SAS Decision Manager 2.1
User's Guide

SAS® Documentation

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SAS® Decision Manager 2.1: User's Guide

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Chapter 1

Overview of SAS Decision Manager

What Is SAS Decision Manager?

SAS Decision Manager enables you to automate decisions that affect everything from profitability to customer satisfaction. By automating decisions, organizations in every industry can function more efficiently and improve interactions with customers, partners, suppliers, and employees. Further, organizations that are highly regulated, such as financial services, health care, and insurance, can more easily achieve compliance as a result of repeatable, traceable decisions.

SAS Decision Manager helps organizations manage data, business rules, analytical models, and optimization techniques. Rule management, model management, data preparation, and deployment are integrated into a consistent interface for easier accessibility.

SAS Decision Manager Documentation

The documentation for SAS Decision Manager consists of the following:

SAS Decision Manager User's Guide
is available from **http://support.sas.com/documentation/solutions/dcm/index.html**. You must supply the following user name and password to view this site:

```
User Name: sas
Password: CIadmin123
```

SAS Decision Manager Administrator's Guide
is available from **http://support.sas.com/documentation/solutions/dcm/index.html**. You must supply the following user name and password to view this site:

```
User Name: sas
Password: CIadmin123
```

Chapter 2

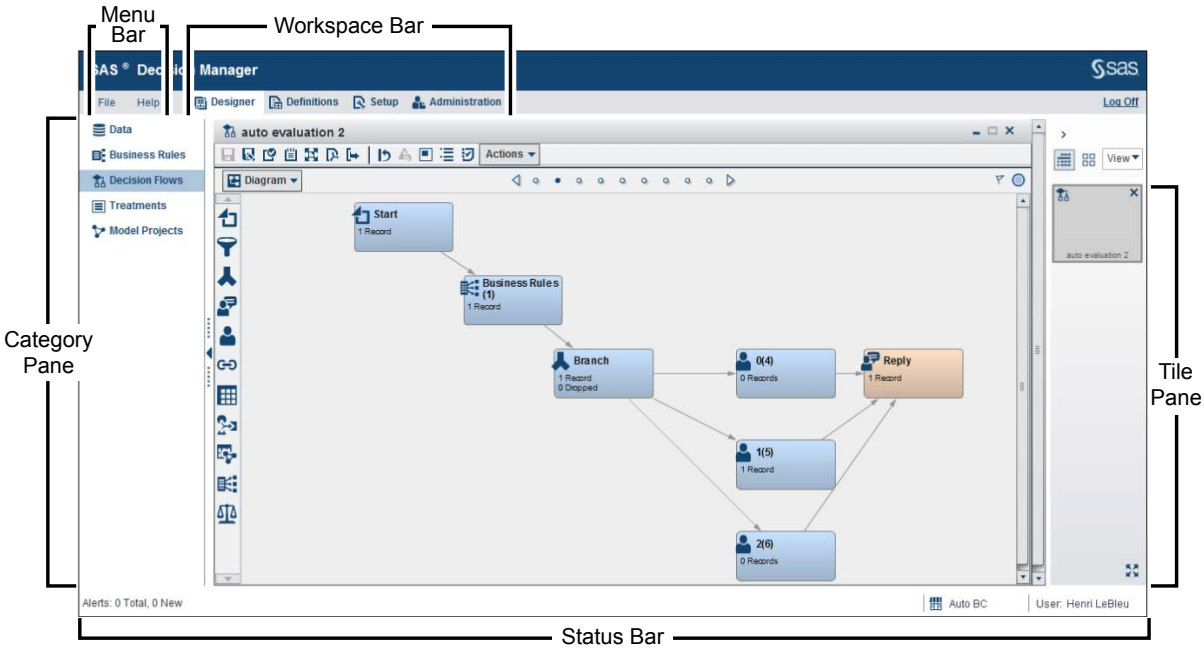
Using SAS Decision Manager

The SAS Decision Manager User Interface

Overview of the User Interface

You use the SAS Decision Manager user interface to manage flow, definitions, and other items.

Display 2.1 *Components of the SAS Decision Manager User Interface*



The user interface has the following components:

- The Menu Bar displays the File and Help menus.
- The Workspace Bar displays the different workspaces that you select.
- The Category Pane lists the categories in each workspace.
- The Tile Pane contains the items that are open in the current workspace.
- The Status Bar displays alerts, the current business context, and the current user.

For information about the version of the Adobe Flash Player that is supported by your operating system and browser, see **http://helpx.adobe.com/flash-player.html**.

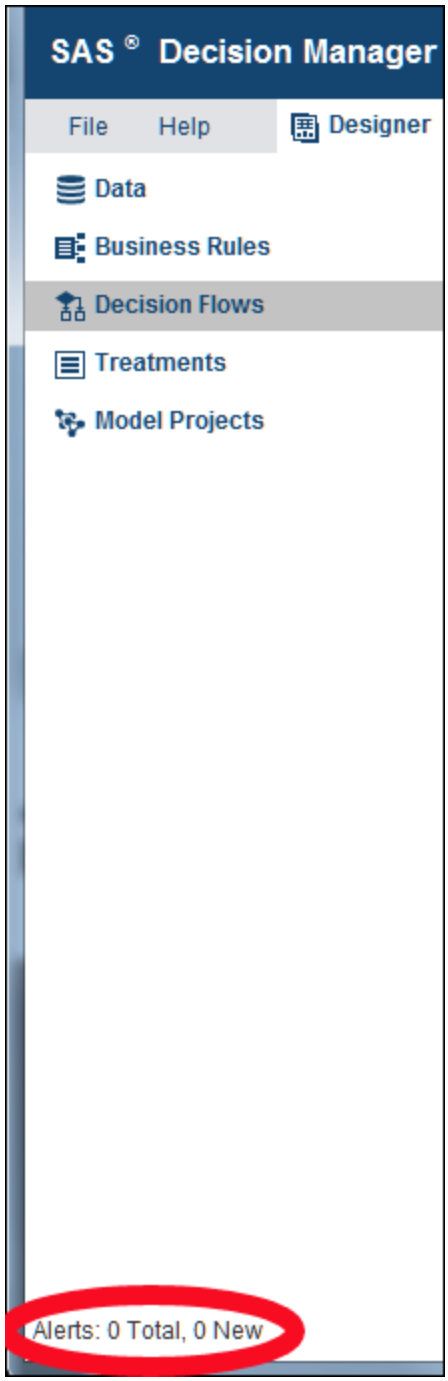
Note: The Flex application that provides the web interface for SAS Decision Manager is not supported on Windows Server 2008.

View Alerts

Alerts are displayed when an action such as an execution has failed. For example, a campaign might fail to execute because counts cannot be updated on a particular node. You can view the Alert message for the flow, open the flow, and then view the Message window to read the message log and details. Alerts are displayed for the actions that you take. Alerts for actions that are taken by another user are not displayed.

Alerts are listed in the bottom left corner of the interface.

Display 2.2 *Alerts*



Click **Alerts** to view the list of alerts. If more than ten alerts are listed, click **More** to view all of the alerts.

You can then open the flow and click to view the message log and details.

Menus

File Menu

From the **File** menu, you can select the following items:

Save All
saves the changes to all of the open objects.

Change Business Context
open a new window where you can select a different business context. All unmodified items in the previous business context are automatically closed.

Recent Work
lists up most recently opened items. Select **Clear Recent Work** to clear the list.

Preferences
displays global preferences and SAS Decision Manager preferences.

Log Off
closes SAS Decision Manager.

Help Menu

From the **Help** menu, you can select the following items:

How To
displays task help for the open page.

SAS on the Web
links to documentation, training, and customer support on the SAS website.

Open Items in Read-only Mode

You can open flows in Read-only mode. Right-click the row that contains the item and select **Open Read-Only**.

Rename Items

You can rename the following items. Right-click the row that contains the item and select **Rename**.

- flow definitions
- global variable display names
- event display names
- decision processes
- models
- reply definitions
- custom diagram tools
- custom detail groups

- custom detail tags

Hide Items from Display

Performance might be slowed if there are a large number of items within a category. You improve performance by hiding these items from display.

You can hide the following items. Select the row that contains the item and select **Actions** ⇨ **Hide**.

- flow definitions
- decision flows

An item is also hidden if you select the **Hidden** attribute on the Properties page.

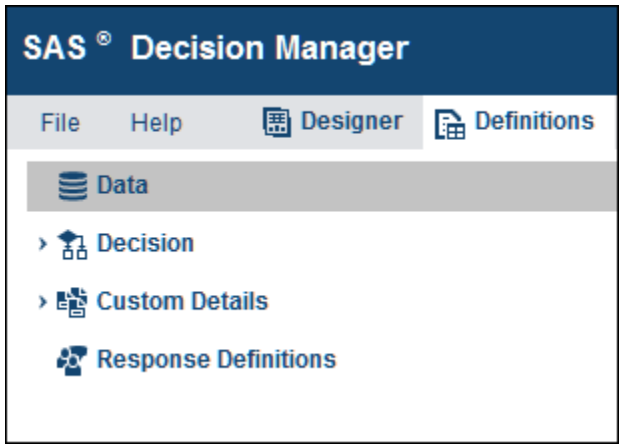
To turn off the **Hidden** attribute and display an item by default, select the row that contains the item and select **Actions** ⇨ **Unhide**.

To show hidden items, select **Actions** ⇨ **Show Hidden *item name***. These items retain their **Hidden** attribute. If hidden items are shown, you can use search options to select hidden or unhidden attributes. For more information, see "Searching for Items" on page 13.

Workspaces

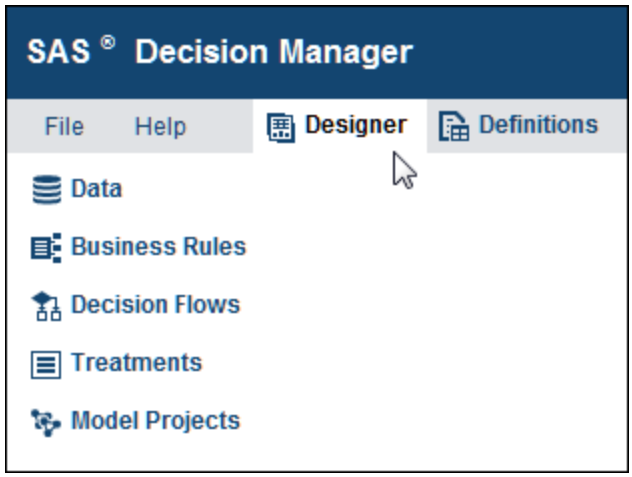
In the Definitions workspace, you create the definitions for your flow.

Display 2.3 *Definitions Workspace*



In the Designer workspace, you create flows that are based on the definitions.

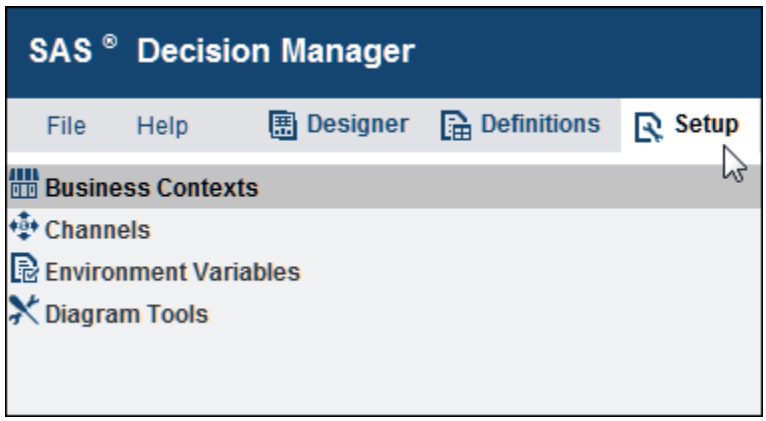
Display 2.4 *Designer Workspace*



The categories that are listed depend on the products that you have licensed.

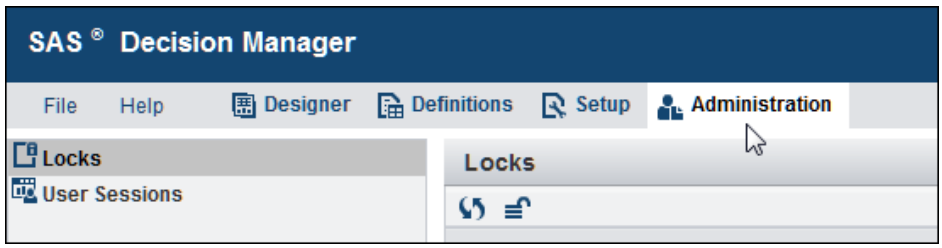
In the Setup workspace, you manage business contexts, channels, environment variables, and diagram tools that are provided with the application.

Display 2.5 *Setup Workspace*



In the Administration workspace, you perform tasks such as controlling user sessions.

Display 2.6 *Administration Workspace*



The Workspace Toolbar

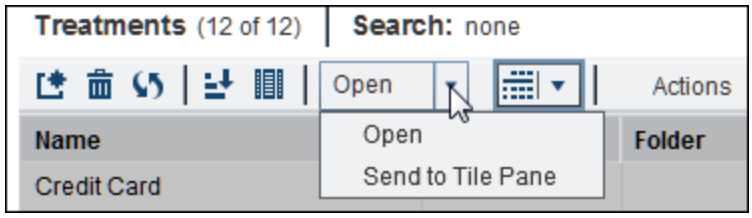
In the Designer and Definitions workspaces, the following icons are available in the toolbar. The icons that are displayed depend on the category that you have selected.

Table 2.1 *Toolbar*

Tool Icon	Tool Icon Name	Description
	Save	Saves changes to environment variables
	New	Creates a new item
	Delete	Deletes the selected item
	Duplicate	Duplicate a business context
	Properties	Display properties of selected objects
	Refresh list	Refresh the list of items
	Publish mode	Publishes model data
	Edit selected channels	Edit channel visibility
	Release	Release a locked object
	Sort	In the Grid and Detail views, opens a window where you can choose how items are sorted
	Manage columns	In the Grid view, opens a window where you can choose the columns that are displayed

In the Designer and Definitions workspaces, select **Open** to open the selected item.

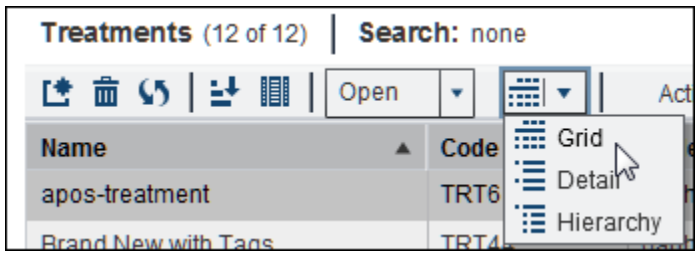
Display 2.7 *Open Selected Item*



Select **Send to Tile Pane** to open the selected item and display its icon in the Tile pane.

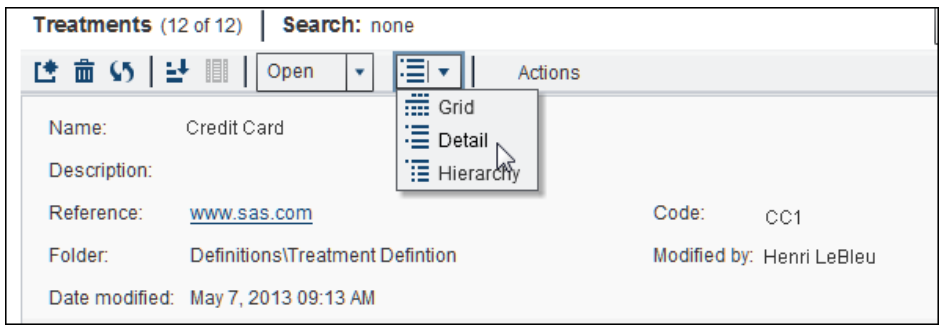
Select **Grid** to display the items in rows and columns.

Display 2.8 *Grid View*



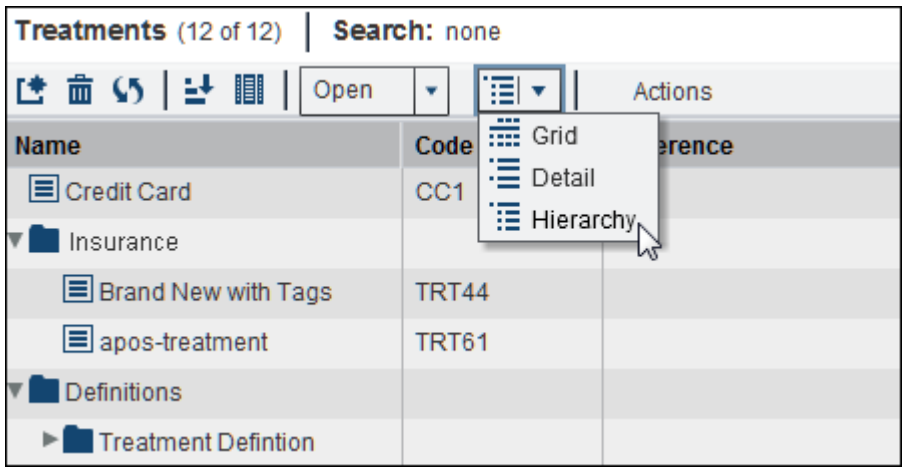
Select **Detail** to display information about each item.

