Ascending or Descending.

Display 33.3 Sort Menu Items for a Graph



## Working with Display Rules for Reports

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### **Overview of Display Rules**

Display rules include all types of highlighting of report objects. They provide a flexible structure to specify conditions. There are several types of display rules. Display rules enable conditions to be shared across objects, but not all display rules apply across all report object types.

SAS Visual Analytics Designer (the designer) provides the following interfaces for display rules:

The Display Rules tab in the right pane enables you to populate intervals, add intervals, or add color-mapped values for the report object, which is currently

- selected in the canvas. You can use this pane to specify both report-level or object-level display rules, depending on what you have selected in the report canvas.
- The **Shared Rules** tab enables you to create a new display rule for a gauge, which is used by other gauges to designate intervals and colors for ranges. You can also edit or delete an existing shared display rule. These rules are shared across multiple gauges and can be created at any time.

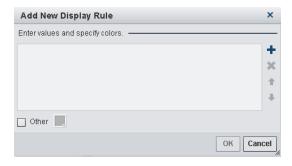
**Note:** Crosstabs, dual axis bar charts, dual axis bar-line charts, dual axis line charts, and dual axis time series plots do not support display rules.

## **Adding Report-Level Display Rules**

To add a report-level display rule:

Without any report objects or the section selected in the report canvas, click the Display Rules tab in the right pane. Click New. The Add New Display Rule window is displayed.

Display 34.1 Add New Display Rule Window

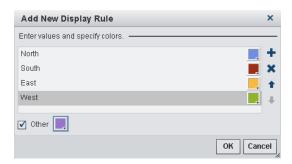


- **2** Enter a value for the display rule in the field.
- **3** Select a color for the display rule.
- 4 (Optional) Repeat the steps for entering a value and selecting a color.

(Optional) Select the Other check box. Then, select a color so that any of the other categories that do not have a color will have the one that you just selected.

In the following example, values and colors have been specified for each region in a list table. And a color has been selected for the **Other** check box.

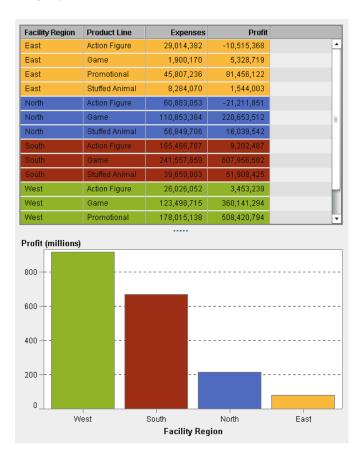
Display 34.2 Add New Display Rule Window with Values and Colors Specified



Click **OK**. The report objects in the report update with the new display rule. And, the display rule appears on the **Display Rules** tab in the right pane.

The following table illustrates the report-level display rules that were defined in the Add New Display Rule window above.

Display 34.3 A List Table and a Bar Chart with Report-Level Display Rules Applied



## **Adding Table-Level Display Rules**

You can add three different types of display rules to tables. You cannot create a display rule to highlight dates in a table.

#### Add Display Rules to a List Table Using an **Expression**

Note: Display rules cannot be added to crosstabs.

To specify a new display rule for a table using an expression:

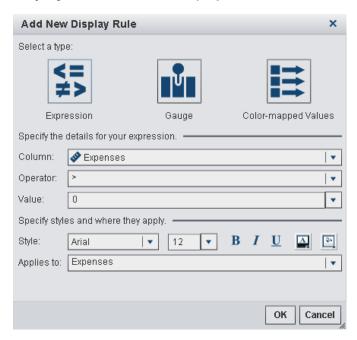
- If it is not already selected, select the table in the report canvas that you want to update.
- In the right pane, click the **Display Rules** tab. Click **New**. The Add New Display Rule window is displayed.

Display 34.4 Add New Display Rule Window for Tables



Click **Expression**. The Add New Display Rule window expands to show the details for the expression.

Display 34.5 Add New Display Rule Window for an Expression



- 4 Select the **Column** or any measure value.
- Select the Operator. You can select =, <>, Between, <, <=, >, >=, Missing, or NotMissing. The default is >.
- 6 Enter or select a Value.
- 7 Modify the style, size, and color of the font.
- 8 Select the row or column in the Applies to drop-down list.
- 9 Click OK. The table updates with the new display rule. The display rule appears on the Display Rules tab in the right pane.

Here is an example of a display rule that uses an expression:

Display 34.6 Display Rules Tab with the Display Rules for an Expression



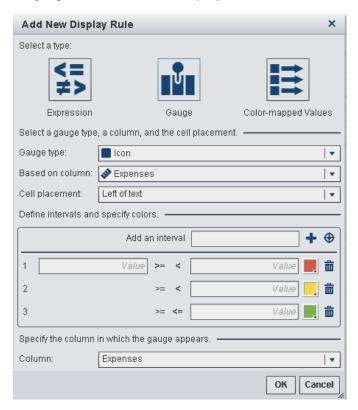
10 (Optional) Click \(\mathbb{K}\) on the **Display Rules** tab to edit the new display rule.

#### Add Display Rules to a List Table Using a Gauge

To specify a new display rule for a table using a gauge:

- If it is not already selected, select the table in the report canvas that you want to update.
- In the right pane, click the **Display Rules** tab. Click **New**. The Add New Display Rule window is displayed.
- Click Gauge. The Add New Display Rule window expands to show the details for the gauge.

Display 34.7 Add New Display Rule Window for a Gauge



- **4** Select a **Gauge type** from the drop-down list. Your choices are a bullet, an icon, a slider, or a thermometer. **Icon** is the default.
- 5 Using the **Based on column** drop-down list, specify which column the rule should be based on in the report.
- Specify where the gauge should appear in the column for the Cell placement. Your choices are Left of text, Right of text, or Replace text.
- 7 Define the intervals and colors for the rule:
  - Enter the individual values for the intervals and then select a color. You can click the operator between the intervals to change it.
  - Click to automatically populate the intervals. The Populate Intervals window is displayed.

**Display 34.8** Populate Intervals Window

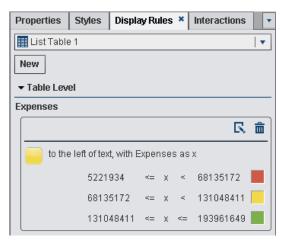
Populate Interva	ls X
Number of intervals:	3
Lower bounds:	1900170
Upper bounds:	241557659
	OK Cancel

You can specify **Number of intervals**, **Lower bounds**, and **Upper bounds**. Click OK.

- Specify the **Column** in which you want the gauge to be displayed
- Click **OK**. The table updates with the new display rule. The display rule appears on the **Display Rules** tab in the right pane.

Here is an example of an automatically populated display rule that uses an icon:

Display Rules Tab with the Display Rules for an Icon Display 34.9



10 (Optional) Click \(\overline{\sc N}\) on the **Display Rules** tab to edit the new display rule.

## Add Display Rules to a List Table Using Color-Mapped Values

To specify a new display rule for a table using color-mapped values:

- If it is not already selected, select the table in the report canvas that you want to update.
- In the right pane, click the **Display Rules** tab. Click **New**. The Add New Display Rule window is displayed.
- 3 Click Color-mapped values. The Add New Display Rule window expands to show the details for the color-mapped values.

Display 34.10 Add New Display Rule Window for Color-Mapped Values



- 4 Select the Column or value to which you want to apply the display rule.
- **5** Click in the box to enter a value for the display rule.

- Select a color for the display rule.
- (Optional) Repeat the steps for entering a value and selecting a color. 7
- (Optional) Select the Other check box. Then, select a color.
- Using the **Applies to** drop-down list, specify where you want to apply the colors. In the following example, values and colors have been specified for products in a list table.

Display 34.11 Add Display Rule Window with Color-Mapped Values Displayed



10 Click **OK**. The table updates with the display rules.

The display rule appears on the **Display Rules** tab in the right pane.

Display 34.12 Display Rule for Color-Mapped Values



**11** (Optional) Click and on the **Display Rules** tab to change the table-level display rule to a report-level display rule.

## **Adding Graph-Level Display Rules**

You can add display rules to graphs. Note that you cannot create a display rule to highlight dates in a graph.

**Note:** Display rules can be added to a waterfall chart only if the **Color by response sign** check box is selected on the **Properties** tab in the right pane.

To specify a new display rule for a graph:

- 1 If it is not already selected, select the graph in the report canvas that you want to update.
- 2 In the right pane, click the **Display Rules** tab. Click **New**. The Add New Display Rule window is displayed.

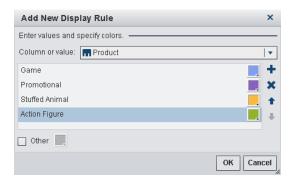
Display 34.13 Add New Display Rule Window for a Graph



- Select a Column or value for the display rule.
- Click in the box to enter a value for the display rule in the field.
- Select a color for the display rule.
- (Optional) Repeat the steps for entering a value and selecting a color. Use the arrows to move values up or down.

In the following example, values and colors have been specified for each product line in a bar chart.

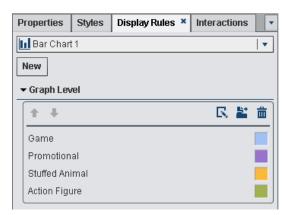
Display 34.14 Add New Display Rule Window with Values and Colors Specified



- (Optional) Select the Other check box. Then, select a color.
- Click **OK**. The graph updates with the new display rule.

The display rule appears on the **Display Rules** tab in the right pane.

**Display 34.15** Display Rules Tab with the Display Rules for a Graph



- 9 (Optional) Click \(\mathbb{K}\) on the **Display Rules** tab to edit the new display rule.
- **10** (Optional) Click in the **Display Rules** tab to change the graph-level display rule to a report-level display rule.

## **Adding Display Rules to a Gauge**

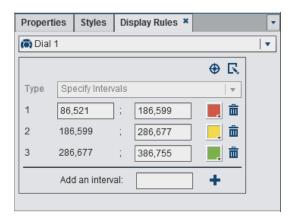
A display rule is used by a gauge to designate intervals and colors for ranges.

To specify a new display rule for a gauge:

- 1 If it is not already selected, select the gauge in the report canvas that you want to update.
- 2 In the right pane, click the **Display Rules** tab.

Here is an example of the **Display Rules** tab for a dial gauge:

Display 34.16 Display Rules Tab for a Dial Gauge



Specify (or modify) the display rules for the gauge. You can populate intervals, edit the display rule, and specify the Type.

To automatically populate the intervals:

Click to display the Populate Intervals window.

Display 34.17 Populate Intervals Window

Populate ir	ntervals	×
Target value:	100	
	ок	Cancel

- Enter a number for **Target value**.
- Click **OK**. The gauge updates with the new display rule.

To edit the display rule for a gauge:

Click \( \mathbb{K} \) to display the Edit Display Rule window.

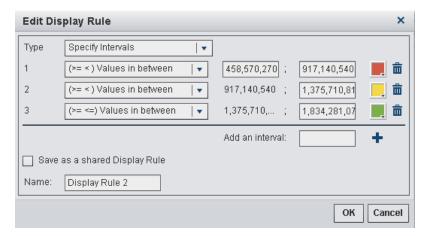
**Display 34.18** Edit Display Rule Window

Edit Dis	play Rule				×
Туре	Specify Intervals				
1	(>= < ) Values in between	🔻	0 ;	148,865,207	
2	(>= < ) Values in between	🔻	148,865,207 ;	582,103,162	
3	(>= <=) Values in between	🔻	582,103,162 ;	1,015,341,11	
			Add an interval:		+
Save	as a shared Display Rule				
Name:	Display Rule 1				
				ок	Cancel

Select a Type. Your choices are either Use a Shared Display Rule or Specify Intervals.