Display 2.9 *Detail View*



Select **Hierarchy** to display the location of items in the folder hierarchy.

Display 2.10 *Hierarchy View*



The Flow and Definition Toolbar

When you open a flow or a definition, the following icons are available in the toolbar. The availability of specific icons depends on which page is active.

Table 2.2 *Toolbar*

Tool Icon	Tool Icon Name	Description
	Save	Saves the current item
	Save as	Saves the current item under another name
	Validate flow	Validates the current flow
	Message log	Displays the message log
	Create document	Creates a document of the flow in pdf format
	Switch to Process gallery	Displays the Process gallery pages
	Switch to Design gallery	Displays the Design view pages

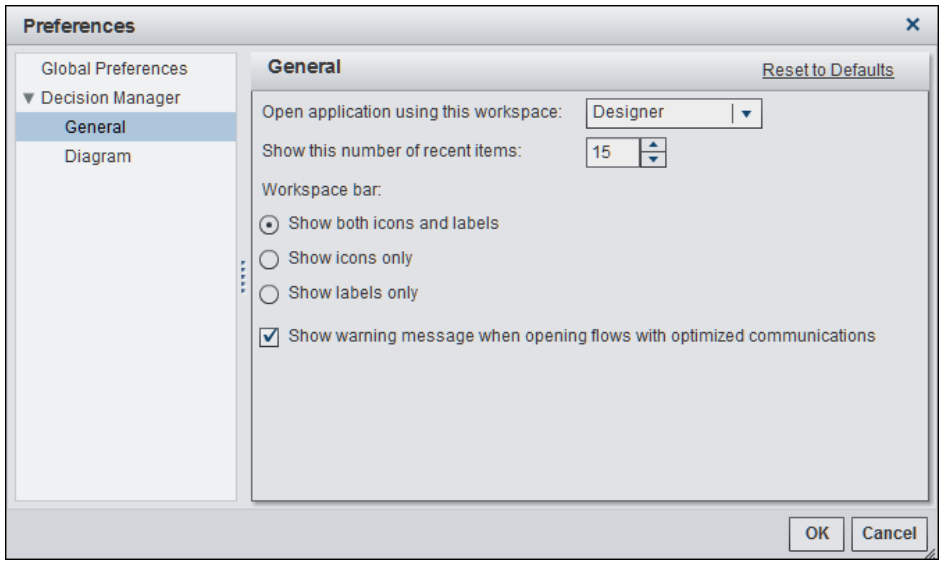
	Clear test counts on all nodes	Clears the counts that were generated in Test mode and live counts that were updated since the last time that counts were cleared
	Clear warnings on all nodes	Clears the warning icons from all the nodes in the diagram
	Overview window	Displays an overview of the diagram
	Copy standard reply from existing flow	Copies an existing standard reply to the Standard Reply page
	Node details	Displays information on the selected node
	Test Mode	Runs tests on the diagram
	Refresh page	Refreshes the current page

Setting Preferences

You can set preferences for your SAS Decision Manager sessions by selecting **File** ⇨ **Preferences**. Click **General** under **SAS Decision Manager**.

Click **Diagram** to set display preferences for diagrams.

Display 2.11 *General Preferences*



Searching for Items

Search for Text

In SAS Decision Manager workspaces and windows, you can enter text in the **Search** field to search for the items that contain that text.

Display 2.12 *Search Field*

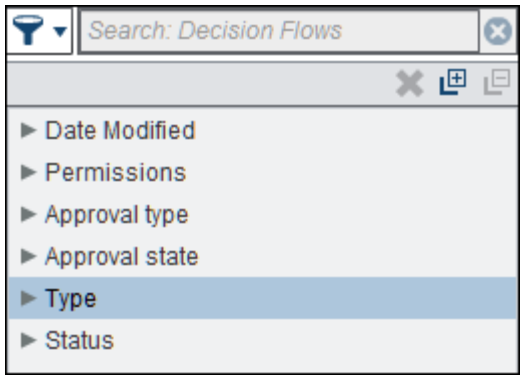
All columns, including the description, are searched for an exact match. The search is not case-sensitive.

Click to clear the contents of the **Search** field.

Use Additional Search Options

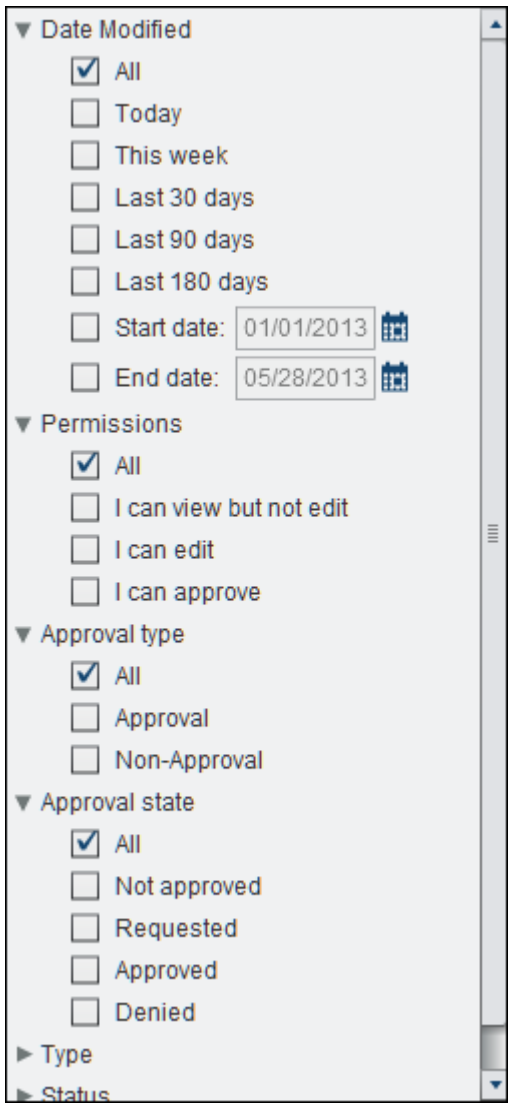
In the Designer and Definitions workspaces, and in some windows, you can select additional search options such as date, ownership, type, and status to filter items. Click to display the search options

Display 2.13 *Additional Search Options*



Select the options to include in the search filter. The available options depend on the items that are listed.

Display 2.14 *Select Search Options*

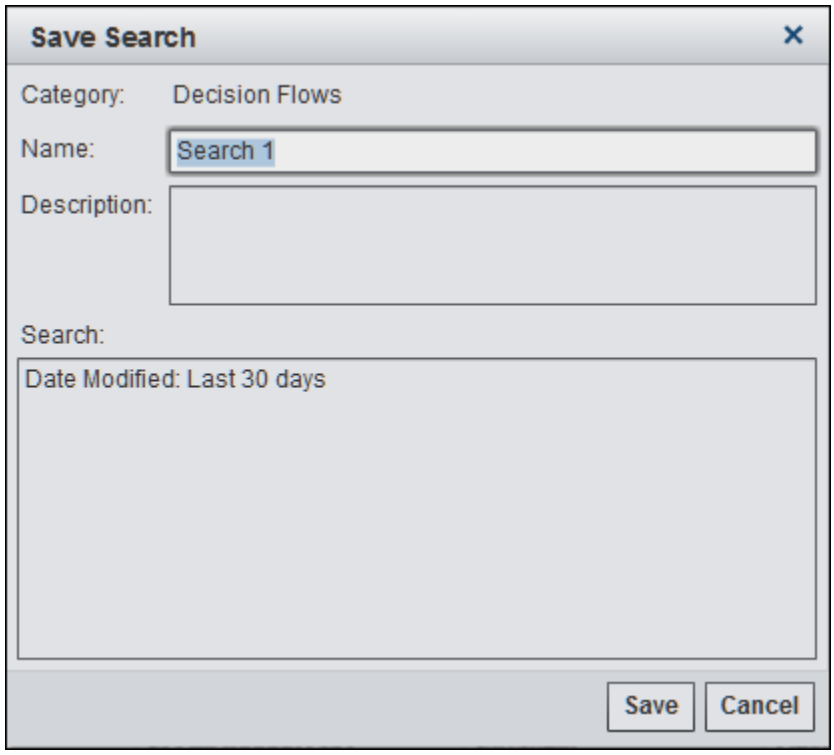


Click ✖ to clear your selections. Click ⊞ to expand the list of options. Click ⊟ to collapse the list of options.

Save a Search Filter

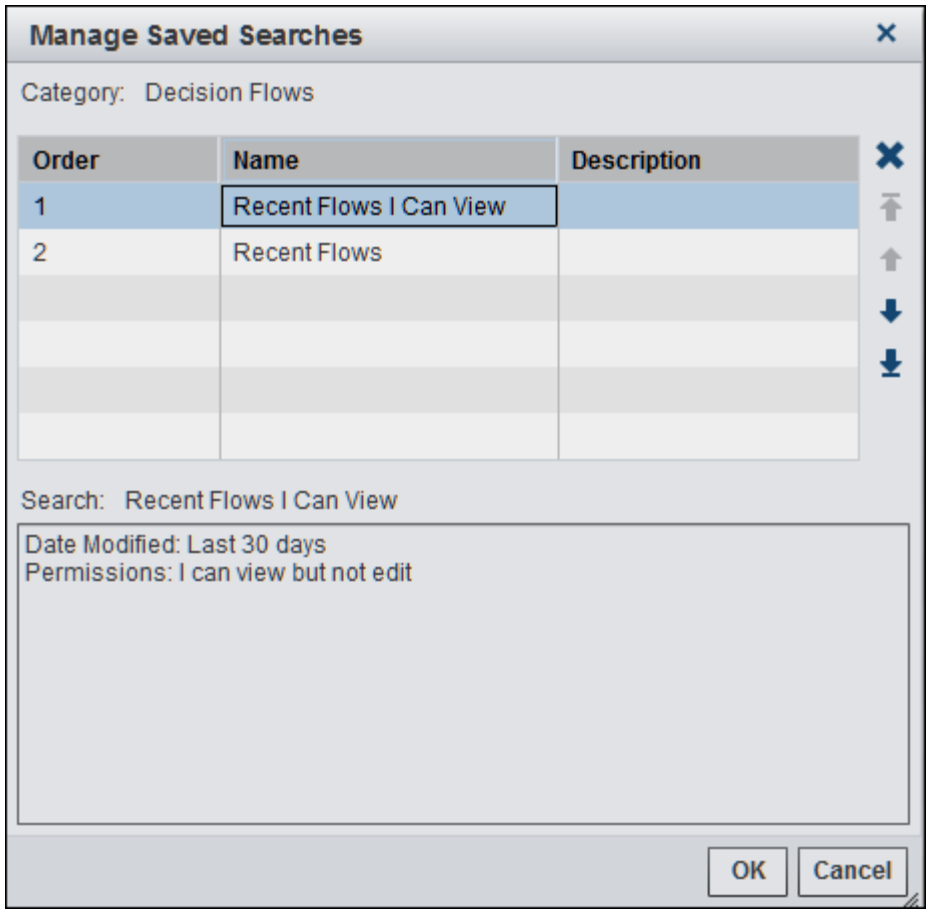
In the Designer and Definitions workspaces, you can save a search filter for later reuse. Click **Save Search** to save your search criteria.

Display 2.15 *Saved Search*



Your saved searches are listed in the **Save Search** menu. To view and manage saved searches, select **Save Search** ⇨ **Manage Saved Searches**.

Display 2.16 *Manage Saved Searches*

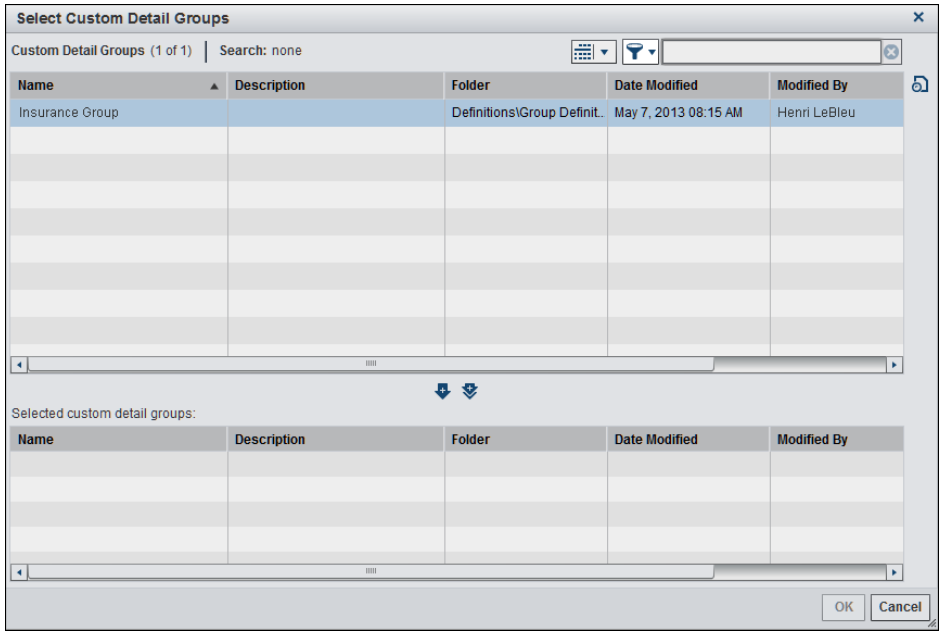


Use the arrows to change the order of the saved searches in the list. Click ✖ to remove a saved search from the list.

Select Items

Throughout SAS Decision Manager, there are windows where you can select items to add.

Display 2.17 *Select Items*

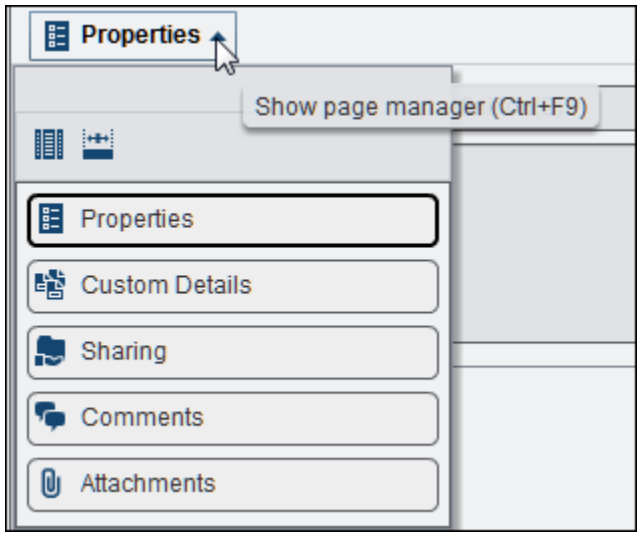


Highlight one or more items and click to add the items to the list of selected items. Click to add all of the items to the list of selected items.

Selecting Pages

The Page Manager displays the pages that belong to a component. Select the page name to display the Page Manager.

Display 2.18 *Page Manager*

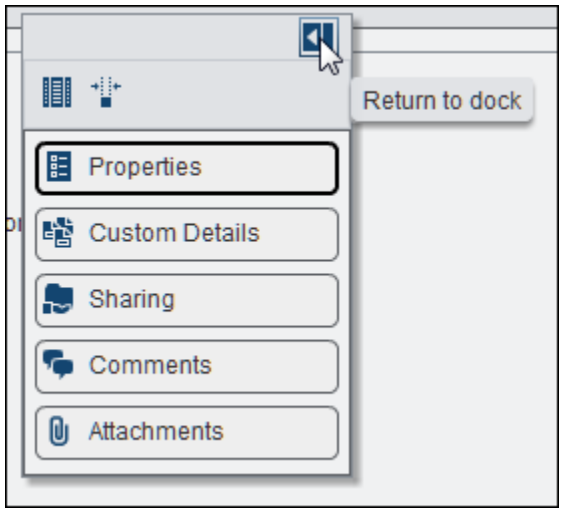


Select the page that you want to view.

Click to resize the Page Manager to accommodate the longest page name.

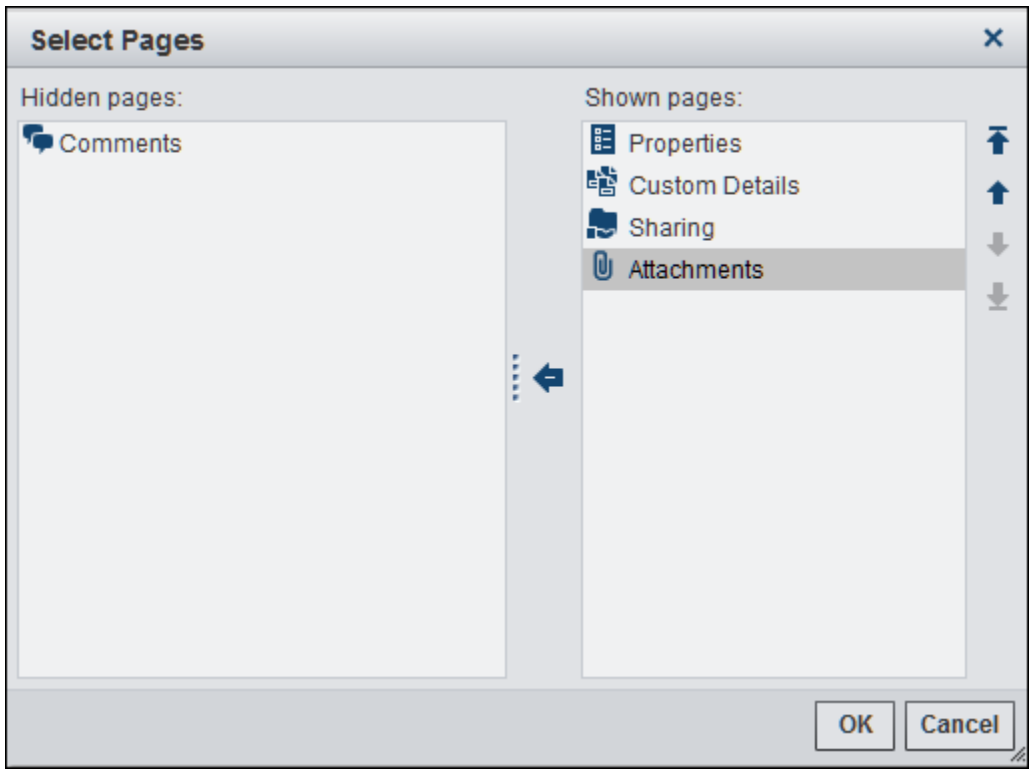
You can drag the Page Manager to any location. Click the arrow in the upper right corner to return the Page Manager to its dock.

Display 2.19 *Return to Dock*



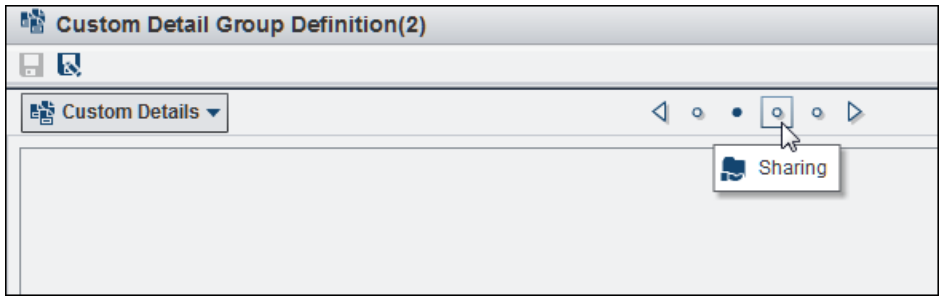
Click . Click the up and down arrows to change the order of the pages. Drag and drop the pages or click the left and right arrows to move pages between the **Hidden pages** and **Shown pages** lists.

Display 2.20 *Select Pages*



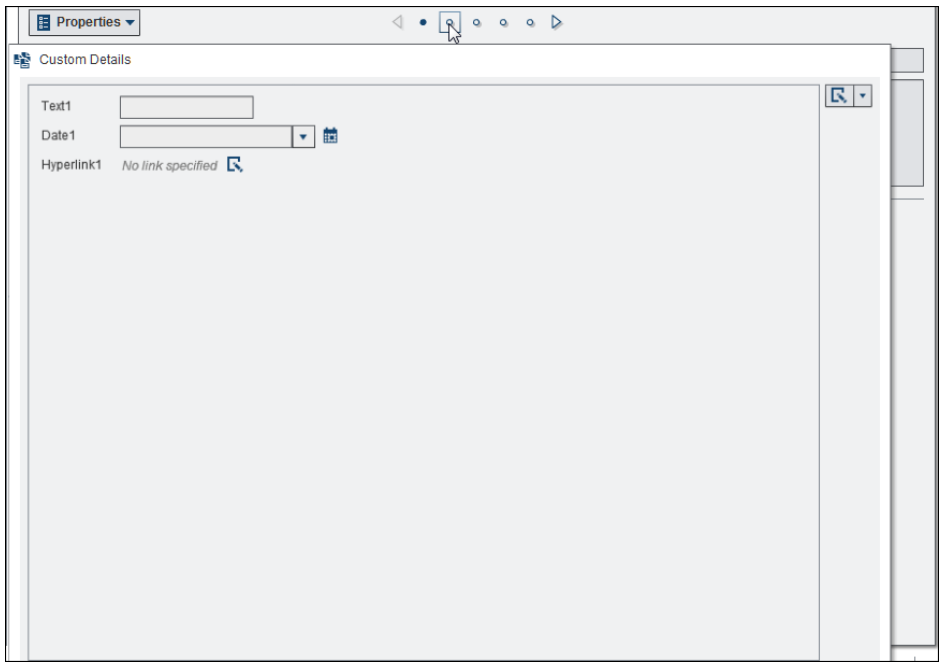
You can also click to display a different page.

Display 2.21 *Display a Different Page*



If you have made changes to a page, a snapshot of your last visit to the page is displayed when you place the mouse pointer over .

Display 2.22 *Page Snapshot*



Diagrams

Diagram Menus

When you right-click the background of the Diagram page, you can select the following menu items:

Paste (Ctrl - V)
pastes a copied node onto the diagram.

Clear All Warnings
clears warning icons from all nodes.

Zoom.
changes the magnification of the diagram.

Layout
changes the orientation of the nodes.

Overview Window
opens a compact schematic view of the diagram. Drag the pointer within the schematic view to change the view area.

Node Details
displays information about the selected node.

Find Node
displays the node names in a table. Double-click a name to highlight the node.

Add Note
adds a note in which you can enter text. When you right-click the note, you can select the following menu items:

Color
enables you to change the color of the note.

Delete
deletes the note.

Collapse
shrinks the note to an icon. Double-click the icon to reopen the note.

Add Text
enables you to add text to the background of the diagram. You can move and resize the text box.

Add Image
enables you to select an image to add to the background of the diagram.

When you right–click a node or a node group, you can select the following menu items:

Properties
displays the Properties window.

Update Counts
updates the count.

Clear Warnings
clears warning icons from the selected nodes.

Node Details
displays information about the selected node.

Copy
copies the selected node.

Delete
deletes the selected node.

Group
collects the selected nodes into a group.

Ungroup
releases the selected nodes from the group.

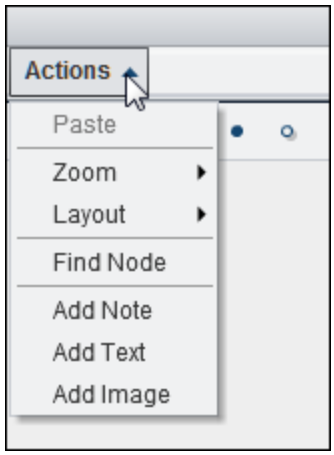
Group Output Cells
gathers the output cells from a node such as an A/B Test node into a group.

Expand
expands the selected group.

Collapse
collapses the selected group.

From the **Actions** menu on the toolbar, you can select an action to perform on the diagram or the selected object.

Display 2.23 *Actions Menu*



Node Status Icons

The status of each node is indicated by one of the following icons:


indicates that the node ran successfully.


indicates that the node is not ready.

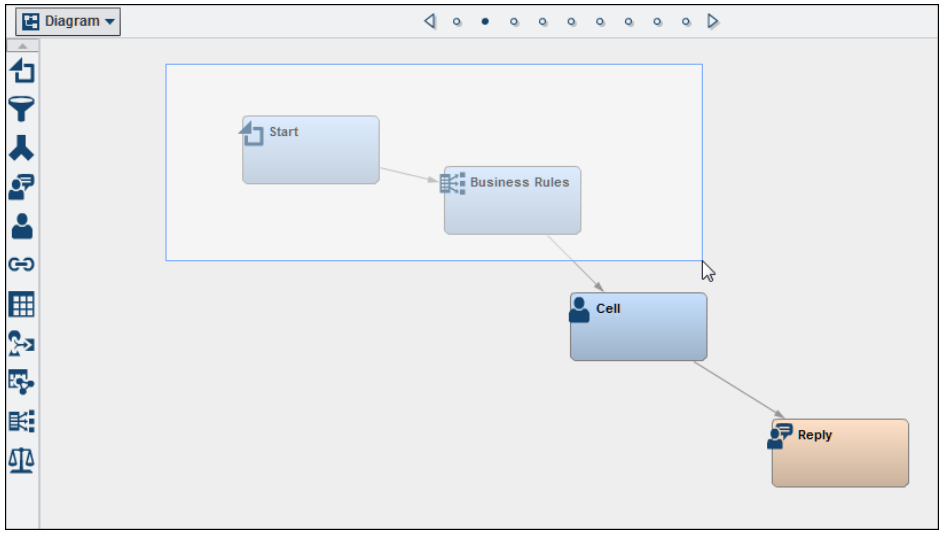

indicates that there are problems that need to be addressed.

Node Groups

Create Node Groups

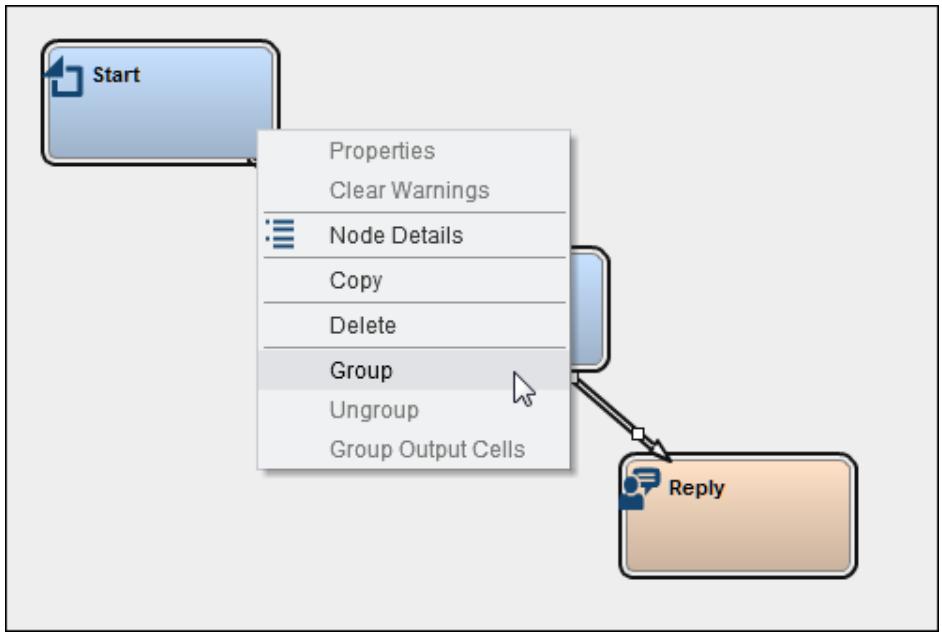
You can simplify the appearance of a diagram and make it easier to manage by gathering nodes into groups. To create a node group, click and drag a selection area around the nodes.

Display 2.24 *Select Nodes*



To add individual nodes to a group, press the CTRL key while clicking each node. Right-click the selected nodes and select **Group**.

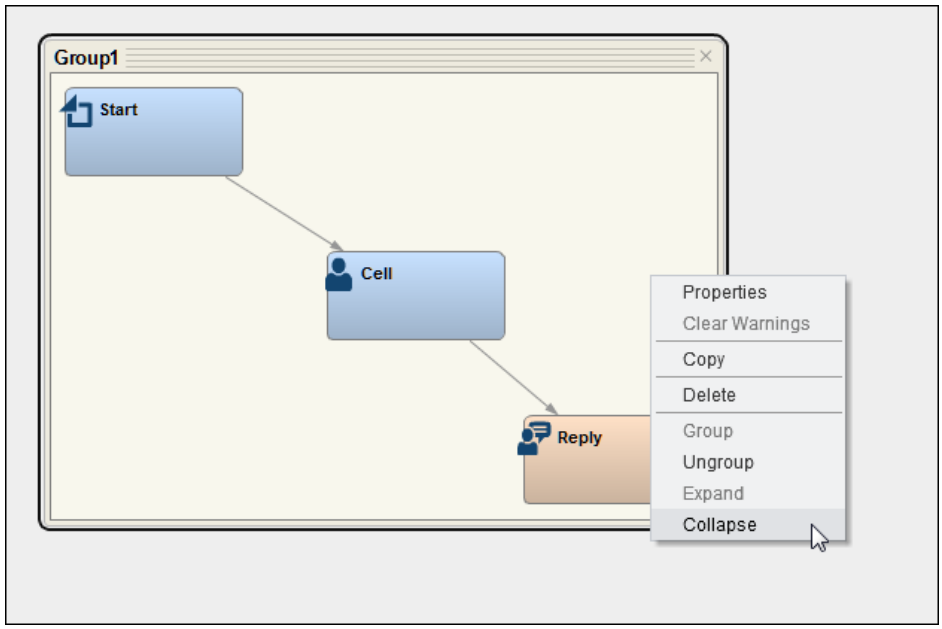
Display 2.25 *Create Node Group*



Collapse Node Groups

To collapse the node group, right-click the group and select **Collapse**.

Display 2.26 *Collapse Node Group*

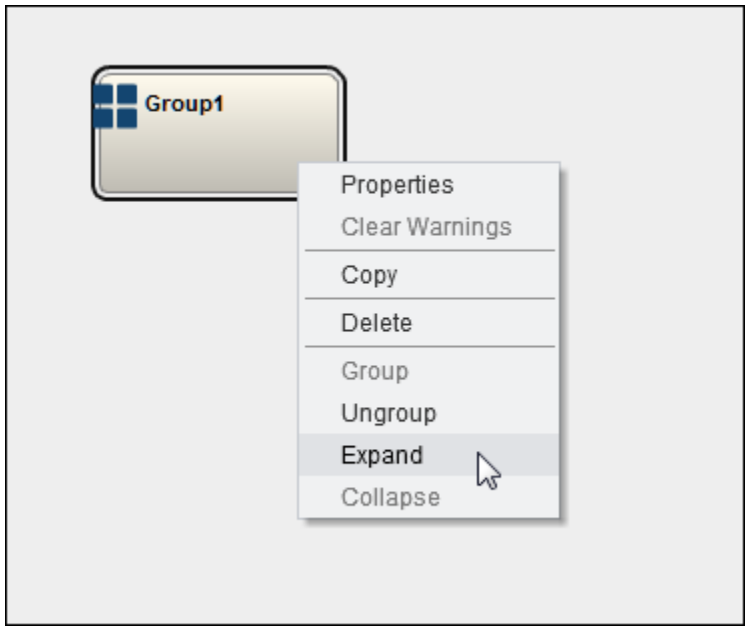


You can also collapse the node group by double-clicking the title bar of the group.

Expand Node Groups

Expand the node group by right-clicking the group and selecting **Expand**.

Display 2.27 *Expand Node Group*

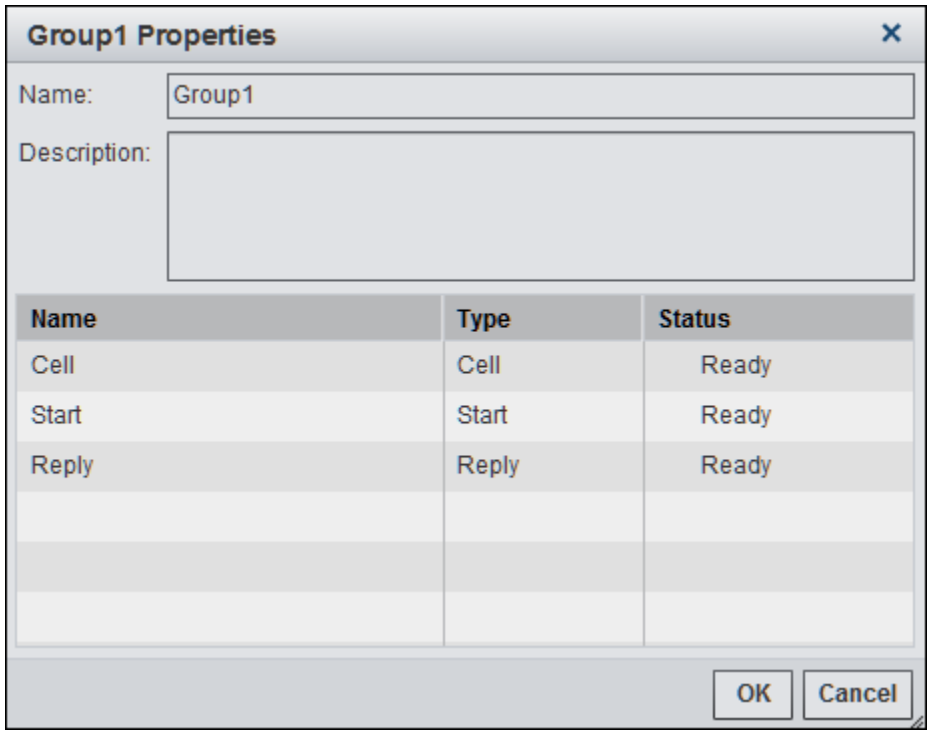


You can also expand the node group by double-clicking the collapsed group.