If you select **Specify Intervals**, then the window contents change so that you can add intervals. Here is an example:

**Display 34.19** Specifying Intervals in the Edit Display Rules Window



Update the conditions for the values, the intervals, and the color for the range. Select a color to open the color picker. To add new intervals to the display rule, enter a number and click **Add**. Select the **Save as a shared Display Rule** check box and specify a **Name** if you want to save the display rule.

**c** Click **OK**. The gauge updates with the new display rule.

## Working with Report Filters

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## **About Report Filters**

In SAS Visual Analytics Designer (the designer), you can create filters to subset your data. Three types of filters are available for report objects:

#### Basic filters

subset the data for individual report objects in your reports by using a single data item. A basic filter is constrained to use only the data item that was selected when the basic filter was created. Basic filters can be modified by using the context menu for a report object or by using the **Edit Filter** window. For more information, see "Working with Basic Filters for Report Objects" on page 412.

#### Advanced filters

subset the data for individual report objects in your reports by using any number of data items and operators (for example, OR and AND) in the same expression. Advanced filters can be created and modified by using the **Advanced Filter** window. For more information, see "Working with Advanced Filters for Report Objects" on page 417.

#### Data item filters

subset the data that is returned from a query in a data source. The data item filters that you create are applied to every report object in the report that uses the data source containing the data item. For more information, see "Working with Data Item Filters in a Report" on page 421.

All of your filters are saved when you save your report.

# **Working with Basic Filters for Report Objects**

#### **About Basic Filters for Report Objects**

For certain report objects, you can subset your data by using the **Filters** tab in the right pane of the designer. You can base your filters on any data item in the current data source for this report object, regardless of whether the data item is assigned to a report object in the current report.

Filters on a report object are applied in conjunction with any data item filters that have been applied. Data item filters do not impact the selections that you can make for filters on a report object. For example, if there is a data item filter on a *Country* item that has the selections for *Canada*, *United States*, and *Germany*, you might still have a report

object filter with selections such as Canada and Mexico. If these filters are applied together, then the report object only displays content for Canada.

#### **Create a Basic Filter for a Report Object**

To create a basic filter for a report object:

- If it is not already selected, select the report object in the report canvas that you want to filter. The report object must have at least one data item assigned.
- In the right pane, click the **Filters** tab.
- Click beside the Add Filter button, and select a data item from the list. Then, click **Add Filter**. The filter appears in the tab.

For a basic filter that uses a check box list, a check box is displayed for each distinct value that uses the current format applied to the data item. Select the data value (or data values) that you want to filter or clear the selections for the data value (or data values) that you do not want to filter. Here is an example of a basic filter that uses a check box list:

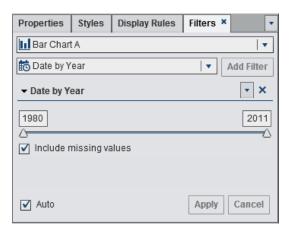
Basic Filter That Uses a Check Box List Display 35.1



Click All to select all of the values. Click it to search for a data item (or data items).

For filters that use a slider, the slider shows you the maximum value and the minimum value that exist for the data item using the current data item format. Use the slider to select a range of target values. Here is an example of a basic filter that users a slider:

Display 35.2 Basic Filter That Uses a Slider



**Note:** By default, your filter changes are applied automatically to the active report object. To apply multiple changes together, clear the **Auto** check box, and then click **Apply** when you are ready to apply changes.

**4** Click ▼ (to the left of the delete icon) for options. The available options depend on whether you are filtering characters, dates, or numerics.

The following filtering options are available:

Option	When Available
Edit Filter	This option is always available.
Filter using continuous values	This option is available only for measure data items.
Filter using discrete values	This option is available for measure and category data items.

Option	When Available
Select all	This option is available when filtering discrete values using a check box list. It selects all of the current discrete values that are listed. This option does not affect the <b>Include missing values</b> setting.
Clear all	This option is available when filtering discrete values using a check box list. It clears the selections of all of the current discrete values that are listed. This option does not affect the <b>Include missing values</b> setting.
Invert selection	This option is available when filtering discrete values using a check box list. It changes all of the discrete value check boxes so that if they are selected, then they are cleared. If they are cleared, then they are selected. This option does not affect the <b>Include missing values</b> setting.
Include missing values	This option is available from the menu only for slider-based filters. It works the same as selecting the <b>Include missing values</b> check box.
Exclude missing values	This menu option is available for slider-based filters and works the same as clearing the <b>Include missing values</b> check box.

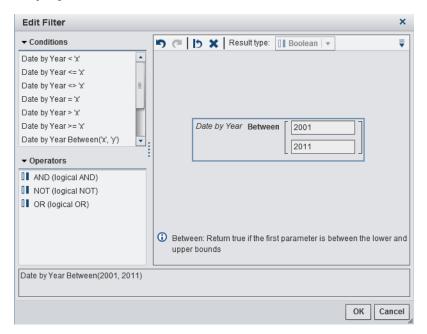
TIP Use the arrow to the left of the filter name on the Filters tab to expand or to collapse the filter details when you are working with multiple filters.

#### **Edit a Basic Filter for a Report Object**

To edit a basic filter for a report object:

- If it is not already selected, select the report object in the report canvas that you want to filter. The report object must have at least one data item assigned.
- In the right pane, click the **Filters** tab.
- Click ▼ beside the filter name. Then, select **Edit Filter**. The Edit Filter window is displayed.

Display 35.3 Edit Filter Window



**4** Build the expression for your filter by dragging and dropping conditions and operators onto the expression in the right pane.

For information about the operators and conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.

**Note:** The AND and OR operators can accept more than two conditions. To add a condition to the operator, drag and drop a new condition onto the operator name in the right pane. For example, to add a third condition to an AND operator, drag and drop the new condition onto AND in the expression.

TIP Right-click the AND or OR operator in the expression, and then select **Add** ► **New Condition**.

5 Click **OK** to apply the filter.

#### **Delete a Basic Filter for a Report Object**

To delete a basic filter, click \* beside the filter on the **Filters** tab.

## **Working with Advanced Filters for Report Objects**

#### **About Advanced Filters for Report Objects**

For most report objects, you can create advanced filters to subset your data by using the **Filters** tab in the right pane.

Advanced filters enable you to create filters that use more than one data item.

Note: Advanced filters that are created in the explorer might contain expressions that you cannot create in the designer.

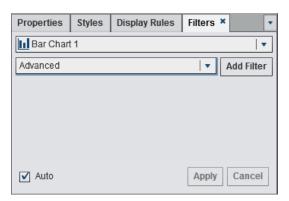
Note: Advanced global filters that are created in the explorer are supported by the designer, but you cannot create advanced global filters in the designer.

#### **Create an Advanced Filter for a Report Object**

To create an advanced filter:

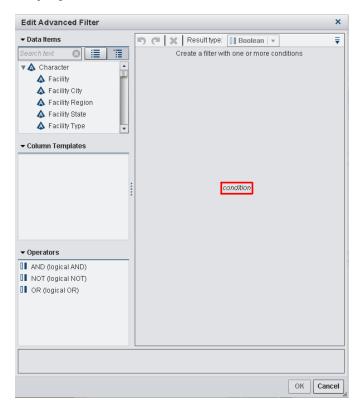
- If it is not already selected, select the report object in the report canvas that you want to filter. The report object must have at least one data item assigned.
- 2 In the right pane, click the **Filters** tab.
- Click ▼ to select **Advanced** instead of a specific data item.

Display 35.4 Advanced Selection on the Filters Tab



4 Click Add Filter. The Edit Advanced Filter window is displayed.

Display 35.5 Edit Advanced Filter Window



- 5 Create a condition for the filter:
  - a From the Data Items list, select the data item on which the condition is based.

**b** From the **Column Templates** list, select a condition.

For information about the conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.

- **c** Drag and drop the condition onto the expression.
- **d** For any required parameters, enter a value or right-click on the parameter field, and select **Replace with** to select a data item for the parameter.
- 6 (Optional) Add an operator to the expression:
  - a From the **Operators** list, select an operator to join the conditions in your expression.

For information about the operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.

- **b** Drag and drop the operator onto the expression.
- **c** From the **Column Templates** list, select another condition. Then, drag and drop the additional condition onto the expression. Complete any required parameters.

TIP Right-click the AND or OR operator in the expression, and then select Add ► New Condition.

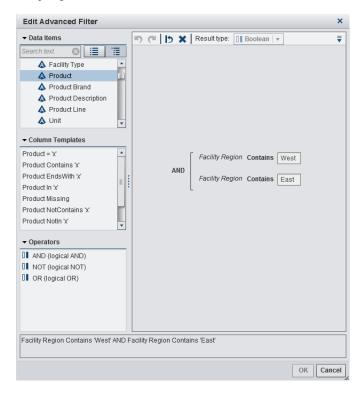
Click **OK** to apply the advanced filter.

#### **Edit an Advanced Filter for a Report Object**

To edit an advanced filter:

- In the right pane, click the **Filters** tab.
- 2 Click v beside the advanced filter name. Then, select Edit Filter. The Edit Advanced Filter window is displayed.

Display 35.6 Edit Advanced Filter Window



- 3 Edit or add a new condition for the filter:
  - a From the **Data Items** list, select the data item on which the condition is based.
  - From the Column Templates list, select a condition.
    For information about the conditions that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.
  - Drag and drop the condition onto the expression.
  - d For any required parameters, enter a value or right-click on the parameter field, and select Replace with to select a data item for the parameter.
- 4 (Optional) Replace a condition by dragging and dropping a new column template onto the existing condition in the expression.
- **5** (Optional) Add an operator to the expression:

a From the **Operators** list, select an operator to join the conditions in your expression.

For information about the operators that are available, see Appendix 2, "Conditions and Operators for Filters," on page 499.

- **b** Drag and drop the operator onto the expression.
- (Optional) Add a condition.

TIP Right-click the AND or OR operator in the expression, and then select Add ► New Condition.

- 6 (Optional) Delete part of an expression by highlighting the part of the expression that you want to delete, and then selecting **Delete** or **Clear**.
- 7 Click **OK** to apply the advanced filter.

#### **Delete an Advanced Filter for a Report Object**

To delete an advanced filter, click × on the filter on the **Filters** tab.

## **Working with Data Item Filters in a** Report

#### **About Data Item Filters**

Data item filters are used to restrict the data that is returned from a query to a data source. The data item filters that you create in the designer are applied to every report object in the report that uses the data source containing the data item. Data item filters are not displayed on the Filters tab. They are identified by a special icon in the data source's data items list.

**Note:** Date data items and calculated data items do not have special icons when a data item filter is applied.

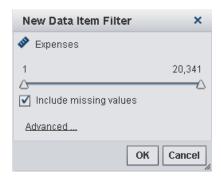
You can use either continuous values or discrete values to create a data item filter. Continuous value filters can be used only for measures. Discrete value filters can be used for any character; numeric; or date, datetime, or data item, as long as the total number of distinct values does not exceed a maximum number.

#### **Create a Data Item Filter**

#### Create a Data Item Filter That Uses Continuous Values

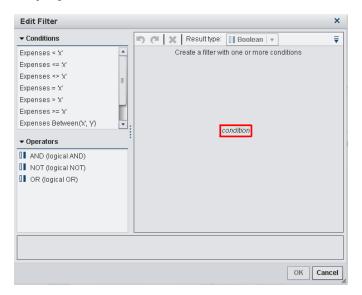
- 1 In the left pane, click the **Data** tab, and then select the data item that you want to filter.
- 2 Right-click on the data item, and then select New Data Item Filter ➤ Using Continuous Values. The New Data Item Filter window is displayed.

Display 35.7 New Data Item Filter Window for a Data Item That Uses Continuous Values



- 3 In the New Data Item Filter window, a slider shows you the maximum value and the minimum value that exist for the data item using the current data item format. Use the slider to select a range of target values.
- 4 (Optional) If you do not want to include missing values in the filter, then clear the **Include missing values** check box.
- **5** (Optional) Click **Advanced** to add more conditions to the data item filter. The Edit Filter window is displayed.

Display 35.8 Edit Filter Window

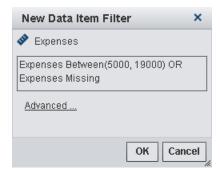


Edit the expression for your filter by dragging and dropping Conditions and **Operators** onto the expression.

For more information about conditions and operators, see Appendix 2, "Conditions and Operators for Filters," on page 499.

Click **OK** in the Edit Filter window. The filter is updated in the New Data Item Filter window.

Display 35.9 New Data Item Filter Window with a Revised Filter



Click **OK** in the New Data Item Filter window. The \$\frac{1}{2}\$ or \$\frac{1}{2}\$ icon identifies the new data item filter on the Data tab.

#### Create a Data Item Filter That Uses Discrete Values

- 1 In the left pane, click the **Data** tab, and then select the data item that you want to filter.
- 2 Right-click on the data item, and then select New Data Item Filter ➤ Using Discrete Values. The New Data Item Filter window is displayed.

**Display 35.10** New Data Item Filter Window for a Data Item That Uses Discrete Values



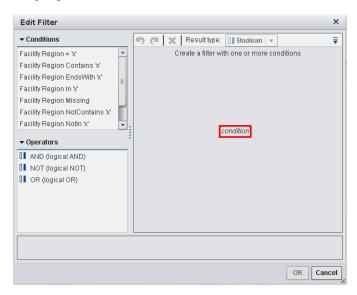
For a data item filter that uses a check box list, a check box is displayed for each distinct value that uses the current format applied to the data item.

**Note:** The content in the New Data Item Filter window depends on the data type and the format of the data item. When you filter on discrete values, some data type and format combinations result in a New Data Item Filter window with a check box list. Or, the New Data Item Filter window has a slider.

- 3 In the New Data Item Filter window, select the data value (or data values) that you want to filter.
- 4 (Optional) Click **!!** to search for a data item.
- 5 (Optional) If you do not want to include missing values in the filter, then clear the Include missing values check box.

(Optional) Click Advanced to add more conditions to the data item filter. The Edit Filter window is displayed.

Display 35.11 Edit Filter Window

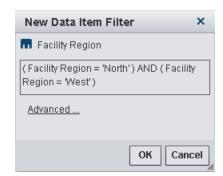


Edit the expression for your filter by dragging and dropping Conditions and **Operators** onto the expression.

For more information about conditions and operators, see Appendix 2, "Conditions and Operators for Filters," on page 499.

Click **OK** in the Edit Filter window. The filter is updated in the New Data Item Filter window.

**Display 35.12** New Data Item Filter Window with a Revised Filter



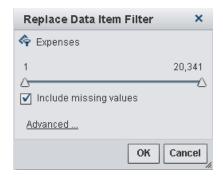
7 Click **OK** in the New Data Item Filter window. The  $\P$  or  $\P$  icon identifies the new data item filter on the **Data** tab.

#### **Replace a Data Item Filter**

#### Replace a Data Item Filter That Uses Continuous Values

- 1 In the left pane, click the **Data** tab, and then select the data item that you want to replace.
- 2 Right-click on the data item, and then select Replace Data Item Filter ▶ Using Continuous Values. Click Yes in the confirmation message that is displayed. The Replace Data Item Filter window is displayed.

**Display 35.13** Replace Data Item Filter Window for a Data Item That Uses Continuous Values



- In the Replace Data Item Filter window, a slider shows you the maximum value and the minimum value that exist for the data item using the current data item format. Use the slider to select a range of target values.
- 4 (Optional) If you do not want to include missing values in the filter, then clear the **Include missing values** check box.
- 5 (Optional) Click Advanced to add more conditions to the data item filter. The Edit Filter window is displayed.
  - Edit the expression for your filter by dragging and dropping Conditions and Operators onto the expression.

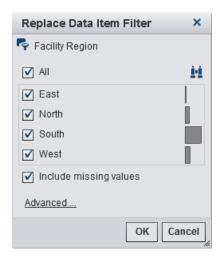
For more information about conditions and operators, see Appendix 2, "Conditions and Operators for Filters," on page 499.

- **b** Click **OK** in the Edit Filter window. The filter is updated in the Replace Data Item Filter window.
- 6 Click **OK** in the Replace Data item Filter window. The report objects that use the replaced data item filter are updated.

#### Replace a Data Item Filter That Uses Discrete Values

- In the left pane, click the **Data** tab, and then select the data item that you want to replace.
- 2 Right-click on the data item, and then select Replace Data Item Filter ▶ Using Discrete Values. Click Yes in the confirmation message that is displayed. The Replace Data Item Filter window is displayed.

Display 35.14 Replace Data Item Filter Window for a Data Item That Uses Discrete Values



- 3 If the Replace Data Item Filter window shows a check box list or slider, adjust those controls to modify the filter. Select the data value (or data values) that you want to filter.
- 4 (Optional) Click **Advanced** to add more conditions to the data item filter. The Edit Filter window is displayed.

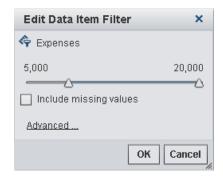
- **a** Edit the expression for your filter by dragging and dropping **Conditions** and **Operators** onto the expression.
  - For more information about conditions and operators, see Appendix 2, "Conditions and Operators for Filters," on page 499.
- **b** Click **OK** in the Edit Filter window. The filter is updated in the Replace Data Item Filter window.
- 5 Click **OK** in the Replace Data Item Filter window. The report objects that use the replaced data item filter are updated.

#### **Edit a Data Item Filter**

#### Edit a Data Item Filter That Uses Continuous Values

- 1 In the left pane, click the **Data** tab, and then select the data item that you want to edit.
- 2 Right-click on the data item, and then select **Edit Data Item Filter**. The Edit Data Item Filter window is displayed.

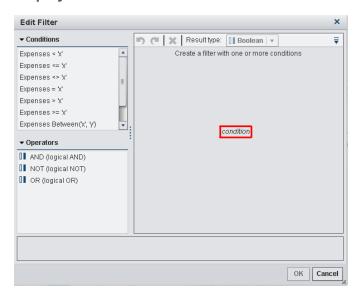
**Display 35.15** Edit Data Item Filter Window for a Data Item Filter That Uses Continuous Values



3 In the Edit Data Item Filter window, a slider shows you the maximum value and the minimum value that exist for the data item using the current data item format. Use the slider to select a range of target values.

- (Optional) If you do not want to include missing values in the filter, then clear the Include missing values check box.
- (Optional) Click Advanced to add more conditions to the data item filter. The Edit Filter window is displayed.

Display 35.16 Edit Filter Window

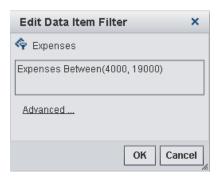


Edit the expression for your filter by dragging and dropping Conditions and **Operators** onto the expression.

For more information about conditions and operators, see Appendix 2, "Conditions and Operators for Filters," on page 499.

Click **OK** in the Edit Filter window. The filter is updated in the Edit Data Item Filter window.

Display 35.17 Edit Data Item Filter Window with a Revised Filter

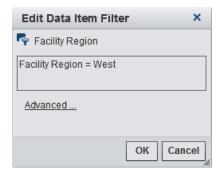


6 Click OK in the Edit Data Item Filter window. The report objects that use the edited data item filter are updated.

#### **Edit a Data Item Filter That Uses Discrete Values**

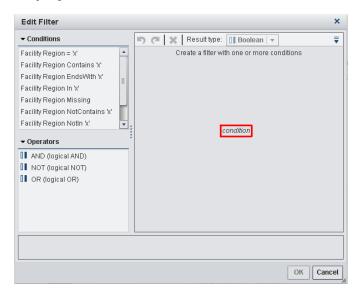
- In the left pane, click the Data tab, and then select the data item that you want to edit.
- 2 Right-click on the data item, and then select Edit Data Item Filter. The Edit Data Item Filter window is displayed.

**Display 35.18** Edit Data Item Filter Window for a Data Item Filter That Uses Discrete Values



- 3 If the Edit Data Item Filter window shows a check box list or slider, adjust those controls to modify the filter. Select the data value (or data values) that you want to filter.
- **4** (Optional) Click **Advanced** to add more conditions to the data item filter. The Edit Filter window is displayed.

**Display 35.19** Edit Filter Window

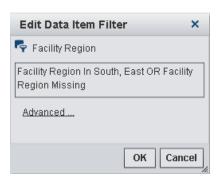


Edit the expression for your filter by dragging and dropping Conditions and **Operators** onto the expression.

For more information about conditions and operators, see Appendix 2, "Conditions and Operators for Filters," on page 499.

Click **OK** in the Edit Filter window. The filter is updated in the Edit Data Item Filter window.

Display 35.20 Edit Data Item Filter Window with a Revised Filter



Click **OK** in the Edit Data Item Filter window. The report objects that use the edited data item filter are updated.

### **Delete a Data Item Filter**

To delete a data item filter:

- 1 In the left pane, click the **Data** tab, and then select the data item that you want to delete.
- 2 Right-click on the data item, and then select **Delete Data Item Filter**. The data item filter is removed from the **Data** tab.

# Working with Interactions

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### **Overview of Interactions**

Interactions are used to direct a report viewer's attention to specific results in a report. Interactions allow data to be subset to reduce the amount of data, and enables users to understand it within a particular context.

The interactions view in SAS Visual Analytics Designer (the designer) enables report authors to specify which interactions they would like to add to tables, graphs, gauges, and controls in a report.

There are these types of interactions:

#### filter

is used to restrict the data that is returned from a query to a data source. Filters are simply a set of rules or conditions that you specify to subset the data that is displayed in a table or graph. The goal is to display only the data that you need to see to perform your analysis.

#### brush

is short for *data brushing*, which enables you to show the same data selected simultaneously in two or more tables, graphs, or controls. Brushing highlights a percentage that reflects the number of shared observations in the data set. Brushing does not highlight a percentage that corresponds to the aggregated value. The brushed data has the same appearance in each object, which makes the data easily apparent to report viewers.

Tables, graphs, and gauges can be the source of an interaction, with the exception of scatter plots and time series plots. Controls that are used on the report canvas can also be the source of an interaction. Controls that are used as section prompts are treated as automatic filters and are not displayed in the interactions view.

Some objects (for example, heat maps and box plots) that are imported from SAS Visual Analytics Explorer (the explorer) cannot participate in interactions.

The Interactions tab in the right pane enables you to create interactions and links.

### **Creating Interactions**

### **Create a Filter Interaction**

You can create interactions using the interactions view or the **Interactions** tab in the right pane.

**Note:** You cannot create interactions from list tables, bubble plots, and scatter plots that use detail data. However, a list table that uses detail data can be the target of an interaction.

**Note:** Scatter plots cannot be the source of an interaction.

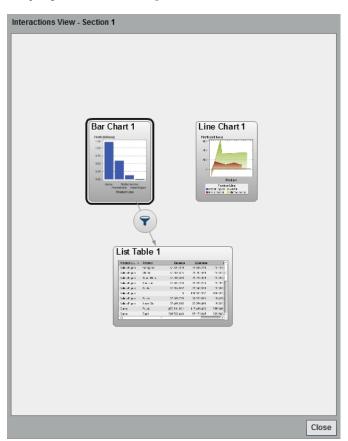
**Note:** Bubble plots can be the source of an interaction only if they have a **Grouping** role assigned.