View the Properties of a Node Group

Right-click any node in the group to see the properties of the node. Click anywhere inside the group area other than a node to see the properties window of the group. Right-click a collapsed node group to see the properties for the group.

Display 2.28 *Node Group Properties*



Change the name or add a description for the node group.

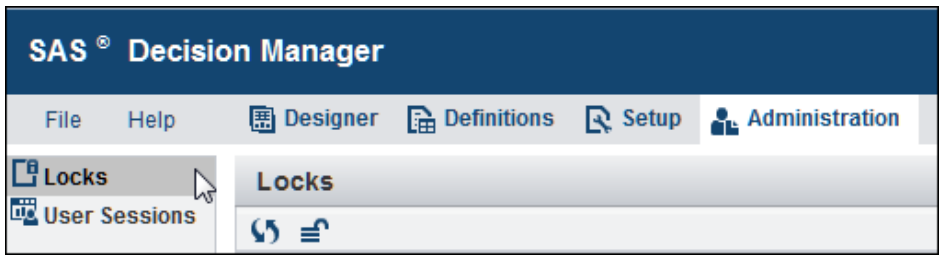
Chapter 3

Administration

Release Locked Objects

In some circumstances, you might not be able to edit an object such as a flow even if you have Edit permission. To unlock an object so that you can edit it, select the Locks category in the Administration workspace.

Display 3.1 *Locks*



Only those objects that you have permission to view or edit are displayed. You must have Edit permission in order to release a locked object.

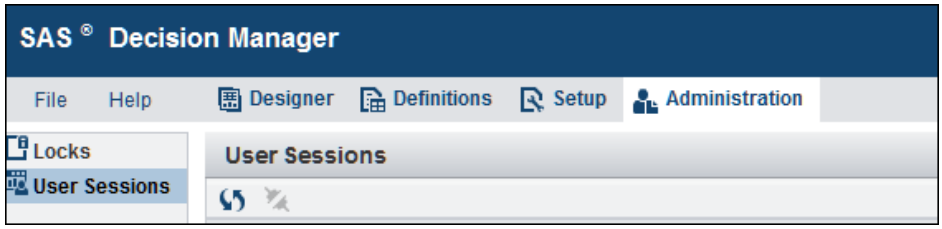
Select the object that you want to release and click to be able to edit the object. After an object is released, any changes to the object can be saved only by selecting **Save as**.

Manage User Sessions

If you are an administrator, you might want to manage active sessions in SAS Decision Manager. For example, you might need to log off from all user sessions in order to provide system maintenance.

To manage user sessions, select the User Sessions category in the Administration workspace.

Display 3.2 *User Sessions*



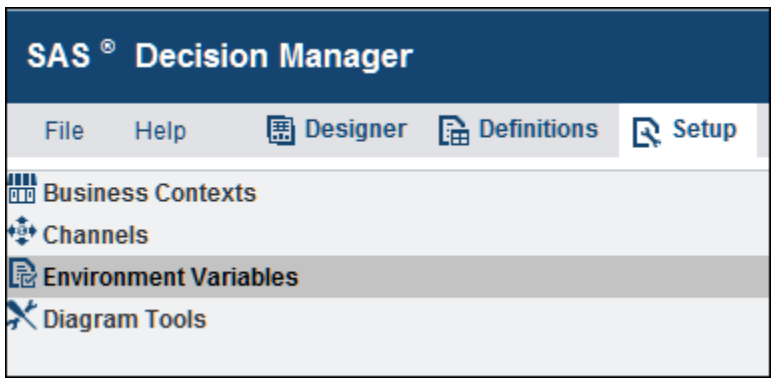
To log off from a user session, select the session and click .

Environment Variables

Overview of Environment Variables

The Environment Variables category in the Setup workspace enables you to modify environment settings such as log size.

Display 3.3 *Environment Variables*

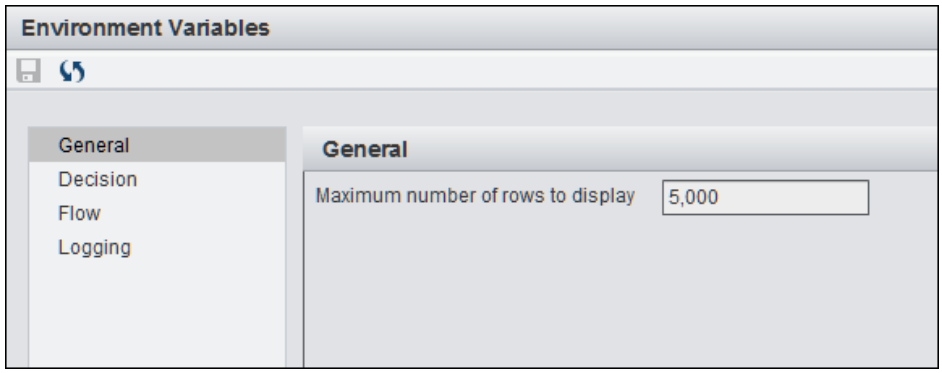


Note: If more than one administrator is editing environment variables at the same time, the last saved edits override previous edits.

Set Row Options

Row options are set on the General page.

Display 3.4 *General Page*



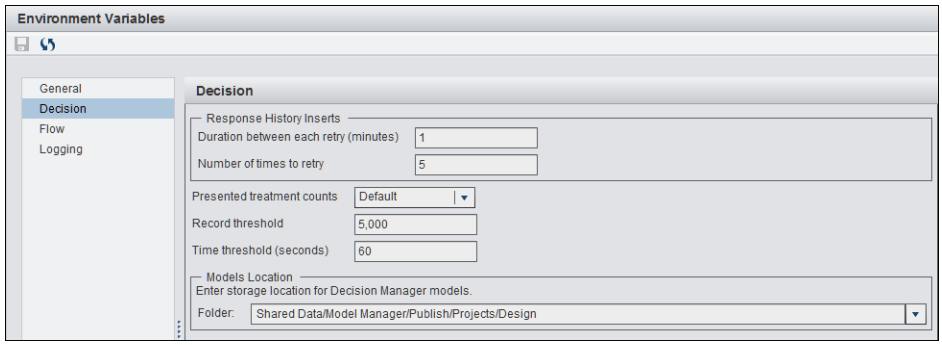
Select a number from **Maximum number of rows to display** to specify the number of rows that are returned from a table or a SAS data set.

Decision Flow Settings

Overview of Decision Flow Settings

Decision flow options are set on the Decision page.

Display 3.5 *Decision Page*



Control Response History Inserts

Response history records might not be added to the common data model because of a failed connection to the SAS library, the network, or the database. When a failed connection prevents response history updates, you can specify further attempts to update response history. Set the duration of time between each attempt and the number of times to attempt to update the records.

To specify the duration of time in minutes between each attempt to update response history, enter or select a number for **Duration between each retry (minutes)**.

To specify the number of times to attempt to update response history records, enter or select a number for **Number of times to retry**.

The total amount of time cannot be more than 60 minutes. For example, you can specify four retries, with a duration of 15 minutes between each attempt.

Control Counts for Presented Treatments

You can control the level of detail of counts for presented treatments, and whether to generate the counts. The counts are based on data in the contact history, presented treatment, and response history tables. To control counts for presented treatments, select an option from the **Presented treatment counts** list.

None
specifies that the counts for presented treatments are not published to the common data model.

Default
specifies that counts for all presented treatments are published to the common data model.

No Duplicates specifies that the counts for treatments are de-duplicated before they are published to the common data model.

Set Thresholds

The default settings for the CICommon web service control the number of records and the amount of time it retains the records before calling a stored process. By default, the CICommon web service collects records up to a limit of 1500 or up to a time of one minute before calling a stored process. If your site has the capability, you can set a higher number of records or a longer time limit.

To change the limit on the number of records, enter or select a number for **Record threshold**.

To change the time threshold, enter or select a number for **Time threshold (seconds)**.

Specify Location for Models

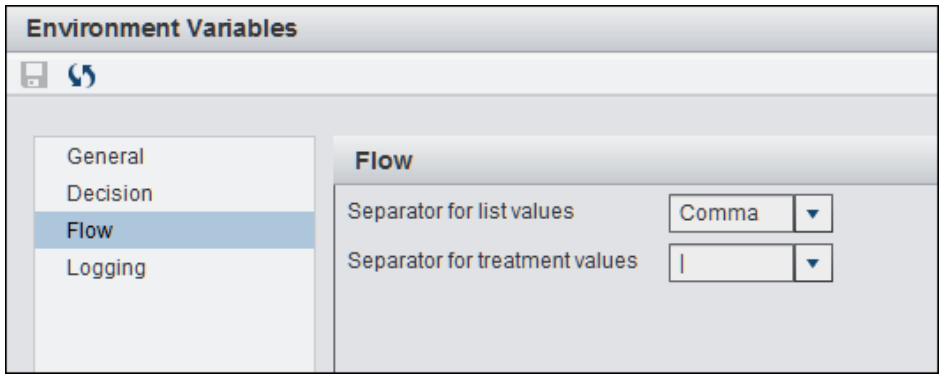
If you have licensed SAS Model Manager, you can specify the location for the folder that contains the models. Models are used to define model processes. For more information, see "Model Processes" on page 117.

To specify a folder, select or enter the location in the **Folder** field.

Set Separators for Lists and Treatment Values

The separators for list and treatment values are displayed on the Flow page.

Display 3.6 *Campaign Page*

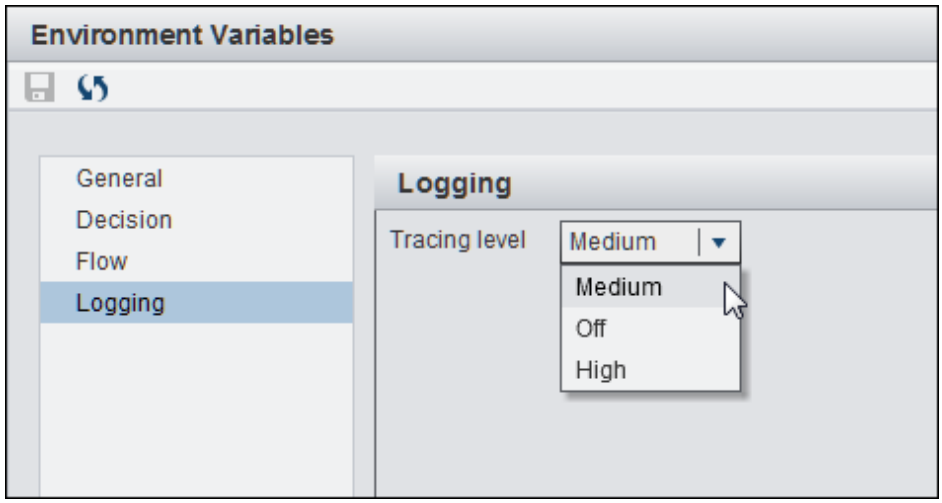


To set the delimiter for lists and treatment values that are exported to external files, enter or select a separator.

Set Logging Level

The trace level for logging is set on the Logging page.

Display 3.7 *Logging Page*



Select a tracing level to set the amount of detail in log messages.

Off
suppresses all logs except those logs that have a setting of DEBUGLEVEL_ALWAYS.

Medium
produces logs with a typical level of detail.

High
produces logs with a very high level of detail.

This option controls the size of the log that is generated for any SAS code that is run during a SAS Decision Manager session.

Chapter 4

Managing Business Rule Folders and Data Tables

Managing Business Rule Folders

Before you add any vocabularies, rule sets, or rule flows, you need to add business rule folders. Your business rule-related content is stored in business rule folders.

Create New Top-Level Folders

To create a new top-level folder:

1. Click , and select **New Top-level Folder**. Alternatively, you can right-click on an existing folder or on an empty area of a category view and select **New Top-Level Folder**.
2. In the New Folder dialog box, enter the name of the new folder. Folder names are case sensitive. SAS Decision Manager considers `myfolder` and `MYFOLDER` to be two unique folders.
3. (Optional) Enter a description for the new folder. Descriptions are limited to 256 characters.
4. Click **OK**.

Create New Subfolders

To create a new folder within another folder:

1. In the Category pane, select the parent folder in which you want to create a new subfolder.
2. Click , and select **New Folder**. Alternatively, you can right-click on an existing folder and select **New Folder**.
3. In the New Folder dialog box, enter the name of the new folder. Folder names are case sensitive. SAS Decision Manager considers `myfolder` and `MYFOLDER` to be two unique folders.
4. (Optional) Enter a description for the new folder. Descriptions are limited to 256 characters.
5. Click **OK**.

Delete a Folder

A folder must be empty before you can delete it. To delete a folder, right-click on the folder, and select **Delete**. Alternatively, click on the folder and then click .

Managing Data Tables

Adding data tables in SAS Decision Manager enables you to view table data, view table metadata, and create table summaries from within SAS Decision Manager.

About Managing Data Tables

In SAS Decision Manager, you can view your list of tables in either the Designer workspace or the Definitions workspace by selecting the Data category. You can use SAS Visual Data Builder to create new tables and add them to this list. See "Adding Tables Using SAS Visual Data Builder" on page 32 for more information. Alternatively, if the table is already registered in metadata, you can add the table to the list as described in "Add a Table Already Registered in Metadata" on page 33.

After you have added a table to the list, you can view table data and metadata, create table summaries, and associate attachments and comments with the table.

Adding Tables Using 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.

To access SAS Visual Data Builder, select the Definitions workspace, select the **Data** category, and select **Tables**. Click to start SAS Visual Data Builder. For more information about SAS Visual Data Builder, click to access *SAS Visual Analytics: User's Guide* and videos about using SAS Visual Data Builder.

Add a Table Already Registered in Metadata

To add a table that has already been registered in metadata, follow these steps:

1. In the Definitions workspace, select the **Data** category, and select **Tables**.
2. Click to add a table.
3. Select the table that you want to add, and click **OK**.

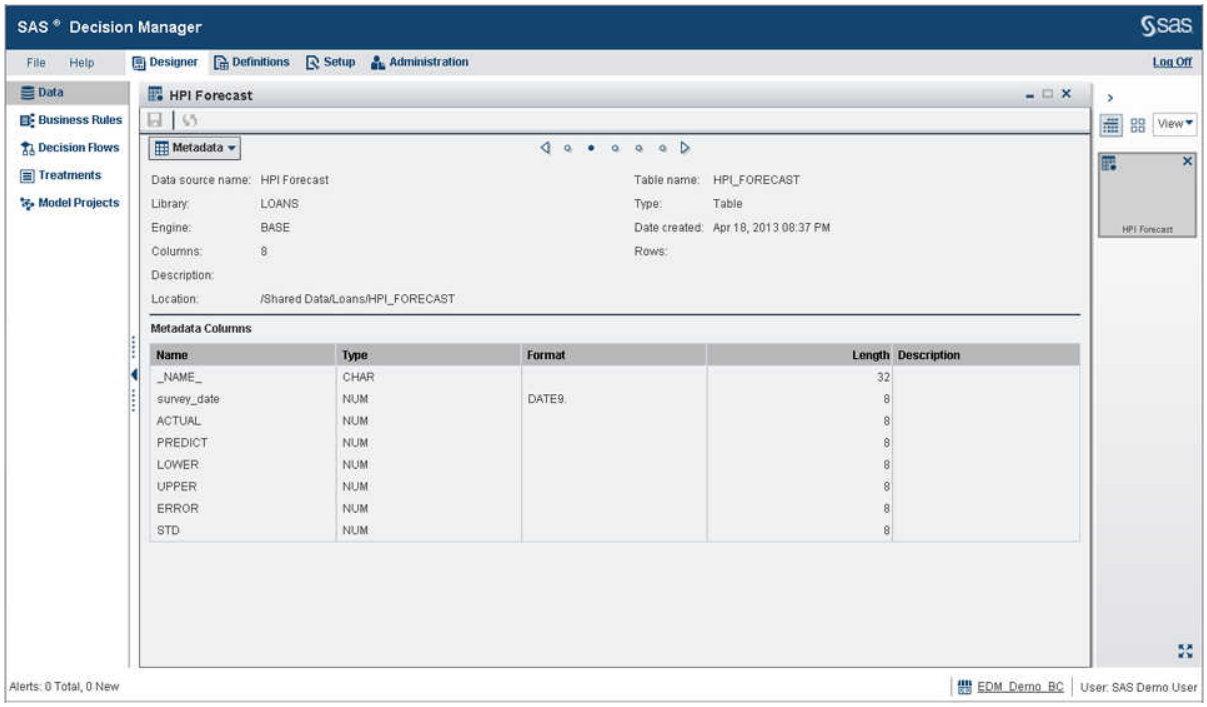
Edit Table Properties

1. In the Definitions workspace, select the **Data** category, and select **Tables**.
2. Double click the table whose properties you want to edit. Alternatively, you can select the table, and select **Open**. By default, SAS Decision Manager displays the Data Source Properties page.
3. Edit the source name and description, or select a different table as the data source.