To create a filter interaction using the interactions view:

- 1 Add the report objects that you want to use to the report canvas. For example, you might have a bar chart, a line chart, and a list table.
- 2 Click Interactions View on the Interactions tab to switch to the interactions view. You can also select **View** ▶ **Show Interactions**.
- 3 In the interactions view, draw a connection between the source and target report objects. When you have created an interaction, the  $\Upsilon$  is displayed between the report objects. Here is an example of an interaction between a bar chart (the source) and a list table (the target):

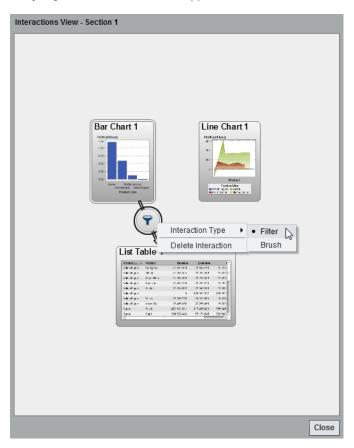
Note: The source and target of an interaction must be based on the same data source.

**Display 36.1** Creating a Filter Interaction between a Bar Chart and a List Table



4 Right-click **?**. Then, select Interaction Type ▶ Filter.

Display 36.2 Interaction Type Menu



- (Optional) Add other filter interactions.
- Click Close. The new interaction (or interactions) appears on the Interactions tab in the right pane.

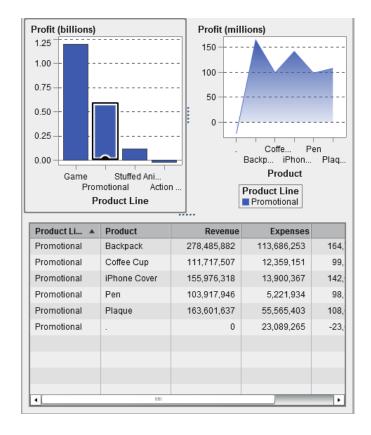
The following example shows the **Interactions** tab for the filtering example shown in Display 36.4 on page 438.

Display 36.3 Interactions Tab with Two Interactions Displayed



Select data in the source report object to filter data in the target report object (or objects). In the following example, the promotional product line was selected in the bar chart. Simultaneously, the line chart and the list table show the same filter.

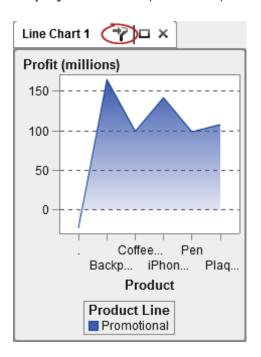
Display 36.4 A Filtering Example with a Bar Chart, a Line Chart, and a List Table



Clicking on another selection applies the filter based on your new selection. For example, in the report above, you can click on the game product line to change the filter. An icon is added to the report object that is filtered.

Here is the line chart that was used in the previous example. The incoming filter icon appears above the report object when it is selected in the canvas.

**Display 36.5** Example of a Report Object with an Incoming Filter



To clear the selection and reset the filter (or filters), press Ctrl+click while viewing the original report object.

To create an interaction using the **New** button on the **Interactions** tab:

- Select a report object in the canvas. For example, you might have a bar chart.
- Select the **Interactions** tab.
- Click **New**, and then select **Interaction**. The **Edit Interaction** window is displayed.

Filter

Bar Chart 1 filters List Table 1 | v |
Clist Table 1 | v |
Dar Chart 1 brushes List Table 1 | v |
Clist Table 1 | v |

Display 36.6 Edit Interaction Window

4 In the Edit Interaction window, select the report object that you want to use as the source of a filter or brush interaction. For example, if your report has a bar chart, and you want it to filter a line chart, the first line should read *Bar Chart 1* filters *List Table 1*.

The Edit Interaction window disables options for filter or brush interactions if they are not possible.

- **5** When you are finished working with interactions, click **OK**.
- **6** The new interaction is displayed in the **Interactions** tab.

### **Create a Data Brushing Interaction**

To create an interaction using data brushing:

- 1 Add the report objects that you want to use to the canvas. For example, you might have a bar chart, a line chart, and a list table.
- 2 Select the Interactions tab.
- 3 Click Interactions View on the Interactions tab to switch to the interactions view. You can also select View ▶ Show Interactions.
- 4 In the interactions view, draw a connection between the source and target report objects. When you have created an interaction, the  $\Upsilon$  is displayed between the report objects.
- 5 Right-click **?**. Then, select **Interaction Type** ▶ **Brush**.

Display 36.7 Interaction Type Menu with Brush Selected

6 Click **Close**. The new interaction (or interactions) appears on **Interactions** tab in the right pane.

Select data in the source report object to brush data in the target report object (or objects). In the following example, the stuffed animal product line was selected in the bar chart. Simultaneously, the line chart and the crosstab highlight the same data.

Profit (billions) Profit (millions) 1.25 600 1.00 400 0.75 200 0.50 താതാ 0.25 0.00 Product Game Stuffed Ani.. Product Line Promotional Action Action Figure Game Product Line Stuffed Animal Promotional Product Li... A Product Revenue Expenses Action Figure Firefighter 37,830,429 22,383,218 37.607.425 22,282,489 Action Figure Athlete Action Figure Super Hero 37,593,488 22,228,489 Action Figure Musician 37,400,758 22,201,224 22,046,588 Action Figure Soldier 37,054,862 126,051,937

37,365,735

37,466,062

472,511,801

396.722.440

Action Figure

Action Figure

Action Figure

Game Game Police

Puzzle

Card

Movie Star

Display 36.8 A Data Brushing Example with a Bar Chart, a Line Chart, and a List Table

Note: If a graph contains a frequency measure, then a crosshatch pattern indicates when it is selected or brushed.

21,939,853

22,256,456

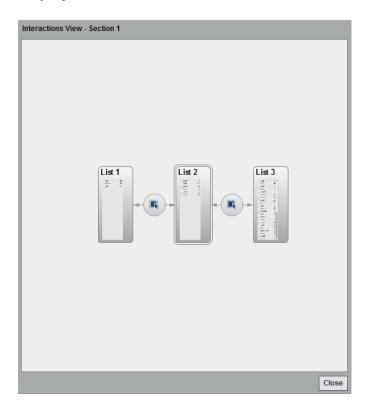
117,465,423

67.173.845

The brush interaction between controls behaves differently than a brush interaction between tables and graphs. When there is a brush interaction between controls, instead of highlighting or selecting the values in the other control, the values that match are moved to the top of the control, and the values that do not match are grayed out. If a frequency data item exists, then the frequency value is updated.

Here is an example of a report on cars with three list controls:

**Display 36.9** Three List Controls with Brush Interactions



The first list contains three countries listed as the Origin. The second list contains six types of vehicles. The third list contains 38 car manufacturing companies. There is a brush interaction between the first list and the second list. There is a second brush

interaction between the second list and the third list. Look at the values in the second list.

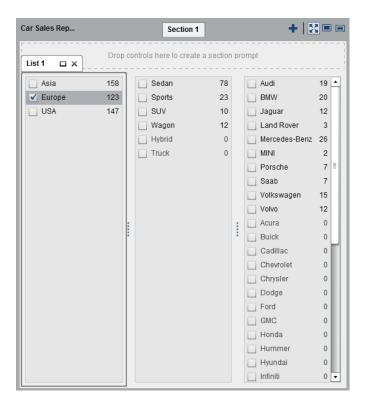
Display 36.10 Example: Three List Controls in a Report



In step 1, the user has selected Europe as the country of Origin in the first list. Notice the changes in the second list. Hybrid and Truck are grayed out, and their frequency

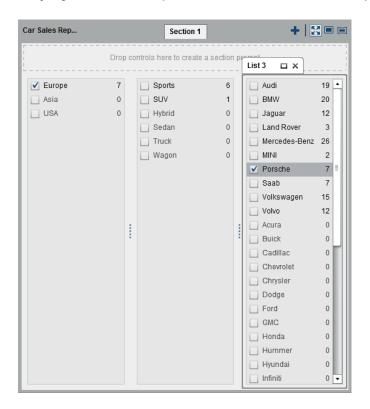
values have both changed to 0. In the third list, all of the car manufacturers that are not located in Europe are grayed out, and their frequency values have all changed to 0

**Display 36.11** Example: Three List Controls in a Report with One Brush Interaction



In step 2, the user has selected Porsche as the car manufacturing company in the third list. Notice the changes in the second list. Hybrid, Sedan, Truck, and Wagon are grayed out, and their frequency values have all changed to 0.

Display 36.12 Example: Three List Controls in a Report with Two Brush Interactions



### **Deleting Interactions**

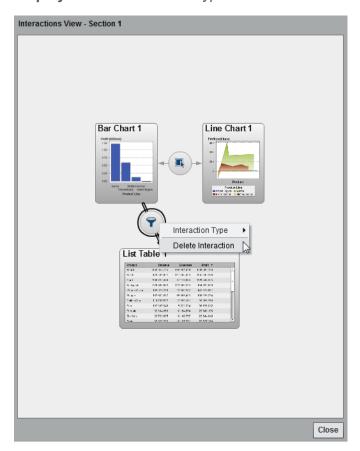
You can delete interactions using the interactions view or the **Interactions** tab in the right pane.

To delete either a filter or data brushing interaction using the interactions view:

Select the Interactions tab.

- Click Interactions View to switch to the interactions view. You can also select View
   Show Interactions.

**Display 36.13** Interaction Type Menu for a Filter with Delete Selected



- 4 Click **Yes** in the confirmation message that is displayed.
- 5 (Optional) Remove other interactions.

To delete an interaction using the **Interactions** tab:

- 1 Click the **Interactions** tab.
- Click m next to the interaction that you want to delete.

Click **Yes** in the confirmation message that is displayed.

### **Creating Links**

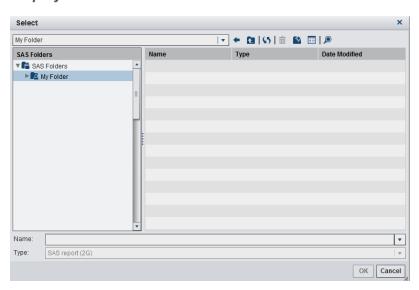
Using the Interactions tab, you can add a link from a report object, text, or image to another report; you can add a link to a specific section in the current report; or you can add a link from report objects (including text objects) to an external URL.

### **Create a Link to Another Report**

To add a link from a report object or image to another report:

- Click the **Interactions** tab.
- Click **New**, and then select **Report Link**. The Select window is displayed.

Display 36.14 Select Window

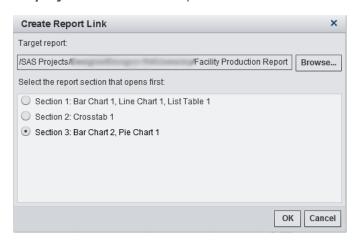


Select a target report, and then click **OK**. The Create Report Link window is displayed.

4 Verify the name of the target report. If you want to select a different target report, click Browse.

If the target report contains more than one section, then select the report section that you want to open first.

Display 36.15 Create Report Link Window with Section 3 Selected



Click **OK**. The new report link is displayed on the **Interactions** tab in the right pane.

Double-click on an item in the report object (for example, a bar, a row in a table, a pie slice, and so on) to activate the report link. You are prompted to save changes to the report object before you can follow the link to the target report. To return to the source report object, use the button next to the target report name above the canvas.