View Table Metadata

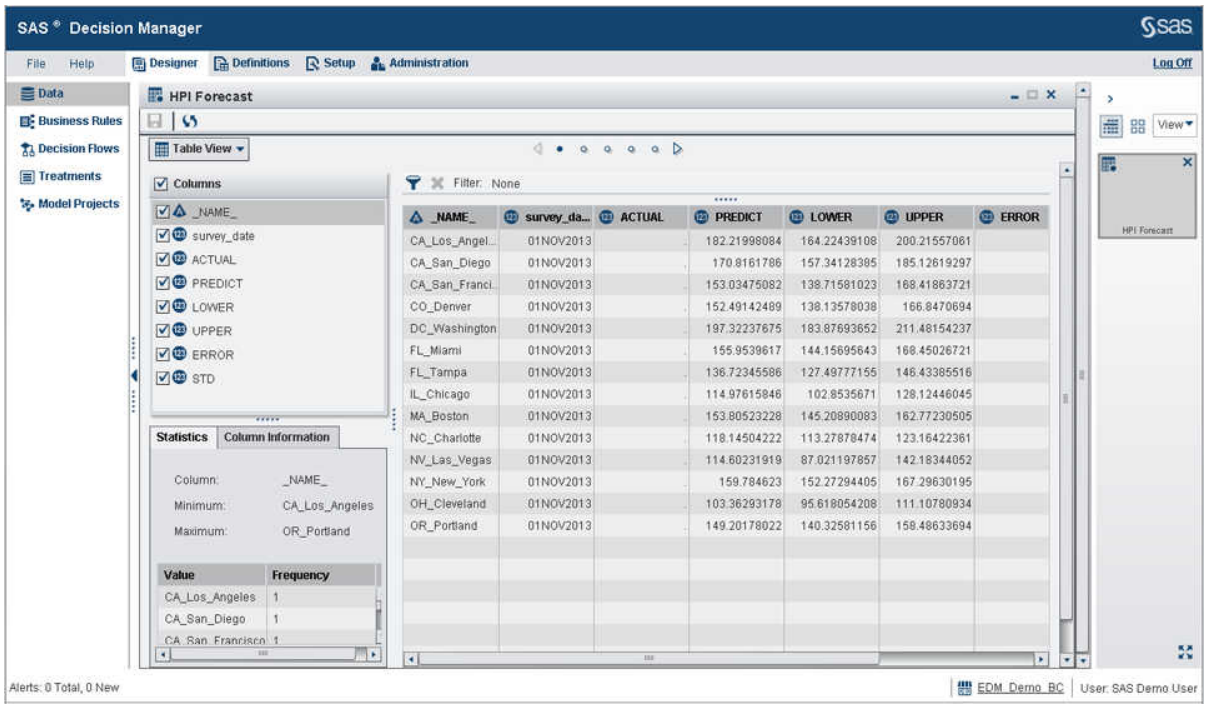
To view table metadata:

1. Select the **Data** category. If you are working in the Definitions workspace, select **Tables**.
2. Double-click the table to open it. Alternatively, you can select the table, and select **Open**.
3. Use the Page Manager to select the Metadata page.



View Table Data

To view table data, select the Designer workspace, and select the **Data** category. Double-click the table to open it. SAS Decision Manager displays the Table View page.



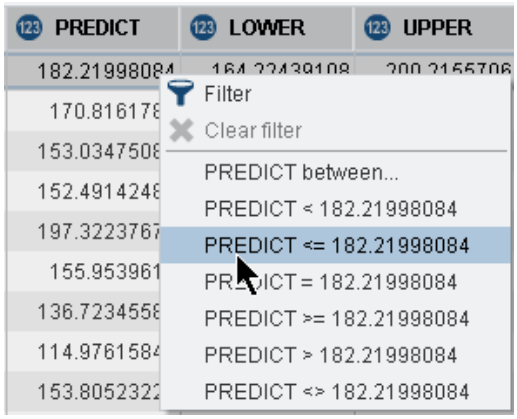
You can choose which columns are shown in the table view by checking the boxes for those columns in the Columns pane. The **Column Information** and **Statistics** tabs display information about the column that is currently selected in the Columns pane.

To sort the table according to the values of column, click on the column heading. If the column is sorted in ascending order, a ▲ appears beside the column heading. When the column is sorted in descending order, a ▼ appears.

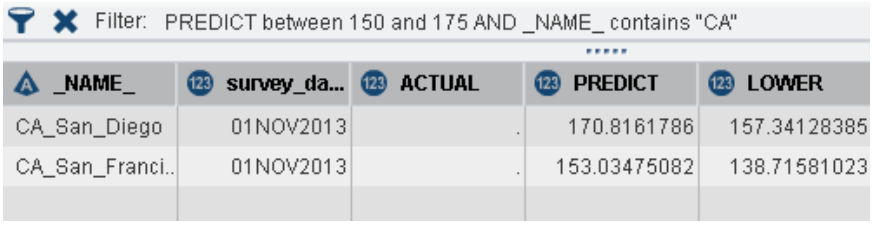
Filter Data in the Table View

You can filter the rows that are shown on the Table View page in either of the following ways:

- Click ▼ above the table. SAS Decision Manager opens the Filter dialog box. Enter a valid SQL expression, and click **Apply**.
- Right-click on a value in the table. SAS Decision Manager displays several predefined filter options. You can select any of these options. Depending on which option you select, you might be prompted to enter data values for the query.



The SQL expression that you enter is displayed above the data table, and the table is filtered accordingly.



To clear the filter and display the entire table, click ✖.

For more information about SQL expressions, see *SAS FedSQL Language Reference*.

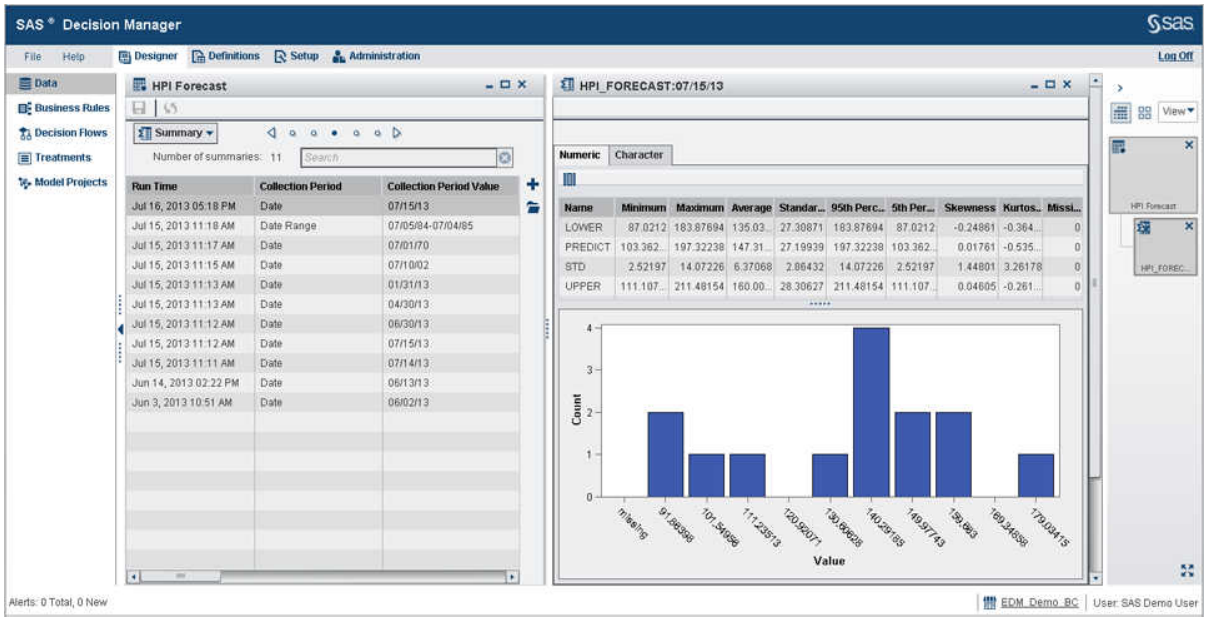
Add a New Table Summary

To add a new table summary:

1. In the Designer workspace, select the **Data** category.
2. Select the table, and select **Open**.
3. Use the Page Manager to select the Summary page.
4. Click ✚ to add a new summary.
5. In the New Summary dialog box, select the **Collection period** and the specific date or time values for the collection period. The summary description is optional.

6. Click **Run Now**. SAS Decision Manager adds the new summary to the Summary page.
7. To view the summary, double-click on the summary in the Summary page.

SAS Decision Manager opens the summary in the same layout.



Add Attachments to a Table

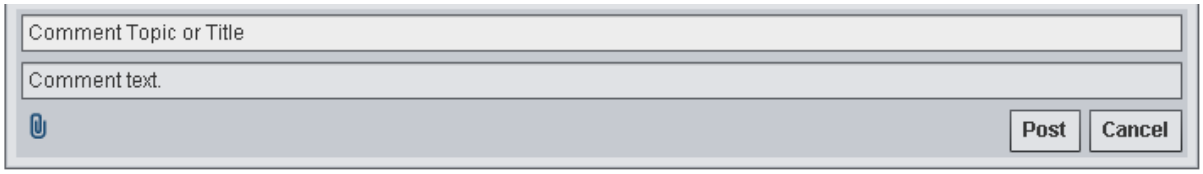
To add an attachment such as a document or an image file:

1. Use the Page Manager to select the Attachments page.
2. Click ✚, and select the attachment file.
3. Click 💾.

Add Comments to a Table

To add a comment:

1. Use the Page Manager to select the Comments page.
2. Enter a topic title and enter the comment. The topic title is required, and the field for comments does not appear until you enter the topic title.



3. (Optional) Click 📎 to add an attachment such as an image or a document.
4. Click **Post**.

To reply to an existing comment, enter your reply in the field immediately below the topic title for the existing comment, and click **Post**.

Click  to see comments that have been posted by others.

To search for text in the comments, enter text in the search field at the top of the Comment page.

Chapter 5

Managing Vocabularies

Introduction to Vocabularies, Entities, and Terms

Vocabularies, entities, and terms are the basic building blocks of a business rules database. Vocabularies contain entities, and entities contain terms.

Object	Description
Vocabulary	Vocabularies contain one or more business entities. Vocabularies enable you to categorize and structure the entities and terms needed to create a rules database.
Entity	An *entity* is an object in a business domain. For example, an entity could be Customer, Transaction, or Account. Entities contain terms. They group terms into logical units. Entities are not mapped to tables or to table columns when rules flows are published.
Term	A term is an attribute of an entity. For example, a customer entity might have terms such as name, address, and income. A transaction entity might contain terms for date, time, transaction amount, and account number. Terms are the objects with which you build business rules. A business rule can have *condition terms* and *action terms*. Suppose your rule is `if balance>1000 then account="premium"`. The term `balance` is a condition term, and `account` is an action term. Terms are mapped to table columns by the applications that use published rule flows that are within metadata.

Tips for Creating Entities and Terms

- Before you define vocabulary entities and terms, review the structure of the tables that input values will come from. Vocabularies should be structured similarly to these tables to ensure that terms are mapped correctly to input columns. Coordinate your work with the groups that will be using the vocabulary. Coordination helps ensure that the vocabulary structure meets their requirements.
- Boolean data can be represented with terms that are defined either as Boolean data types or as string data types. In some cases, Boolean values might be better represented by using terms defined as strings. For example, if your data already uses `yes` and `no` for Boolean data, then you probably want to use a string term to process these values rather than try to translate those values to `true` and `false`.

Create a Vocabulary

To create a new vocabulary:

1. In the Definitions workspace, select the **Data** category, and then select **Vocabularies**.
2. Right-click on the folder where you want to create the new vocabulary, and select **New Vocabulary**. Alternatively, you can select the folder, click , and then select **New Vocabulary**.
3. In the New Vocabulary dialog box, enter the name of the new vocabulary. Vocabulary names can contain up to 32 characters and must be unique within an entire rules database. Vocabulary names are case insensitive, and SAS Decision Manager considers `name` to be equal to `NAME`.
4. (Optional) Enter a description for the new vocabulary. Descriptions are limited to 256 characters.
5. Click **OK**.

Create New Entities

To create a new entity:

1. Right-click on the vocabulary where you want to create the new entity, and select **New Entity**. Alternatively, you can select the vocabulary, click , and then select **New Entity**.
2. In the New Entity dialog box, enter the name of the new entity. Entity names can contain up to 32 characters and must be unique within a vocabulary. Entity names are case insensitive, and SAS Decision Manager considers `name` to be equal to `NAME`.
3. (Optional) Enter a description for the new entity. Descriptions are limited to 256 characters.

4. Click **OK**.

Create New Terms

To create a new term:

1. Right-click on the entity where you want to create the new term, and select **New Term**. Alternatively, you can select the entity, click , and then select **New Term**.
2. In the New Term dialog box, enter the name of the new term. Term names can contain up to 32 characters and must be unique within a vocabulary. Term names are case insensitive, and SAS Decision Manager considers **`name`** to be equal to **`NAME`**.

   Note: You cannot use **`_N_`** or any DS2 reserved word as a term name. See "Reserved Words in the DS2 Language" in Chapter 19 of *SAS DS2 Language Reference* at **`http://support.sas.com/documentation/onlinedoc/base/index.html`**.
3. (Optional) Enter a description for the new term. Descriptions are limited to 256 characters.
4. Select the data type for the new term.
5. Select the domain type for the new term.
6. (Optional) Specify the domain values for the new term. Domain values are the set of expected values for a term.See "Specify Domain Values" on page 41 for more information.
7. (Optional) Select **Exclude from input** if you do not want the term to be mapped to a column in an input data set. (The application expects all terms to be mapped to columns in an input data set.)
8. (Optional) Select **Exclude from output** to exclude a term from the output data sets that are generated by rule flows.

   TIP To create a temporary term for use only while a rule flow is executing, select both **Exclude from input** and **Exclude from output**.
9. Click **OK**.

Specify Domain Values

Domain values are the set of expected values for a term. Domain values are not used to validate rules. They are used to enable faster and easier rule authoring. They are displayed in the Expression Editor, which enables you to add a value to an expression by double-clicking on the value.

Domain values can include term or variable names. For continuous values, you can use the greater than (>), less than (<), and equal (=) signs to set limits for ranges. You cannot include a semi-colon (;) within a domain value. You do not need to enclose string values in quotation marks unless the value itself contains an apostrophe (').

Separate individual domain values with a semi-colon (;).

Note: To enter continuous date and datetime values, enclose the values in single quotation marks, followed by a **d** or **dt** as shown in the following table.

The following table shows examples of domain values.

Table 5.1 *Examples of Domain Values*

Data Type	Domain Type	Examples
String	Discrete	`high risk;low risk` `"d'oscail";"d'fhill"`
Integer	Discrete	`0;800;3500`
	Continuous	`>100;<=myterm`
Decimal	Discrete	`3.14;12.98`
	Continuous	`>1.25;<=N1`
Date	Discrete	`01jul2012;31jul2012`
	Continuous	`>='01jan2013'd;<='31dec2013'd`
Datetime	Discrete	`01jul2012:10:52:00;31jul2012:23:00:00`
	Continuous	`<='01jul2012:00:00:00'dt;>'31jul2012:23:00:00'dt`
Boolean	By default, Boolean values are set to **True** and **False** and cannot be changed.	

Edit Existing Vocabularies, Entities, or Terms

To edit an existing object:

1. Right-click on the object that you want to edit, and select **Open**. Alternatively, you can select the object, and then click **Open** in the toolbar.
2. Edit the object's properties as needed.
3. Click .

Delete Vocabularies, Entities, or Terms

Note: You cannot delete a vocabulary, entity, or term if it is used in a rule set.

You can delete an object in one of two ways:

- Right-click on the object, and select **Delete**.
- Select the object, and click  .

Chapter 6

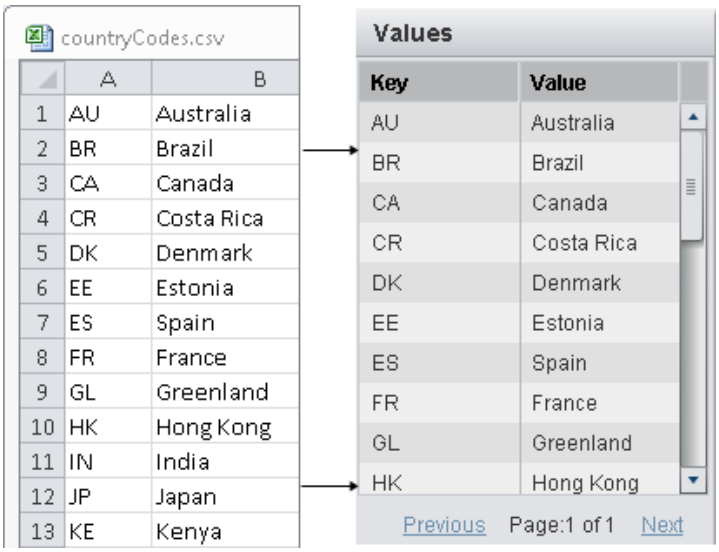
Using Lookup Tables and Functions

About Lookup Tables and Functions

SAS Decision Manager provides the ability to import lookup tables and reference them from rules. Lookup tables are tables of key-value pairs. For example, you can use a lookup table to retrieve a part name based on the part code number or to retrieve the full name for a country based on its abbreviation.

You can import lookup data from comma-separated-values (CSV) files such as those created by Microsoft Excel into lookup tables in SAS Decision Manager. You can re-import updated CSV files as needed to refresh the lookup tables.

Figure 6.1 *CSV File Imported Into SAS Decision Manager*



In a lookup table, each *lookup key* is associated with a *lookup value*. Lookup keys must be unique within each lookup table. Lookup values are limited to 512 characters.

SAS Decision Manager provides two functions, Lookup and LookupValue, that enable you to determine whether a lookup key exists in a lookup table and to retrieve a lookup value from a lookup table.

Create a New Lookup Table

You create a new lookup table by importing a CSV file.

To create a new lookup table:

1. In the Definitions workspace, select **Data** category, and then select **Lookups**.
2. Right-click on the folder where you want to create the new lookup table, and select **New Lookup**. Alternatively, select the folder where you want to add the new lookup table, click on the toolbar, and then select **New Lookup**.
3. In the New Lookup dialog box, enter a name for the new lookup table. Names are limited to 32 characters and can contain only alphanumeric characters and underscores. Lookup table names must be unique within the business rules database.
4. (Optional) Enter a description for the new lookup table. Descriptions are limited to 256 characters.
5. Click , and select the CSV file that contains the lookup data.
6. Click **OK**.

Refresh a Lookup Table

To refresh a lookup table:

1. Right-click on the lookup table that you want to refresh, and select **Refresh Lookup**.
2. Click , and select the CSV file that contains the lookup data.
3. Click **OK**.

Delete a Lookup Table

Note: You cannot delete a lookup table if it is referenced in a rule.

To delete a lookup table:

1. In the Definitions workspace, select **Data** category, and then select **Lookups**.
2. Select the lookup table and click . Alternatively, you can right-click on the lookup table, and then select **Delete** from the menu.

Verify Lookup Keys (Lookup Function)

You can use the Lookup function to verify that a key value exists in a lookup table. You can specify the Lookup function in condition expressions only. Specify the Lookup function as the expression for the term whose value is the lookup key that you want to search for. The syntax of the Lookup function is as follows:

Lookup ("*lookup_table_name*")

For *lookup_table_name*, specify the name of the lookup table that you want to search.

For example, if you want to verify that the value of the term Ctry_Key exists as a key value in the table Country_Codes, enter the Lookup function as the expression for the Ctry_Key term as shown in the following display.

	Condition Term
#	Ctry_Key
1	Lookup('Country_Codes')

The Lookup function returns a value of **`True`** or **`False`**, depending on whether the key value exists in the lookup table. For example, suppose the Ctry_Key column in the current input record contains the value “CA”. If the Country_Codes lookup table contains the lookup key “CA”, then the expression shown in the display above evaluates to True.

Note: If an expression contains the Lookup function, then the expression cannot contain anything else.

Get Lookup Values (LookupValue Function)

You can use the LookupValue function to retrieve a lookup value from a lookup table. You can specify the LookupValue function in action expressions only. The syntax of the LookupValue function is as follows:

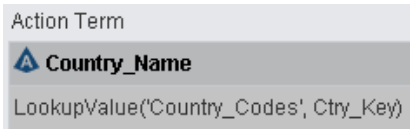
LookupValue ("*lookup_table_name*", *term_or_string*)

lookup_table_name
the name of the lookup table that you want to search.

term_or_string
a term or character string that specifies the lookup key for the value that you want to retrieve. Enclose character strings in quotation marks.

For example, suppose the term Ctry_Key contains a lookup key. To retrieve the lookup value that is associated with that key from the table Country_Codes, enter the following expression for the Ctry_Key term:

```
LookupValue('Country_Codes',Ctry_Key)
```



The first few entries in the Country_Codes lookup table are shown below.

Values

Key	Value
AU	Australia
BR	Brazil
CA	Canada
CR	Costa Rica

For example, suppose the Ctry_Key column in the current input record contains the value “CA”. The Country_Codes lookup table contains the lookup key “CA”, and the lookup value that corresponds to that key is “Canada”. The expression shown in the display above assigns the value “Canada” to the term Country_Name.

Note: If an expression contains the LookupValue function, then the expression cannot contain anything else.

Chapter 7

Defining the Components of Flows

Business Contexts

Overview of Business Contexts

A business context defines the information that an individual user can access. For example, in a large, decentralized environment, multiple groups might access different data. One massive information map for all groups might become too unwieldy. By defining different business contexts for different groups, an administrator can provide smaller, targeted information maps that are more efficient and easier to use. Different, smaller business contexts result in better performance in because the smaller information maps are easier to process and update.

Business contexts can enhance information security. A single information map for all groups might violate the information security policies of a large corporation. By defining separate business contexts, the corporation can ensure that individuals and groups have access only to the data that is required to conduct their specific business.

Create Business Context Folders

The metadata for business context folders is stored within a user-created folder on the **Folders** tab of SAS Management Console. All users should have Write access to this folder.

To create a unique folder for each business context and set the permissions for that folder:

1. Create a new folder on the **Folders** tab of SAS Management Console.
2. Right-click the new folder and select **Properties**.
3. On the **Authorization** tab, click **Add** and assign ReadMetadata, WriteMetadata, WriteMemberMetadata permissions to the groups who will have access to this folder. This folder is the root folder for the business context. SAS Customer Intelligence Studio users are not able to navigate above this folder. You can also edit the permissions at a later time.

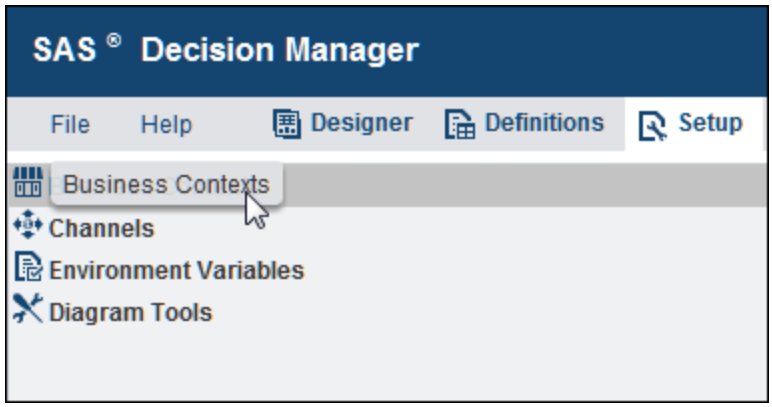
Each business context folder contains a separate structure of subfolders. Business contexts cannot share subfolders and cannot have the same root folder. A business context folder cannot be a subfolder of another business context folder.

Note: Do not use your private user folder or the **`Shared Data`** folder as a location for storing business contexts.

Create a Business Context

To create a business context, select the Business Contexts category in the Setup workspace.

Display 7.1 *Business Contexts*



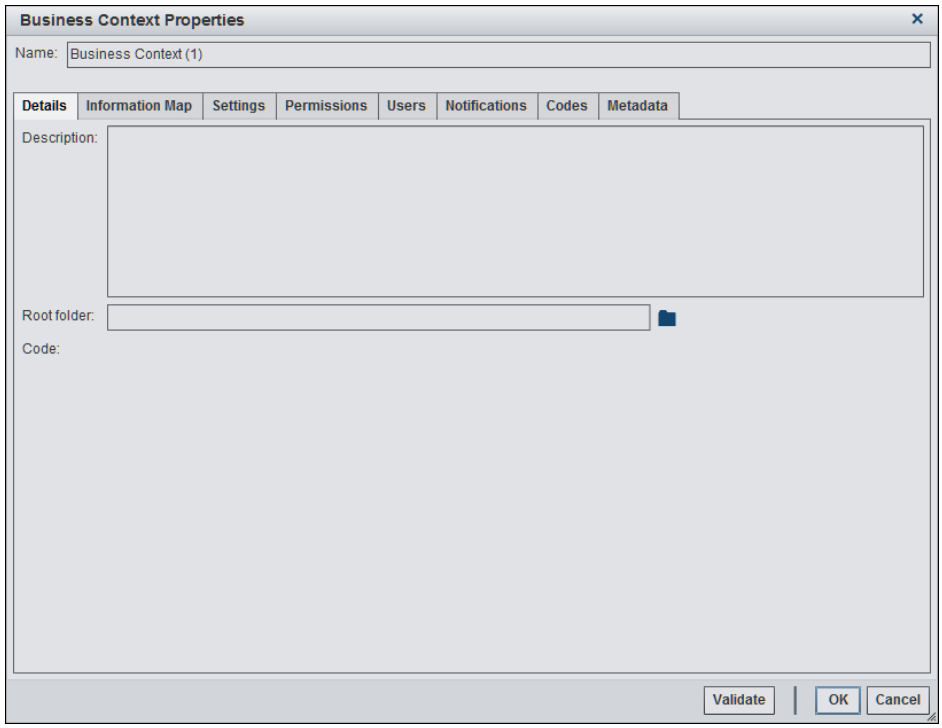
Click  to create the business context.

When you log off from SAS Decision Manager, all business contexts that have not been modified are automatically saved.

Specify Business Context Details

The **Details** tab of the Business Context Properties window displays basic information.

Display 7.2 *Details Tab*

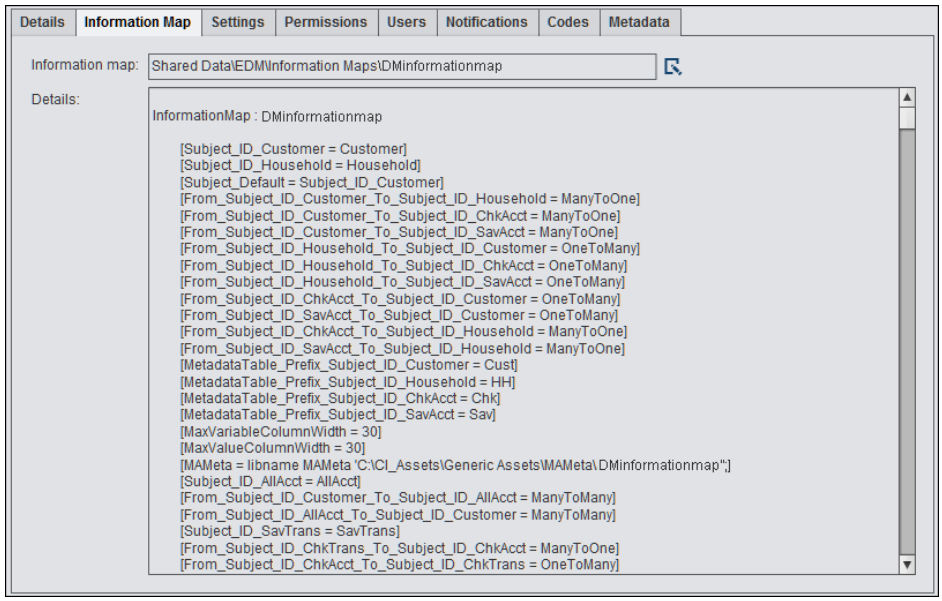


Click  to select a folder for the business context.

Select an Information Map

On the **Information Map** tab, select the information map on which the business context is based.

Display 7.3 *Information Map Tab*



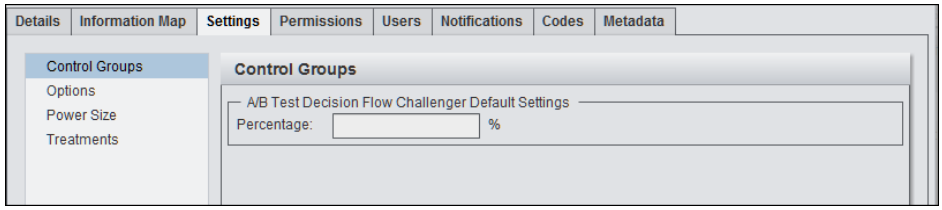
Click  to select an information map.

Specify Control Group Settings

Overview of Control Group Settings

The Control Groups section on the **Settings** tab determines the default settings for A/B Test control groups. The settings that you specify here are optional and can be overridden in the flow.

Display 7.4 *Control Groups*



Decision Flow Control Group Settings

In the A/B Test Decision Flow Challenger Default Settings section, enter a number to set the default percentage of a challenger in an A/B Test node in a decision flow. The percentage must be greater than 0 and less than or equal to 50.

Specify Options

Overview of Specifying Options

The Options section of the **Settings** tab specifies options for libraries, data sets, and reporting. In order to use the data set settings that are most applicable to your site, you should have a thorough understanding of common data model architecture.

The Data options settings that are displayed depend on the products that are installed at your site.

Data Options Settings for Decision Flows

Select an item from the **Decision test data grid input library** list to select a library that contains data grids that you can use as input in testing flows.

Select an item from the **Decision test data grid output library** list to select a library that contains data grids that you can use to receive output from testing flows.

A Decision Services repository stores the events and global variables for the business context. If there is more than one repository available, select an item from the **Decision Services repository** list.

Set Database Upload Options

To enable faster uploading of tables and updating of contact history, enter DBSDOPTIONS variable options in the **Data set options** field. Enter values for the DBTEMPSCHEMA option in the **Schema** field. If the database has native temporary locations, select **Use temporary table capability of database**. However, selecting this option can prevent the updating of contact history. For more information, see the documentation on the Bulk Load Facility in the *SAS Marketing Automation and SAS Real-Time Decision Manager Administrator's Guide*.

Note: The CICommon web service must be restarted in order for the database upload options to take effect. For more information, contact your system administrator.

Set Reporting Options

Select a libref for the location of the common data model from the **Reporting libref** list. If you do not select a libef, you cannot publish flows. After a flow has been published once, a report can be produced every time that the flow is saved if you select **Automatically publish flows on subsequent save**.

Note: In cases where a package has been deleted, the flow is published when it is saved even if **Automatically publish flows on subsequent save** is not selected. This is to ensure that the common data model is updated with the deletion.

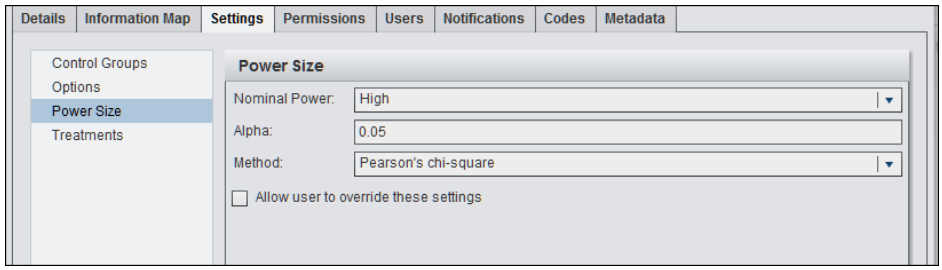
Set Approval Options

Select **Open approved flows as read-only when user is not an approver** to prevent other users who are not on the list of approvers from editing approved flows.

Specify Statistical Power Size

In the Power Size section of the **Settings** tab, you configure the statistical size estimator. The business user can use the estimator to determine the sample size that is required and then analyze response rates for statistically significant differences.

Display 7.5 *Power Size*



Nominal power specifies the desired power of the test and is expressed as a probability. Select **High** (0.9), **Medium** (0.75), or **Low** (0.6).

Alpha specifies the level of significance of the statistical test. The default value is 0.05, or a 5% level of significance. The value of **Alpha** might need adjustment where there is more than one subgroup. For example, if you have divided a champion group into five smaller subgroups that each receive a different treatment and if you want the probability of making at least one error in five tests to be 5%, you should set the probability of making an error in an individual test to 5% divided by 5, or 0.01.

Method specifies a modeling technique. Select **Pearson's chi-square**, **Fisher's exact**, or **Likelihood ratio chi-square**.