Here is an example of the button that enables you to return to the source report object:

Display 36.16 Button to Return to the Source Report Object



To add a link from text to another report:

1 Double-click inside the text object on the canvas and enter the text. You can use the floating toolbar to change the font, font size, text color, and text background color. You can specify whether the text is bold, italic, or underlined, and whether it is left-aligned, centered, or right-aligned.

You can use the context menu to cut, copy, and delete text. However, you have to use the keyboard shortcut (Ctrl +V) to paste text.

2 (Optional) Add a hyperlink by selecting some text, and then clicking ⇔. Select **Hyperlink**. The Link Setup window is displayed. Select the **Type** of link. The options are External URL and Report Link. If your report has multiple sections, then the **Section Link** option is also displayed.

Enter a URL. The http:// part of the link is provided. The link can be relative to the current web application server.

Display 36.17 Link Setup Window



Click **OK**. The link appears in the text object.

### Create a Link to One or More Sections in a Report

To add a link from a report object, text, or image to a specific section in the same report:

- Click the **Interactions** tab.
- 2 Click **New**, and then select **Section Link**. The Create Section Link window is displayed.

Display 36.18 Create Section Link Window

Create Section Link	×
Link List Table 1 to:	
☐ All	
Section 2: Crosstab 1	
Section 3: Bar Chart 2, Pie Chart 1	
Filter links can be passed only to objects with the same data source.	
OK Can	cel

3 Select **All** to link to all of the sections in the report or select a specific section (or sections) in the report.

Click **OK**. The new section link is displayed on the **Interactions** tab in the right pane. If you selected multiple sections, those links are displayed on the **Interactions** tab.

Alternatively, you can create a section link using the interactions view.

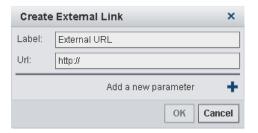
#### Create a Link to an External URL

You can add a link from a report object, text, or image to an external URL. The http:// part of the link is provided. The link can be relative to the current web application server. For example, you can link to a stored process, which means that you would not need to specify http://servername:port because you are already logged on to that server.

To add a link to an external URL:

- Click the Interactions tab.
- 2 Click New, and then select External Link. The Create External Link window is displayed.

Display 36.19 Create External Link Window



- Enter a **Label** and a **Url** for the link.
- (Optional) Click + to specify additional parameters for the link. You can specify the Format value option, a Source, and a Target. The Format value option applies only to dates and numbers. You can add multiple parameters.

Display 36.20 Create External Link Window Expanded to Show Parameters



Press Enter or Tab to activate the **OK** button. Click **OK**. The new external link is displayed on the Interactions tab in the right pane.

Double-click on a report object to link to the external URL.

## **Deleting Links**

To delete a link from a text object, select the linked text, and then click ♥ . Then, select Remove Link.

To delete a link using the **Interactions** tab:

Click the Interactions tab.

- 2 Click in next to the link that you want to delete.
- 3 Click **Yes** in the confirmation message that is displayed.

# Ranking Values in Reports

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## **Overview of Ranking in Reports**

Using SAS Visual Analytics Designer (the designer), you can rank the data in a report object to show the top (greatest) value or bottom (least) value for a category that is based on a measure. For a list table, you can also rank across a set of categories for the top value or bottom value in the set. A rank filters the values of a category based on the aggregated measure by the top or bottom of the values. A rank greatly reduces the visible categories to make it easier to focus on the top value or bottom value that interests a user.

For example, you might create a rank of the top 10 countries by frequency to select the 10 countries that are most represented in your report. As another example, you might create a rank of the top 10 countries by population to select the 10 countries with the greatest populations.

### **Adding a New Rank**

You can use the **Ranks** tab to create ranks to subset the data in your reports. You can also right-click on your graphs and tables to add a rank to limit the number of bars, rows, and so on. Controls and gauges support ranks.

A single category rank ranks the top of a single category.

To add a rank:

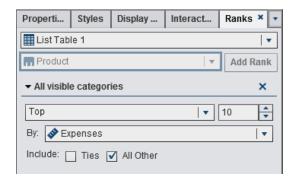
- Click the Ranks tab.
- 2 Select a data item. You can select any category or geography data item, regardless of whether it is assigned to the current report object.

For list tables only, you can select **All visible categories**. This rank ranks across the crossing. For example, you select the region and product data items. You rank on the crossing of these data items. In this case, the column is no longer considered a single column, it is considered the crossing of the columns.

The **Detail rank** option is available for list tables, bubble plots, and scatter plots that show detail data. If the report object has a detail rank, then it is the only rank that it can have. Otherwise, report objects can have multiple ranks.

3 Click Add Rank. The Ranks tab expands.

Display 37.1 Ranks Tab



- 4 Select the type of rank from the drop-down list. **Top** specifies that the rank selects the greatest value. **Bottom** specifies that the rank selects the least value.
- 5 Specify the number of values for the rank. For example, if you specify 5, and you select **Top** as the rank type, then the rank selects the five greatest values.
- **6** From the **By** drop-down list, select the measure that is used to create the rank. You can select any measure.
- 7 (Optional) Select **Ties** to include ties in the rank.

If you select **Ties**, then the rank selects as many values as necessary to include all of the ties. If you do not select **Ties**, then the rank selects only the number of values that are specified by the rank parameters.

For example, if your rank selects the top three values, but there are five values tied for the greatest value, then the number of values that are selected by the rank depends on the **Ties** option. If you select **Ties**, then the rank includes all five of the tied values. If you do not select **Ties**, then the rank includes only three of the tied values.

8 (Optional) Select All Other to show the measurements for the categories that did not qualify as a top or bottom value.

Note: The All Other option is not available when there is a detail rank or when the data item is hidden. It is not available if the rank is on a prompt control, geo bubble map, or geo region map.

When the All Other option is specified for a report object, the total, subtotal, and percent of total show values with respect to all of the data, rather than data just relative to data qualifying under the rank. The data that does not fit into the top or bottom of the rank is aggregated in the **All Other** category.

You can use the All Other option with a top ranking to reduce the number of slices in a pie chart. However, this means that the "Other" slice is removed from the pie chart.

If you do not select All Other, then the rank shows only the data as filtered by the category values that qualify as the top or bottom value.

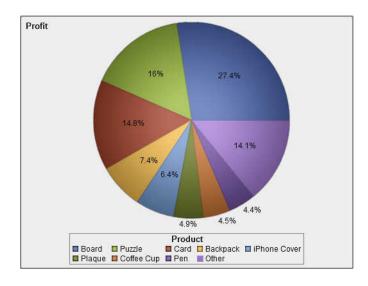
**Note:** If **All Other** is selected, then any **All Other** value that appears in a table or graph cannot be selected. This means that the **All Other** value cannot be the source value for an interaction.

By default, your new rank is applied automatically to the report object.

You can add more than one rank to a report object, as long as the first rank is not a **Detail rank** or an **All visible categories** rank.

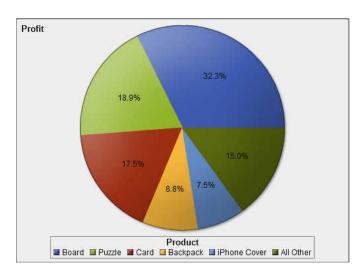
Here is an example of a pie chart that shows the profit for multiple product lines before a rank is applied:

Display 37.2 Pie Chart with Profits for Each Product Line Displayed



Here is the same pie chart after a rank of the top five product lines is added. The All Other option was selected, so the "Other" slice is not displayed.

Display 37.3 Pie Chart with Profits for the Top Five Product Lines Displayed



## **Deleting a Rank**

To delete a rank, click **X** on the rank on the **Ranks** tab.

You can also right-click on the report object and select **Remove Rank** as long as there is only one rank for the report object.

# Maintaining Multi-Section Reports

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### **Overview of Report Sections**

Any report in SAS Visual Analytics Designer (the designer) can have multiple sections. Multiple sections can be used to present different views of the data to the person who views the report. Each section has one or more data sources. There is no limit to the number of sections in a report.

### **Adding a Section to a Report**

You can add sections to any report, including reports that were created in SAS Visual Analytics Explorer (the explorer).

Here is an example of what the first section tab looks like:

Display 38.1 First Section Tab



To add a new section to a report, click + in to the right of the first section tab in the report. The new tab appears to the right of the existing tab (or tabs).

Here is an example:

Display 38.2 Multiple Section Tabs

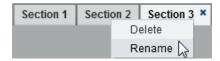
Report 1	Section 1	Section 2	Section 3 ×	+1

## **Renaming a Report Section**

To rename a report section:

1 Right-click the section tab that you want to rename. A menu is displayed.

Display 38.3 The Menu Option for Renaming a Section



- 2 Select Rename.
- 3 Type a new name, and then press Enter. The new name also appears on the **Properties** tab in the right pane.

Alternatively, you can change the name on the **Properties** tab.

## **Deleting a Section from a Report**

To delete a section from a report, right-click the section tab that you want to remove. Select **Delete**.

**Note:** The **Delete** menu option is not available if the report has only one section.

### Moving or Dragging a Report Object to **Another Section**

To move a report object from one section in a report to another section, right-click the report object, and select Move to. Then, select the name of the other section. You can drag an object from one section and drop it onto the tab for another section to move it to that section.

If you move an object to a section with precision layout, then you must manually move the object to its proper location. All objects are put in the top left corner by default.

# **Exporting Data from Report Objects**

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# Overview of Exporting from the Designer

All users who have the Export Data capability can use the designer to export data from report objects to Microsoft Excel format for future viewing or printing. This exported output can be saved locally on disk, and then opened in Microsoft Excel.

When you export a graph from SAS Visual Analytics Designer (the designer), you are exporting the data, not the visual graph representation.

Not all report objects in the designer support the exporting feature. For example, you cannot export data from gauges. If the export feature is not available for a particular report object, the **Export <reportObjectName>** menu item does not appear when you right-click on the object.

# **Exporting Data from Report Objects**

# **Export Data from a List Table**

To export data from a list table:

- 1 If the list table that you want to export is not already selected, select it.
- 2 Right-click on the list table, and select Export <listTableName>, where <listTableName> is the name of the report object.

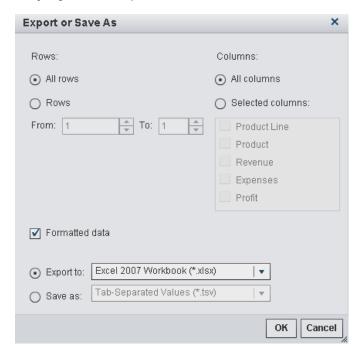
Here is an example of the **Export** menu option for a list table:

Display 39.1 Export Menu for List Tables

Product Li A	Product	Reve	enue	Expenses		-
Action Figure	Firefighter	37,830,	429	22,383,218	15	
Action Figure	Athlete	37,607,	425	22,282,489	15	
Action Figure	Replace Product		188	22,228,489	15	
Action Figure	Remove Product	Line	758	22,201,224	15	
Action Figure —	Sort		362	22,046,588	15	
Action Figure	Add Rank on Pro		0	126,051,937	-126	
Action Figure —	Add Link		735	21,939,853	15	
Action Figure	Add Display Rule	!	)62	22,256,456	15	d
Game -	Add Sparkline		301	117,465,423	355	ı
Game	Export List Table	N	140	67,173,845	329	ı
Game	201010 2101 10010		795	193,961,649	608	ı
Game	Duplicate List Ta	DIE 1	0	99,209,012	-99	ı
Promotional	Coffee Cup	111,717,	507	12,359,151	99	ı
Promotional	Backpack	278,485,	882	113,686,253	164	
- Dromotional			^	22,000,265	•	•

The Export or Save As window is displayed.