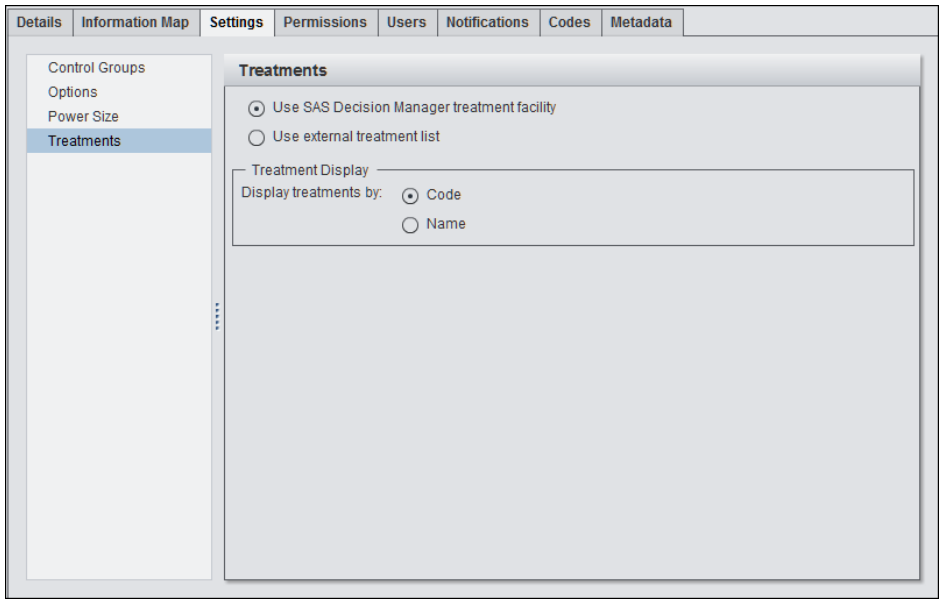
Select **Allow user to override these settings** to enable the flow editor to override the settings on the **Advanced** tab of the statistical size estimator.

Specify Location of Treatment Values

In the Treatments section of the **Settings** tab, you specify the location of treatment values. A treatment is a type of document that is used to communicate a decision, such as how to process an insurance claim. A treatment includes the formats and content that are associated with the decision.

You can select from these treatment values when you associate treatments with result cells in a flow.

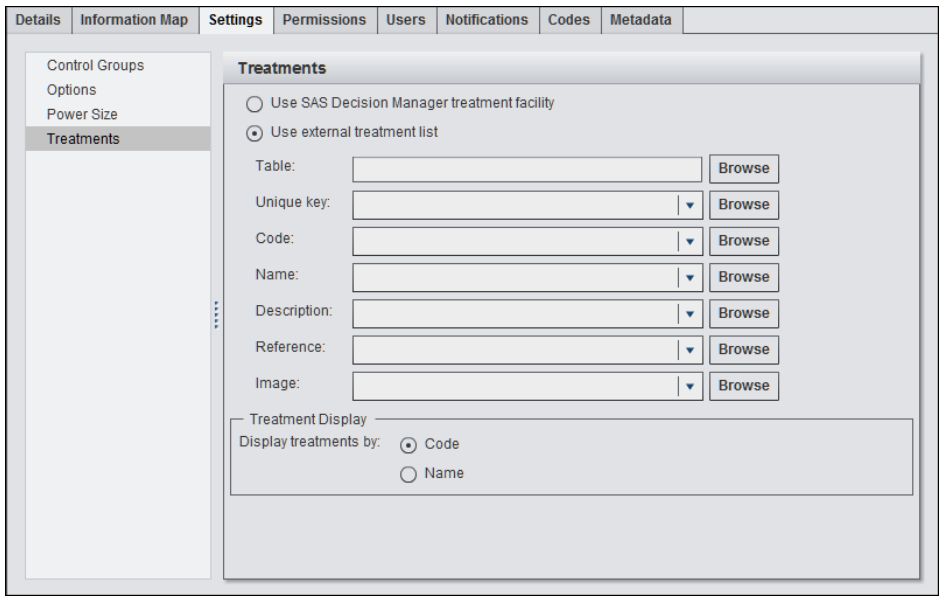
Display 7.6 *Treatments*



You can use treatments that you have created in SAS Decision Manager, or you can use treatments that were created outside SAS Decision Manager. Select **Use SAS Decision Manager treatment facility** to create and use treatments that you have created in SAS Decision Manager. If you use the SAS Decision Manager treatment facility, you cannot use treatments that were created outside SAS Decision Manager. SAS Decision Manager users can update, edit, and view the contents of treatments that are created by the SAS Decision Manager treatment facility.

To use treatments that were created outside SAS Decision Manager, select **Use external treatment list**.

Display 7.7 *External Treatment List*



Users can select from this list of values when they add treatments to a flow. If you use an external treatment list, you cannot use treatments that were created by the SAS Decision

Manager treatment facility. SAS Decision Manager users cannot update, edit, or view the contents of treatments that come from an external list. Treatments that come from an external list cannot contain custom details. Treatments that have duplicate IDs are removed. Treatments with missing numeric values are not displayed in SAS Decision Manager.

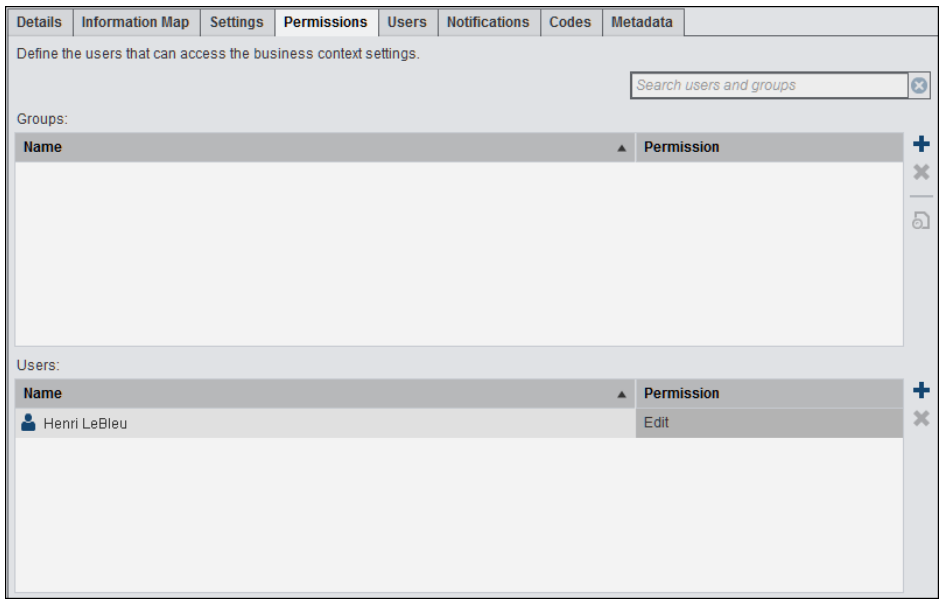
Click **Browse** to select a table that contains an external treatment list. Associate a unique key, code, and name with the list of treatments. A description is optional. Treatments that are created externally must contain a unique key and a code or name for the treatment. If the table does not have a column that corresponds to the name, the data that is associated with the Code column is used to populate the **Name** field. If the table does not have a column that corresponds to the code, the data that is associated with the Name column is used to populate the **Code** field. If you change the treatment option, treatments that already are assigned to flows are not affected.

To control the display of treatment column headings in a flow, select **Code** or **Name** in the Treatment Display section.

Share Business Context with Users and Groups

The **Permissions** tab lists the users and groups who can have access to the business context definition in the Setup workspace.

Display 7.8 *Permissions Tab*



To view the users in a group, select the group and click .

In order to edit user or group permissions, you must have Edit access. The owner automatically has Edit permission. The owner's permission cannot be edited. To grant View or Edit permission to a user or user group, click the **Permission** cell and select the permission. By default, all users and groups that you select have Edit permission.

In general, the permission that you set for an individual user overrides the permission that is set for a group that the user is a member of. For more information about the relationship of permissions between users and groups, see *SAS Intelligence Platform: Security Administration Guide* at **SAS Intelligence Platform**.

To add a user to the list, click ✚ and select a user. To add a group to the list, click ✚ and select a group.

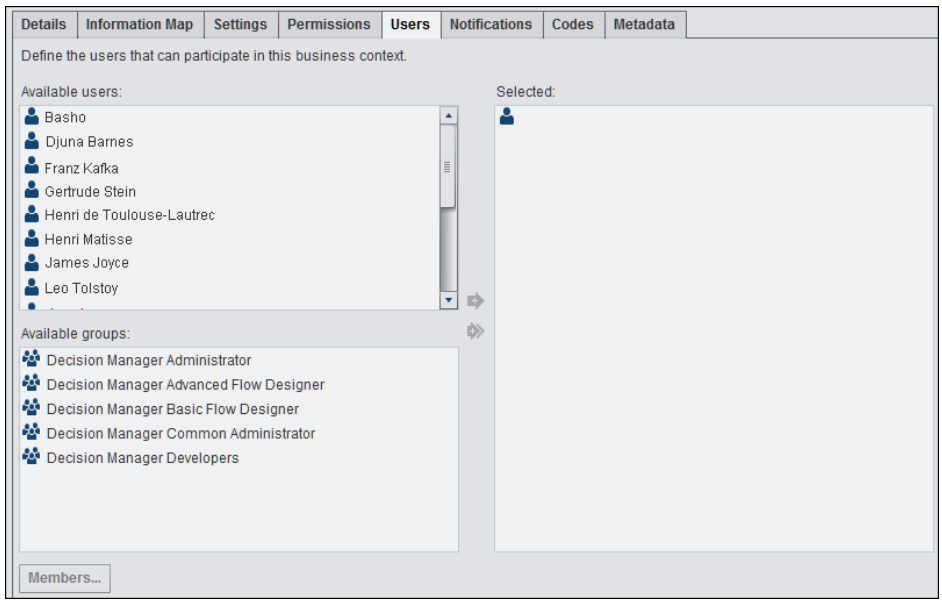
If you set a permission to **View**, the user can see the business context in the Setup workspace, but cannot save any changes to the business context. **Edit** permission enables the user to see the business context and to save changes to it.

Note: To create or edit a table in the Data category, the user must have Edit permission.

Select Users of Business Context Objects

The **Users** tab lists the users and groups who can choose the business context in SAS Decision Manager and create and manage assets in the Definitions and Designer workspaces.

Display 7.9 *Users Tab*

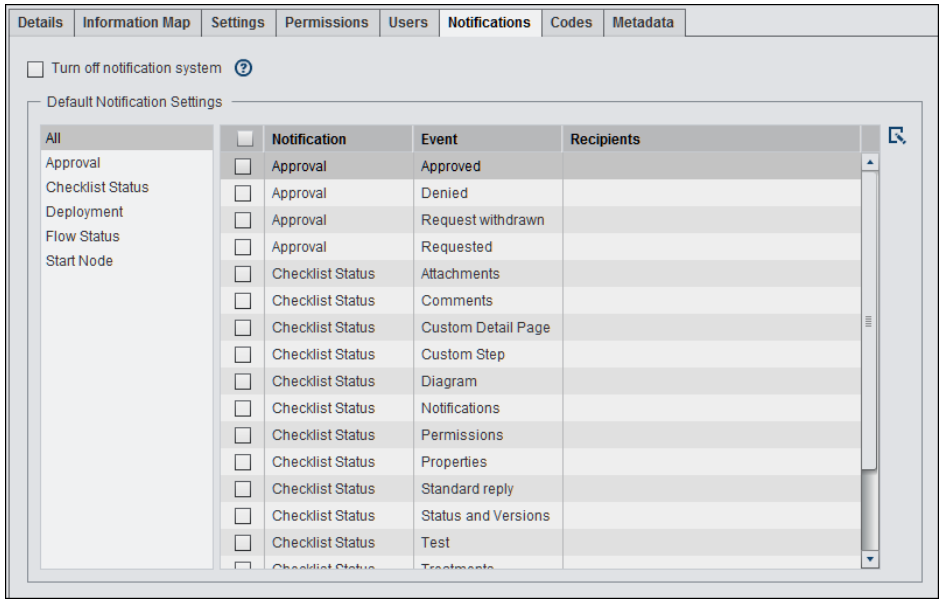


Select the users and groups who will have access to the objects.

Enable E-mail Notifications

On the **Notifications** tab, set the e-mail notifications to send after an event such as a change in checklist status.

Display 7.10 *Notifications Tab*



Notifications are enabled by default. To disable all notifications, select **Turn off notification system**. Notification recipient settings are retained and are applied if you enable notifications.

CAUTION:

If you turn off the notification system, users of existing flows might not be aware that notifications will not be sent.

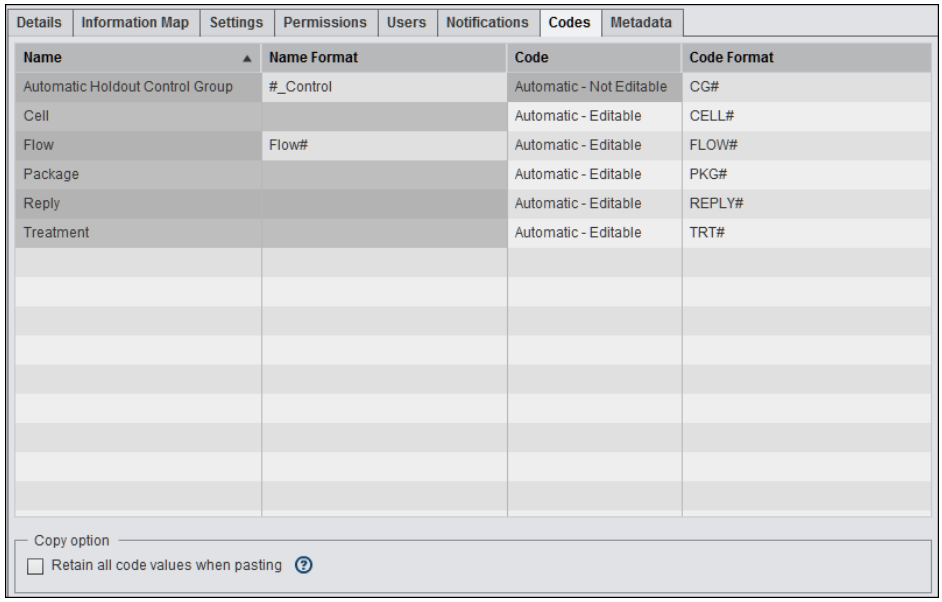
Select a row and click to select the recipients of the notification. This setting applies to any notification of the same type that is sent from that business context.

Note: In order to receive the notification, the correct e-mail addresses must be assigned to the users in the User Manager plug-in in SAS Management Console. For more information, see *SAS Marketing Automation and SAS Real-Time Decision Manager Administrator's Guide*.

Specify Formats for Codes and Flow Names

On the **Codes** tab, specify the format of cell codes, automatic holdout control group codes and names, flow names, and other items. Valid characters for codes are alphanumeric characters, numerals, underscores, hyphens, and periods. Blank spaces are not allowed in code formats.

Display 7.11 *Codes*



Enter the name of the automatic holdout control group or flow in the **Name Format** column. Include the symbol # that will be replaced by a unique number or, in the case of a control group, the name of the marketing cell that the control group is derived from. The # can occur anywhere in the name. By default, the flow name format is Flow#. The control group name format is #_Control, where the symbol # is replaced by the name of the marketing cell. Names can be no longer than 60 characters.

To specify the properties of the code, click a cell in the **Code** column and select either **Automatic - Editable**, **Automatic - Not Editable**, or **Manual - Editable**. The **Automatic - Not Editable** setting for holdout control groups cannot be changed. If the format for a control group name or code is changed in the business context, existing control group cell names and codes are not changed to the new format. New control group names and codes comply with the new format. Codes can be no longer than 32 characters.

Enter the code format in the **Code Format** column. Include the symbol # that will be replaced by a unique number. The # can occur anywhere in the code name. For control group code formats, the symbol # is replaced by the cell code of the marketing cell.

The following are the default formats:

- CAMP#
- REPLY#
- CELL#
- CG#
- PKG#
- TRT#

For the **Automatic-Editable** and **Automatic-Not Editable** properties, code formats are required. If automatic holdout control groups are enabled, the PKG# code format is also required for the **Manual-Editable** property.

To retain codes, including auto-generated codes, when pasting nodes, select **Retain all code values when pasting**. This setting applies to flows within the selected business context.

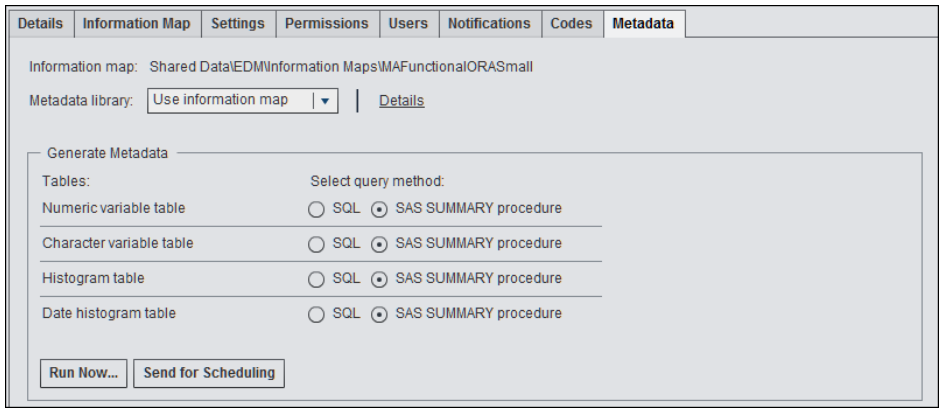
The following codes are retained:

- flow codes
- cell codes, including marketing cells
- control group codes and names
- package codes

Generate Information Map Metadata

If there has been a change to an information map, you might need to generate new information map metadata. On the **Metadata** tab, you manage the generation of metadata tables for information maps. Metadata tables are SAS data sets that contain location and summary information about data items.