**Display 39.2** Export or Save As Window for List Tables



- Choose one of the following export options for rows:
  - Select **All rows** to export all rows.
  - Select **Rows** to specify a range of rows to export. Enter a number in the **From** and To fields.
- Choose one of the following export options for columns:
  - Select **All columns** to export all columns.
  - Select **Selected columns** to specify which columns to export. Then, select the check box (or check boxes) to the left of the column (or columns) that you want to export. At least one column is required. If you do not select a column, then a message is displayed, and the Export or Save As window cannot be closed.
- (Optional) To choose whether the exported data is formatted, either select or clear the Formatted data check box. This check box is selected by default.

- 6 If you select Export to, then the only option is Excel 2007 Workbook (\*.xlsx) to create a Microsoft Excel spreadsheet.
- 7 If you select **Save as**, choose one of the following options:
  - Select Tab-Separated Values (\*.tsv) to create a data file.
  - Select Comma-Separated Values (\*.csv) to create a data file.
- 8 Click OK.
- 9 When you are prompted, choose either to open the file or to save it.

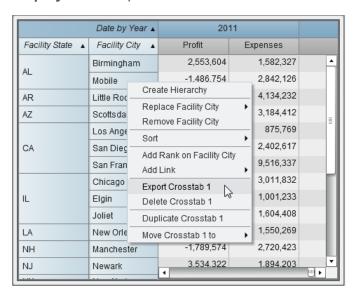
# **Export Data from a Crosstab**

To export detail data from a crosstab:

- 1 If the crosstab that you want to export is not already selected, select it.
- 2 Right-click on the crosstab, and select Export <crosstabName>, where <crosstabName> is the name of the report object.

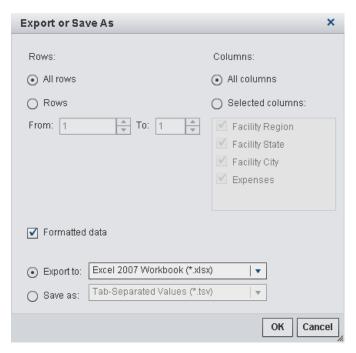
Here is an example of the **Export** menu option for a crosstab:

Display 39.3 Export Menu for Crosstabs



The Export or Save As window is displayed.

Display 39.4 Export or Save As Window for Crosstabs



- Choose one of the following export options for rows:
  - Select **All rows** to export all rows.
  - Select **Rows** to specify a range of rows to export. Enter a number in the **From** and To fields.
- Choose one of the following export options for columns:
  - Select **All columns** to export all columns.
  - Select **Selected columns** to specify which columns to export. Then, select the check box (or check boxes) to the left of the column (or columns) that you want to export. At least one column is required. If you do not select a column, then a message is displayed, and the Export or Save As window cannot be closed.
- (Optional) To choose whether the exported data is formatted, either select or clear the Formatted data check box. This check box is selected by default.

- 6 If you select **Export to**, then the only option is **Excel 2007 Workbook (\*.xlsx)** to create a Microsoft Excel spreadsheet.
- 7 If you select **Save as**, choose one of the following options:
  - Select Tab-Separated Values (\*.tsv) to create a data file.
  - Select Comma-Separated Values (\*.csv) to create a data file.
- 8 Click OK.
- 9 When you are prompted, choose either to open the file or to save it.

# **Export Data from a Graph**

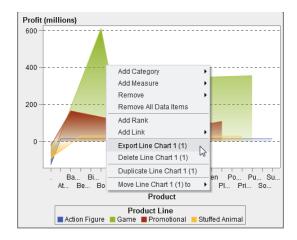
**Note:** You cannot export the actual visual graph. Only the data can be exported.

To export data from a graph:

- 1 If the graph that you want to export is not already selected, select it.
- 2 Right-click on the graph, and select Export <graphName>, where <graphName> is the name of the report object.

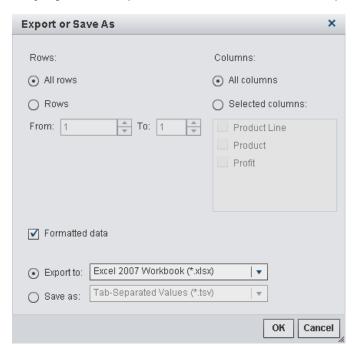
Here is an example of the **Export** menu option for a line chart:

Display 39.5 Export Menu for Graphs



The Export or Save As window is displayed.

Display 39.6 Export or Save As Window for Graphs



- Choose one of the following export options for rows:
  - Select **All rows** to export all rows.
  - Select **Rows** to specify a range of rows to export. Enter a number in the **From** and To fields.
- Choose one of the following export options for columns:
  - Select **All columns** to export all columns.
  - Select **Selected columns** to specify which columns to export. Then, select the check box (or check boxes) to the left of the column (or columns) that you want to export. At least one column is required. If you do not select a column, then a message is displayed, and the Export or Save As window cannot be closed.
- (Optional) To choose whether the exported data is formatted, either select or clear the Formatted data check box. This check box is selected by default.

- 6 If you select **Export to**, then the only option is **Excel 2007 Workbook (\*.xlsx)** to create a Microsoft Excel spreadsheet.
- 7 If you select **Save as**, choose one of the following options:
  - Select Tab-Separated Values (\*.tsv) to create a data file.
  - Select Comma-Separated Values (\*.csv) to create a data file.
- 8 Click OK.
- 9 When you are prompted, choose either to open the file or to save it.



# Viewing Reports

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# Viewing Reports on a Mobile Device

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# **Opening the App for the First Time**

You can use the SAS Mobile BI for iPad or Android app to view SAS Visual Analytics reports on your mobile device. The SAS Mobile BI for iPad app is available in the iTunes App Store. The Android app is available from Google Play.

When you open either app for the first time, sample reports are available in My Portfolio. The app provides online Help for using SAS Mobile BI. You can view the online Help in My Portfolio. The online Help also provides access to tutorial videos about how to use the app.

# Add a Server Connection for iPad

When you first open the SAS Mobile BI for iPad app, the only connection that is available is to the SAS Demo Server.

To access your corporate library server, you must add a connection to that server. If your company has more than one server, you can add additional connections in the same way.

**Note:** Contact your SAS Visual Analytics system administrator for your user ID, password, and server information.

Here are the steps to connect to a server:

- 1 If you are in My Portfolio, tap **Library**.
- 2 Tap Connections in the library.
- 3 Tap Add Connections.
- 4 Tap the **Server** field, and enter the address of the new server.

**Note:** If the server requires a secure (SSL) connection, type *https://* at the beginning of the server address.

- **5** Tap the **User ID** field, and enter your user ID.
- **6** Tap the **Password** field, and enter your password.
- **7** Tap the **Description** field, and enter a description for the new connection.
- 8 Tap **Next** to verify the connection.
- **9** Tap **Save**. The connection is saved, and the Connections window closes.

**Note:** If the connection fails, a message is displayed to help you correct the problem.

Information about available reports is automatically downloaded and appears in the library.

# **Add a Server Connection for Android**

When you first open the SAS Mobile BI for Android app, the only connection that is available is to the SAS Demo Server.

To access your corporate library server, you must add a connection to that server. If your company has more than one server, you can add additional connections in the same way.

Note: Contact your SAS Visual Analytics system administrator for your user ID, password, and server information.

Here are the steps to connect to a server:

- If you are in My Portfolio, tap **Library**.
- Tap the **Connections** icon in the library.
- Tap **Add Connections**.
- 4 Tap the Server field, and enter the address of the new server. If the port is a nonstandard port, then you should enter the port number.

**Note:** If the server requires a secure (SSL) connection, type https:// at the beginning of the server address.

- 5 Tap the **User ID** field, and enter your user ID.
- Tap the **Password** field, and enter your password.
- Tap the **Description** field, and enter a description for the new connection.
- On the keyboard, tap **Done** to verify the connection.
- Tap **OK**. The connection is saved, the Connections window closes, and the library appears.

**Note:** If the connection fails, the Extended Connection Properties window displays a message to help you correct the problem.

# Viewing Reports in SAS Visual Analytics Viewer

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# Overview of Viewing Reports in SAS Visual Analytics Viewer

As an alternative to viewing reports on a mobile device, you can use the web viewer. For users with a Report Viewing role, the SAS Visual Analytics Viewer (the viewer) enables them to view report content.

# **Opening a Report in the Viewer**

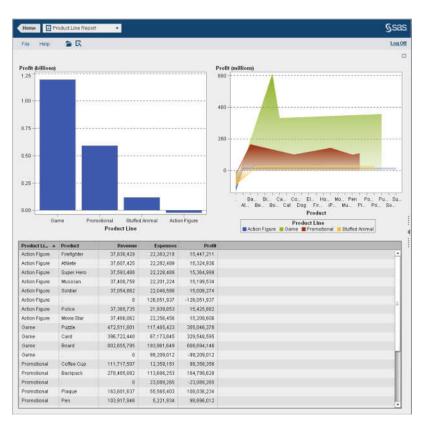
To open a report in the viewer:

- Click on a report on the SAS Visual Analytics home page.
- Use the object inspector on the home page to view details about the report, and then click View. For more information about the object inspector, see "Discovering Details Using the Object Inspector on the Home Page" on page 21.

The layout of the tiles in the treemap is dependent on the size of the display area. This means that the same treemap might appear slightly different in the viewer than it does in SAS Visual Analytics Designer (the designer) or on a mobile device.

# Here is an example of a report in the viewer:

**Display 41.1** A Report in the Viewer



If you have the Create Report capability, then you can select File ▶ Edit Report in the current report. The designer is displayed, and then you can edit the report.

# **Viewing Report Object Information**

You can select a report object to display icons that provide more information about that report object. Depending on which type of report object you select, you might see the following icons:

Icon	Description
<b>(i)</b>	Click to display the title of the report object.
	Click to maximize the report object. This icon is displayed only if there is more than one report object being displayed.
ð	Click to restore the report object to its original size. This icon is displayed only if you previously maximized the report object.
<b>→</b> ?	Click to display incoming filter information for a report object. This icon is displayed only if the data for the report object has been filtered as a result of selecting data in another report object.
Ø	Click to display the prompt dialog box for a stored process. This icon is displayed only for prompted stored processes. You can use the prompt dialog box to change prompt values for a stored process and to re-execute the stored process.

# Adding Comments to a Report in the Viewer

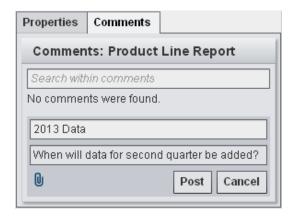
If you have the Add Comments capability, then you can add or view comments. Comments can be added to a report or to an object within a report. The comments that you add are automatically saved with the report.

To add a comment to a report or to an object within a report:

- Expand the right pane. Click the **Comments** tab. (If you are adding a comment to a report object, then select the report object.)
- 2 Enter a topic name and a comment.

Here is an example:

Display 41.2 Adding Comments in SAS Visual Analytics Viewer



- (Optional) Click 🗓 to attach a file or an image to your comment. There is no restriction on the file type or the size of the attachment.
- 4 Click Post to add your comment. Your comment is added to the Comments tab in the right pane.

To respond to an existing comment:

- 1 Expand the right pane. Click the **Comments** tab. Select an existing comment, and then enter a reply.
- (Optional) Click 🗓 to attach a file or image to your reply.
- Click **Post**. Your reply is added to the **Comments** tab in the right pane.

**Note:** To edit another user's comments or to delete comments, you must have the **Comments:Administrator** predefined role.

#### To search for a comment:

- 1 Expand the right pane. Click the **Comments** tab. Enter the word or phrase that you want to search for in the **Search within comments** field on the **Comments** tab.
- 2 (Optional) To clear the Search within comments field, click S.

# **Interacting with Reports in the Viewer**

# Filtering, Brushing, and Drilling in Reports

Depending on the interactions that were defined by the report author, you might be able to interact with your report in the following ways:

#### filter

restricts the data that is returned from a query to a data source. Click on data in the source report object to filter data in the target report object (or objects). Clicking on different data applies the filter based on the new data. To clear the selection, click in the white space that surrounds the source report object.

#### brush

enables you to show the same data selected simultaneously in two or more tables, graphs, or both. Click on data in the source report object to brush data in the target report object (or objects). To clear the selection, click in the white space that surrounds the source report object.

#### drill down

enables you to move from summary information to more detailed data. If the data contains hierarchies, you can double-click on the data to drill down the hierarchy into detailed information. When you drill down the hierarchy, breadcrumbs at the top of the report object enable you to drill back up the hierarchy.

# **Viewing Links in Reports**

Report objects can link to other report objects, sections, or whole reports, or they can link to external links. To view a link from a report object, double-click on the report object. If there are multiple links from a report object, then a list appears that enables you to select a link. When you are viewing a link, the following buttons are displayed in the top left corner:

If a report object that you are linking to shares a data source with the current report object, then the target report object is filtered based on the data value that you doubleclicked. If you do not want the target report object to be filtered, you can click I, and deselect Apply link filters. If the data source is not shared between the two report objects, then no additional filtering takes place in the target report object.

To go back to the original report object, click . .



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# **Appendix 1**

# Operators for Calculated Data Items

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# Overview of Operators for Calculated Data Items

In the explorer and the designer, you can calculate data items by using expressions that contain operators. The operators that you can use are grouped into the following categories:

Numeric (simple) operators

perform basic mathematical operations such as addition and multiplication. See "Numeric (Simple) Operators" on page 490.

# Numeric (advanced) operators

perform advanced mathematical functions such as evaluating logarithms and truncating decimals. See "Numeric (Advanced) Operators" on page 493.

# Boolean operators

evaluate whether a set of logical conditions is true. See "Boolean Operators" on page 492.

# Comparison operators

evaluate how the values of your data items compare. See "Comparison Operators" on page 491.

# Date and Time operators

convert values to, from, or between date and time formats. See "Date and Time Operators" on page 495.

# Text operators

evaluate text values. See "Text Operators" on page 498.

# Aggregated operators (aggregated measures only)

calculate aggregations for aggregated measures. See "Aggregated Operators" on page 497.

# **Numeric (Simple) Operators**

-X

returns a value with the opposite sign of the input value.

For example, -1 returns 1 and 1 returns -1.

x - y

subtracts the second value from the first value.

For example, (2,1) returns 1.

x \* y

multiplies the first and second values together.

For example, (2,3) returns 6.

x/y

divides the first value by the second value.

For example, (6,2) returns 3.

x + y

adds the first and second values together.

For example, (1,2) returns 3.

# **Comparison Operators**

#### Between

returns true if the first value is between the second and third values (inclusive).

For example, (X, 50, 100) returns true if X is between 50 and 100.

ln

returns true if the first value is in the list specified by the second parameter. To select your list, assign a data item to the first parameter, and then choose the values from the drop-down list.

For example, X In (1,2,3) returns true when the value of X is either 1, 2, or 3.

**Note:** This operator cannot be used to compare measures.

# Missing

returns true if the value is a missing value.

### NotIn

returns true if the first value is not in the list specified by the second parameter. To select your list, assign a data item to the first parameter, and then choose the values from the drop-down list.

For example, X NotIn (1,2,3) returns true when the value of X is not 1, 2, or 3.

**Note:** This operator cannot be used to compare measures.

# NotMissing

returns true if the value is not a missing value.

x < y

returns true if the first value is less than the second value.

 $x \le y$ 

returns true if the first value is less than or equal to the second value.

x <> y

returns true if the first value is not equal to the second value.

x = y

returns true if the first value is equal to the second value.

x > y

returns true if the first value is greater than the second value.

 $\chi >= \gamma$ 

returns true if the first value is greater than or equal to the second value.

# **Boolean Operators**

# AND

joins two conditions and returns true if both conditions are true.

For example,

(1 = 1) AND (2 = 2)

returns true, and

(1 = 1) AND (2 = 1)

returns false.

# IF... ELSE

returns different values, depending on whether the condition is true. The first parameter specifies the condition. The second parameter specifies the value to

return if the condition is true. The third parameter specifies the value to return if the condition is false.

# For example,

```
if (X > Y) return X else Y
```

returns the value of X if X is greater than Y, but returns the value of Y otherwise.

### NOT

returns true if the condition is false.

For example, not (1 = 2) returns true.

## OR

joins two conditions and returns true if either condition is true.

# For example,

```
(1 = 1) OR (2 = 2)
```

returns true, and

$$(1 = 1)$$
 OR  $(2 = 1)$ 

returns true.

# **Numeric (Advanced) Operators**

# |X|

returns the absolute value of the input value.

For example, -3 returns 3.

# Ceil

rounds the input value up to the nearest integer.

For example, 4.2 returns 5 and -4.8 returns -4.

# Exp

raises the constant e to the power specified by the input value.

For example, 5 returns e to the 5th power (148.41).

# Floor

rounds the input value down to the nearest integer.

For example, 4.8 returns 4 and -4.2 returns -5.

## Ln

returns the natural logarithm (base e) of the input value.

For example, 10 returns the eth root of 10 (2.30...).

# Log

returns the logarithm of the first value, where the second value specifies the base.

For example, (64, 8) returns the base 8 logarithm of 64 (2).

# Mod

returns the remainder after dividing the first value by the second value.

For example, (5,2) returns 1.

#### Power

raises the first value to the power of the second value.

For example, (5,2) returns 5 to the 2nd power (25).

#### Root

returns the *n*th root of the first value, where the second value specifies *n* (the base of the root).

For example, (27,3) returns the 3rd (cube) root of 27 (3).

#### Round

rounds the first value to the number of decimal places that is specified by the second value. Selects the second value from the drop-down list.

For example, (7.354, 2) returns 7.35.

**Note:** If you select 0 decimal places, then the values are rounded to the nearest integer.

# Trunc

truncates the input value to an integer.

For example, 8.9 returns 8 and -8.9 returns -8.

# **Date and Time Operators**

#### DateFromMDY

creates a date value from separate month, day, and year values. The first value specifies the month as a number between 1–12. The second value specifies the day as a number between 1-31. The third value specifies the year as a four-digit number.

For example, (1,15,2013) returns 15JAN2013.

### DateFromYQ

creates a date value from separate year and guarter values. The first value specifies the year as a four-digit number. The second value specifies the quarter as a number between 1-4.

For example, (2013,1) returns 01JAN2013.

**Note:** The date is generated using the first day of each quarter.

#### DatePart

converts a datetime value to a date value.

For example, January 15, 2013 05:15 PM returns 15JAN2013.

# **DateTimeFromDateHMS**

creates a datetime value from a date value and separate hour, minute, and second values. The first value specifies the date. The second value specifies the hour as a number between 0–23. The third value specifies the minute as a number between 0–59. The fourth value specifies the second as a number between 0–59.

For example, (15JAN2013, 17, 15, 23) returns January 15, 2013 05:15:23 PM

### DateTimeFromTimeMDY

creates a datetime value from a time value and separate month, day, and year values. The first value specifies the time. The second value specifies the month as a number between 1–12. The third value specifies the day as a number between 1–31. The fourth value specifies the year as a four-digit number.

For example, (05:15:23 PM, 1, 15, 2013) returns January 15, 2013 05:15:23 PM.

# DayOfMonth

returns the day of the month from a date value as a number between 1–31.

For example, 15JAN2013 returns 15.

# DayOfWeek

returns the day of the week from a date value as a number between 1–7 (1 is Sunday.)

For example, 15JAN2013 returns 3 (Tuesday.)

# DayOfYear

returns the day of the year from a date value as a number between 1–366.

For example, 15FEB2013 returns 46.

#### Hour

returns the hour from a time or datetime value as a number between 0-23.

For example, 05:15:23 PM returns 17.

### Minute

returns the minute from a time or datetime value as a number between 0-59.

For example, 05:15:23 PM returns 15.

#### Month

returns the month from a date value as a number between 1–12.

For example, 15JAN2013 returns 1.

#### Now

creates a datetime value from the current date and time.

## Quarter

returns the quarter from a date value as a number between 1-4.

For example, 15AUG2013 returns 3.

## Second

returns the second from a time or datetime value as a number between 0-59.

For example, 05:15:23 PM returns 23.

# **TimeFromHMS**

creates a time value from separate hour, minute, and second values. The first value specifies the hour as a number between 0-23. The second value specifies the minute as a number between 0-59. The third value specifies the second as a number between 0-59.

For example, (17,15,23) returns 05:15:23 PM.

# **TimePart**

converts a datetime value to a time value.

For example, January 15, 2013 05:15:23 PM returns 05:15:23 PM.

## WeekNumber

returns the week of the year as a number between 1-53, where week 2 begins on the second Sunday of the year.

For example, 04AUG2013 returns 31.

# Year

returns the year from a date value as a four-digit number.

For example, 15JAN2013 returns 2013.

# **Aggregated Operators**

# Avq

calculates the average value for a measure.

### Count

calculates the total number of values for a category.

#### Distinct

calculates the number of distinct values for a category.

# Max

calculates the greatest value for a measure.

#### Min

calculates the least value for a measure.

#### Sum

calculates the sum of the values for a measure.

# **Text Operators**

Note: Text operators are not case sensitive.

### Contains

specifies that a matching value must contain the filter value.

# **EndsWith**

specifies that a matching value must contain the filter value at the end of the value.

#### **NotContains**

specifies that a matching value must not contain the filter value.

# StartsWith

specifies that a matching value must contain the filter value at the start of the value.

# **Appendix 2**

# Conditions and Operators for Filters

In SAS Visual Analytics, filters are based on expressions that contain conditions and operators. Depending on the type of data that is used by the filter, you can select from the following categories of filter conditions and operators:

Table A2.1 Conditions for Character Data

=	Specifies that a matching value must match one of the filter values exactly.  Note: The match for this condition is case sensitive.
Contains	Specifies that a matching value must contain the filter value.
EndsWith	Specifies that a matching value must contain the filter value at the end of the value.
In	Specifies that a matching value is in the list that you select. To select your list, choose the values from the drop-down list.
Missing	Specifies that a missing value matches the filter.
NotContains	Specifies that a matching value must not contain the filter value.
NotIn	Specifies that a matching value is not in the list that you select. To select your list, choose the values from the drop-down list.
NotMissing	Specifies that a nonmissing value matches the filter.
StartsWith	Specifies that a matching value must contain the filter value at the start of the value.

 Table A2.2
 Conditions for Continuous Numeric Data and Date and Time Data

<>	Specifies that a matching value must not be equal to the filter value.
=	Specifies that a matching value must be equal to the filter value.
<	Specifies that a matching value must be less than the filter value.
<=	Specifies that a matching value must be less than or equal to the filter value.
>	Specifies that a matching value must be greater than the filter value.
>=	Specifies that a matching value must be greater than or equal to the filter value.
Between	Specifies that a matching value must be greater than or equal to the first filter value and less than or equal to the second filter value.
Missing	Specifies that a missing value matches the filter.
NotMissing	Specifies that a nonmissing value matches the filter.
Table A2.3 Conditions for	Discrete Numeric Data and Date and Time Data
<b>&lt;&gt;</b>	Specifies that a matching value must not be equal to the filter
	value.
=	Specifies that a matching value must be equal to the filter value.
= <	
	Specifies that a matching value must be equal to the filter value.

>=	Specifies that a matching value must be greater than or equal to the filter value.
Between	Specifies that a matching value must be greater than or equal to the first filter value and less than or equal to the second filter value.
In	Specifies that a matching value is in the list that you select. To select your list, choose the values from the drop-down list.
Notin	Specifies that a matching value is not in the list that you select. To select your list, choose the values from the drop-down list.
Missing	Specifies that a missing value matches the filter.
NotMissing	Specifies that a nonmissing value matches the filter.
Table A2.4 Operators for	All Data Types
AND	Joins two or more conditions and specifies that a matching value must match all of the conditions.
NOT	Specifies that a matching value must not match the expression that follows NOT.
OR	Joins two or more conditions and specifies that a matching value must match at least one of the conditions.

# **Appendix 3**

# **Data Limits**

Data	Limits	for S	AS I	Visual	Analy	<i>tics</i>	Explo	orer	 	 <b>503</b>
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# **Data Limits for SAS Visual Analytics Explorer**

Some of the visualizations in SAS Visual Analytics Explorer (the explorer) have limits to the number of data values that they can display. The limit values are affected by the **Visualization data threshold** setting in the Preferences window. For more information about the Preferences window, see "Specify Preferences That Are Specific to SAS Visual Analytics Explorer" on page 127.

The following table displays the data limits for visualizations in the explorer:

 Table A3.1
 Data Limits for the Explorer

Visualization Type	Variation	Behavior when Limit Is Exceeded	Default Threshold	Minimum Threshold	Maximum Threshold
Table	_	For sorted tables only, paging is applied to the table.	10,000	1,000	100,000

Visualization Type	Variation	Behavior when Limit Is Exceeded	Default Threshold	Minimum Threshold	Maximum Threshold
Crosstab	_	An error message appears.	41,000	9,500	50,000
Bar Chart	Not grouped or latticed.	The bar chart shows a subset that contains the first or last ranked values.	3,000	810	3,625
	Grouped or latticed.	An error message appears.	3,000	810	3,625
Line Chart	Single numeric or datetime category in the <b>Category</b> role.	The line chart shows a subset that contains the first or last ranked value.  An error message appears.	10,000	5,630	11,250
	Single string category in the <b>Category</b> role.		4,000	1,380	4,750
	No string categories in the <b>Category</b> role, grouped or latticed.		10,000	5,630	11,250
	One or more string categories in the <b>Category</b> role, grouped or latticed.		4,000	1,380	4,750

Visualization Type	Variation	Behavior when Limit Is Exceeded	Default Threshold	Minimum Threshold	Maximum Threshold
Scatter Plot	Two measures, not grouped.	The scatter plot is converted to a heat map.	40,000	9,375	48,750
	Two measures, grouped.	An error message appears.	40,000	9,375	48,750
	Three or more measures, not grouped.	The scatter plot is converted to a correlation matrix.	80,000 / number of measures	18,750 / number of measures	97,500 / number of measures
	Three or more measures, grouped.	An error message appears.	80,000 / number of measures	18,750 / number of measures	97,500 / number of measures
Bubble Plot	No categories.	An error message appears.	25,000	7,500	30,000
	Grouped.	The bubble plot shows the top or bottom value by size.	500	150	600
	Latticed.	An error	1,050	4,900	50,000
	Grouped and latticed.	message appears.	500	150	600
	Animated.		50,000	15,000	60,000
Histogram	_	_	None	None	None
Box Plot	_	An error message appears.	2,900 boxes	800 boxes	3,500 boxes

Visualization Type	Variation	Behavior when Limit Is Exceeded	Default Threshold	Minimum Threshold	Maximum Threshold
Heat Map	No categories.	_	None	None	None
	One or more categories.	An error message appears.	3,000	1,250	3,500
Geo Map	_	An error message appears.	5,000	1,500	6,000
Treemap	No additional levels.	The treemap shows a subset that contains the first or last ranked value.	4,900	1,050	6,000
	One or more additional levels.	The number of additional levels is reduced to 0. If the threshold is still exceeded, then the treemap shows a subset that contains the first or last ranked value.	4,900	1,050	6,000
Correlation Matrix	_		60 measures	1	1

Visualization Type	Variation	Behavior when Limit Is Exceeded	Default Threshold	Minimum Threshold	Maximum Threshold
Decision Tree	Number of nodes.	An error message appears.	180	75	200
	Number of target values.	The decision tree displays truncated data.	50	30	50
	Number of predictor values.	An error message appears.	4300	1500	5000

In addition to the data thresholds that are set by the Preferences window, there are server data limits that can be set by the system administrator. For information about the server data limits, see the topic "Manage High-Cardinality Data" in the SAS Visual Analytics: Administration Guide.

# **High-Cardinality Thresholds for Report Objects**

Client-side thresholds for report objects are documented in the following table. These thresholds affect the designer and all of the viewers. The second column indicates the maximum number of unique values.

Table A3.2 Client-Side Thresholds for Report Objects

Report Object	Rows
Gauges (bullets, sliders, thermometers, dials, and speedometers)	10
Bubble plots	1,500
Bar charts (regular, targeted, dual axis, and dual axis bar-line)	3,000

Report Object	Rows
Waterfall charts	3,000
Scatter plots	3,000
Line charts (regular and dual axis line)	4,000
Time series plots (regular and dual axis)	10,000
Treemaps	25,000
Pie charts	40,000
Tables (list tables and crosstabs)	40,000

In general, requests that exceed a client-side report object threshold cause an error message to be displayed. An exception is that for detail data, excess rows are truncated.

**Note:** Scatter plots always show detail data. List tables show details if the user selects the **Show detail data** check box. Bubble plots show details unless a category is assigned to the group role.

**Note:** If a data source contains more than a million records, queries are blocked for data items whose cardinality is greater than 10,000 unique items in any particular category.

# **Appendix 4**

# Troubleshooting in SAS Visual Analytics Designer

Issue: The Repair Report window is displayed.

#### Resolution:

When you open a report in the designer, you might be prompted to repair the report. For example, this can happen when one or more columns have been removed from the data source. You might be prompted to repair the report when you refresh a report or change a data source. You might be prompted to repair a report if your system administrator is still deciding which data items should be in a table.

# To repair a report:

**1** Decide whether you want to fix individual data items or all of the data items in the report.

Fixes can be made at the individual data item level. For example, if two data items are removed from a report, then the Repair Report window displays separate entries for each data item. The report objects that are impacted by each data item appear below each of the data items.

Here is an example of the **Repair Report** window that is displayed when a missing column affects two report objects:

Display A4.1 Repair Report Window



- 2 Select the report objects that you want to fix, and then click Fix All.
- 3 Click Close in the confirmation message that is displayed.

# **Glossary**

#### **Apache Hadoop**

a framework that allows for the distributed processing of large data sets across clusters of computers using a simple programming model.

#### bar chart

a chart that consists of a grid and some vertical or horizontal columns (bars). Each column represents quantitative data.

#### bar-line chart

a bar chart with an overlaid line graph.

# box plot

a graphical display of five statistics (the minimum, lower quartile, median, upper quartile, and maximum) that summarize the distribution of a set of data. The lower quartile (25th percentile) is represented by the lower edge of the box, and the upper quartile (75th percentile) is represented by the upper edge of the box. The median (50th percentile) is represented by a central line that divides the box into sections. The extreme values are represented by whiskers that extend out from the edges of the box.

#### calculated column

a column that does not exist in any of the tables that are accessed, but which is created as a result of a column expression.

# capability

an application feature that is under role-based management. Typically, a capability corresponds to a menu item or button. For example, a Report Creation capability

might correspond to a New Report menu item in a reporting application. Capabilities are assigned to roles.

# choropleth map

a two-dimensional map that uses color and fill pattern combinations to represent different categories or levels of magnitude.

#### co-located data provider

a distributed data source, such as SAS Visual Analytics Hadoop or a third-party vendor database, that has SAS High-Performance Analytics software installed on the same machines. The SAS software on each machine processes the data that is local to the machine or that the data source makes available as the result of a query.

#### crosstab

a two-dimensional table that shows frequency distributions or other aggregate statistics for the intersections of two or more category data items. In a crosstabulation table, categories are displayed on both the columns and rows, and each cell value represents the data result from the intersection of the categories on the specific row and column.

#### data item

an item in a data source that is either a logical view of a data field or a calculation. The author of a report decides which data items to use in a particular section of a report. There are three types of data items: hierarchies, categories, and measures.

#### data source

a table, view, or file from which you will extract information. Sources can be in any format that SAS can access, on any supported hardware platform. The metadata for a source is typically an input to a job.

# dependency

a trigger condition that must be met before a job can run in a scheduled flow.

# deployed job

a job that has been saved in a deployment directory and can be scheduled.

#### deployment directory

the location for generated SAS DATA step programs that will be executed by the batch server as part of a scheduled flow.

#### file event

a file-related occurrence that is used as a trigger in a scheduled flow. For example, a file event occurs when a scheduling server determines that a specified file exists.

#### filter

specified criteria that are applied to data in order to identify the subset of data for a subsequent operation, such as continued processing.

#### flow

a set of jobs and associated dependencies that is scheduled in the Schedule Manager plug-in in SAS Management Console.

# heat map

a graphical representation of data where the values taken by a variable in a twodimensional map are represented as colors.

# iob

a collection of SAS tasks that can create output.

# job event

a job-related occurrence that is used as a trigger in a scheduled flow. For example, a job event occurs when the scheduling server issues a command to determine whether a job ran successfully.

# job flow

a group of jobs and their dependencies, including dependencies on other jobs, on files, or on specified dates and times.

# join condition

a combination of join keys and a comparison operator.

#### list table

a two-dimensional representation of data, in which the data values are arranged in rows and columns.

#### local data

data that is accessible through the file systems on a computer. This includes data on hard drives or available through network file systems.

#### pie chart

a circular chart that is divided into slices by radial lines. Each slice represents the relative contribution of each part to the whole.

#### query

a set of instructions that requests particular information from one or more data sources.

#### remote data

data that is not accessible through the file systems available to a computer. To use remote data, you must direct a SAS server to access the data that is available through file systems on the remote machine.

# report

output that is generated by running custom SAS code against the data in your project.

#### role

a set of capabilities within an application that are targeted to a particular group of users.

# **SAS Management Console**

a Java application that provides a single user interface for performing SAS administrative tasks.

# scatter plot

a two- or three-dimensional plot that shows the joint variation of two (or three) variables from a group of table rows. The coordinates of each point in the plot correspond to the data values for a single table row (observation).

#### scatter plot matrix

a grid of scatter plots showing pairwise combinations of multiple numeric variables.

#### scheduling server

a server that runs deployed jobs in a scheduled flow. Before running a job, the scheduling server determines when the schedule for the deployed job as well as all of the dependencies for the job have been met.

#### source

See data source

# subquery

a query-expression that is nested as part of another query-expression. Depending on the clause that contains it, a subquery can return a single value or multiple values.

#### time series

an ordered sequence of values of a variable that are observed at equally spaced time intervals

#### user role

See role

# visual exploration

a metadata object that contains visualizations and data settings that are saved from a session of SAS Visual Analytics Explorer.

#### visualization

an interactive visual representation of data. A visualization can be a table, a chart, or a geographic map.

#### waterfall chart

a form of data visualization that is used to understand or explain the cumulative effect on an initial value of sequentially introduced positive or negative values. Usually, the initial and the final values are represented by whole columns, and the intermediate values are denoted by floating columns.

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