Display 7.12 *Metadata Tab*

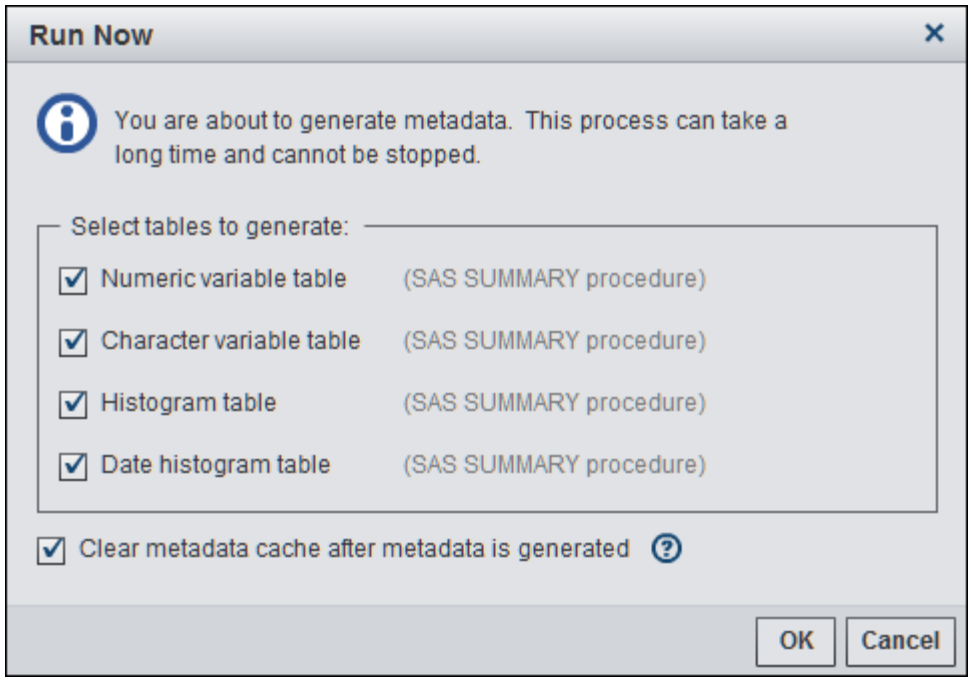


The generated metadata is stored in a library with the libref of MAMeta. Select a library from the **Metadata library** list. Click **Details** to display LIBNAME statement for the library. The **Use Information Map** item uses the MAMeta LIBNAME state within the information map. For more information, see "SAS Information Maps for Campaigns" in *SAS Marketing Automation and SAS Real-Time Decision Manager Administrator's Guide*.

Select **SQL** as a query method if the information map is not complex, but contains a large amount of data. Select **SAS SUMMARY Procedure** to specify if the SUMMARY procedure should be used.

If the metadata counts are current and ready for use in a flow, click **Run Now**.

Display 7.13 *Run Now*



Select the tables that you want to generate. To improve performance, previous metadata counts are stored in a cache that is used by SAS Decision Manager. To replace the existing metadata counts with new counts, select **Clear metadata cache after metadata is generated** to clear the metadata cache. The metadata cache is cleared for all business contexts that share the current information map.

If the metadata counts are in the process of being updated, click **Send for Scheduling** to generate all of the tables and to send the job to the SAS Schedule Manager. The metadata cache is cleared automatically after the metadata has been generated.

Validate Business Context Settings

Click **Validate** to validate the business context settings.

Flows

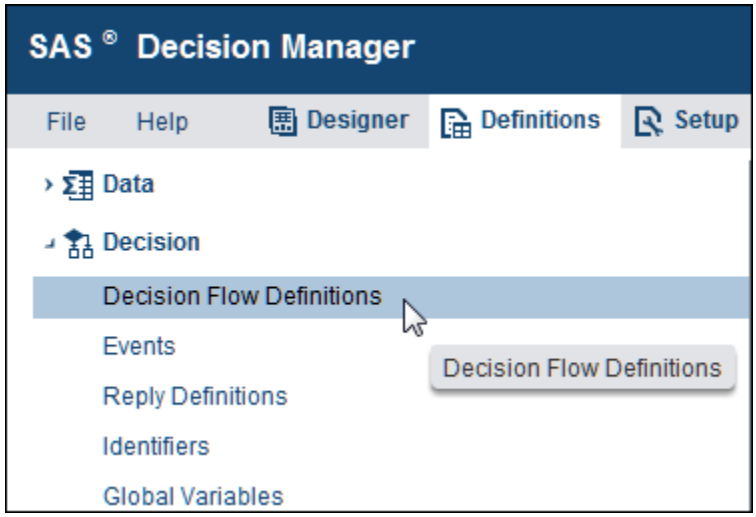
Overview of Flow Definitions

When you create a new flow, you select a flow definition. The details that you specify for a flow definition determine the information that is available.

Create a Flow Definition

To create a new flow definition, expand the Decision category in the Definitions workspace, and select **Decision Flow Definitions**.

Display 7.14 *Decision Flow Definitions*

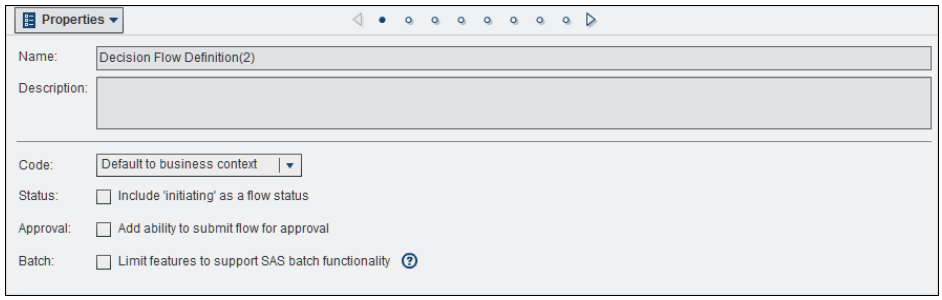


Click and select **New decision flow definition** to create the definition.

Specify Flow Definition Properties

The Properties page displays information about the flow definition. You can edit the name when you save the flow definition.

Display 7.15 *Flow Definition Properties*



Use the **Code** list to specify the following options:

Automatic - editable
The code is automatically generated and can be edited. The format is derived from the setting for the current business context.

Automatic - not editable
The code is automatically generated and cannot be edited. The format is derived from the setting for the current business context.

Manual - editable
The code is supplied manually by the user.

Default to business context
The code settings default to the settings for the current business context.

Select **Include 'initiating' as a flow status** to specify that **Initiating** and **Initiation complete** are available as statuses in the flow.

Select **Add ability to submit flow for approval** if you want to add an approval step to the process. Selecting this option adds an Approval page to the Process gallery. At least one user or group on the flow Permissions page must have Approval permission.

Select **Limit features to support SAS batch functionality** if you want to apply scores, business rules, and other SAS Decision Manager logic to a batch data process. The cost advantage of the batch option can be significant if a batch process is sufficient. For example, a loan processor might want to run a nightly batch process to identify applicants who are credit risks.

If you select this option, you can select only events that do not contain arrays or data grids. The decision flow cannot include contact history or web processes.

The disadvantage of selecting this option is that many processes now occur in real time, because of the continuous stream of available data. The volume of data can make batch processes insufficient. Users who are involved with claims or case management might need to make decisions more quickly. Another disadvantage is that the rapid flow of data might provide new information that cannot be sufficiently integrated into batch processes.

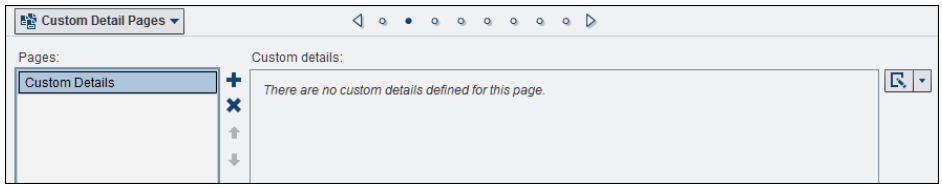
After a flow has been created based on a flow definition, further changes to a flow definition are not reflected in that flow.

Add Custom Detail Pages

Overview of Custom Detail Pages

On the Custom Detail Pages page, you add new pages that contain user-defined fields. You can select these pages for inclusion in the Design gallery or Process gallery for a flow.

Display 7.16 *Custom Detail Pages*

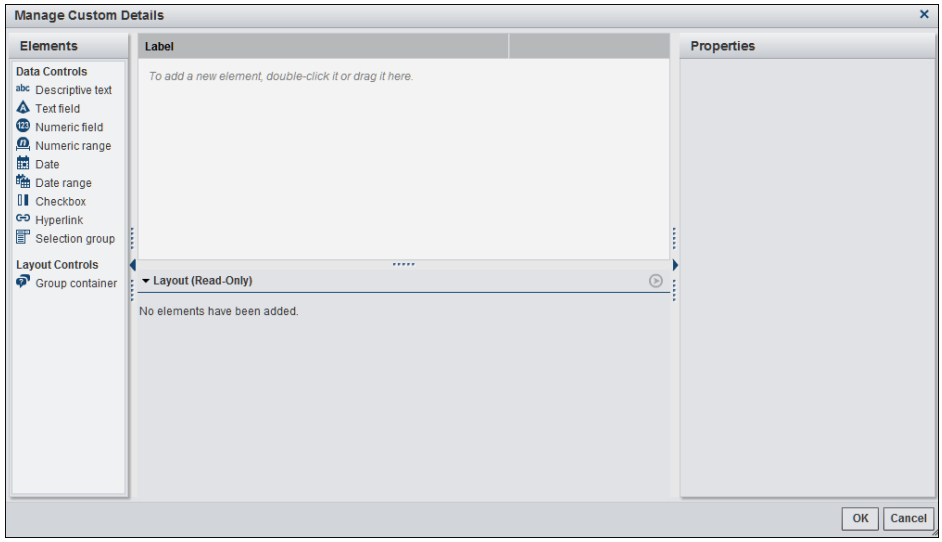


Click ✚ to add a new page to the table. Click and select **Manage custom details** to add custom details to the page. Select **Add custom detail groups to add custom detail groups to the page.**

Manage Custom Details

In the Manage Custom Details window, you supply information about the custom details.

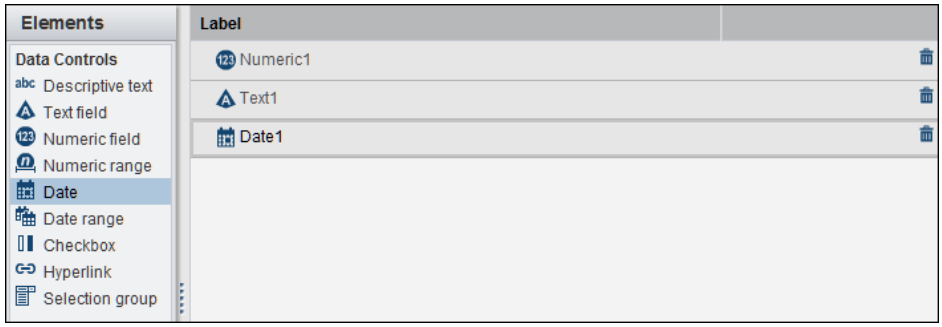
Display 7.17 *Manage Custom Details*



Select an Element

To select the type of custom detail, double-click it or drag an element from the **Elements** pane to the **Label** pane.

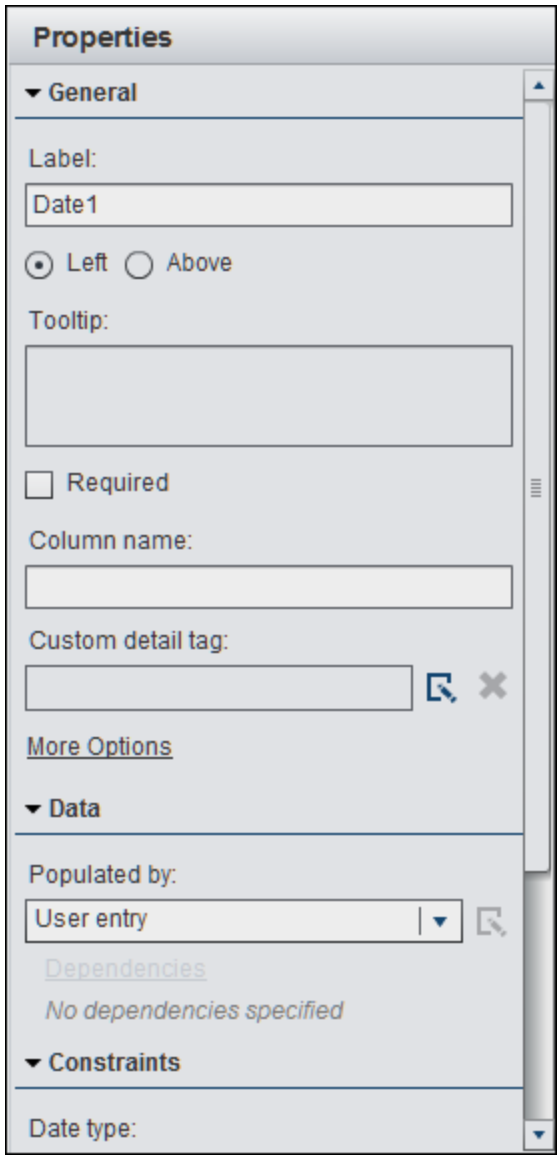
Display 7.18 *Select Element*



Specify Properties

In the **Properties** pane, specify the details for the selected element. The details vary, depending on the element and the software component. As you set the properties, you can review the results in the **Layout** pane.

Display 7.19 *Custom Detail Properties*



Specify General Properties

The following items are the possible properties in the General section. Click **More Options** to display more properties.

Label
is the name that is displayed with the field. Select **Left** or **Above** to set the location of the label in relation to the custom detail.

Note: The names of custom details that are passed to SAS Marketing Optimization must be no longer than 26 characters.

Description
is the description of the field.

Tooltip
is the text that is displayed when you rest the mouse pointer on the field.

Required
indicates that a value is required.

Dynamic
indicates that a value is dynamic. Dynamic custom details can be modified. Values that are not dynamic cannot be changed. This option is available only for treatments.

Column name
is the name of the column that is displayed in a published report.

Minimum column name
is the name of the column that displays the minimum value in a range.

Maximum column name
is the name of the column that displays the maximum value in a range.

Custom detail tag
is the custom detail tag that is associated with the custom detail. Click  to select a custom detail tag.

Minimum custom detail tag
is the custom detail tag that is associated with the minimum value in a range. Click  to select a custom detail tag.

Maximum custom detail tag
is the custom detail tag that is associated with the maximum value in a range. Click  to select a custom detail tag.

Width
is the width of a field.

Hint
is the text that is displayed beneath the field that indicates the value that should be entered.

In-field hint
is the text that is displayed in the field that indicates the value that should be entered.

Specify Data

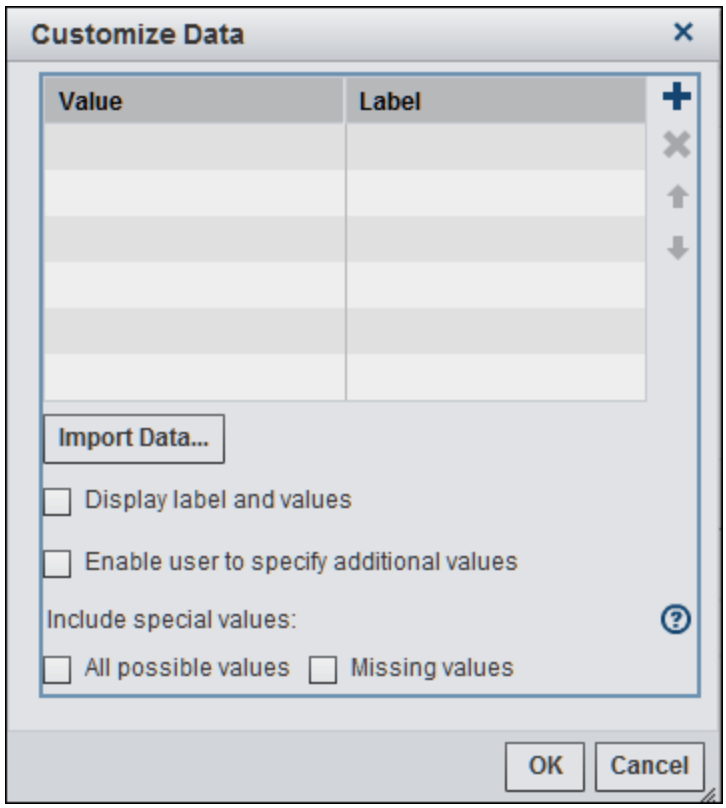
These are the possible properties in the Data section:

Number of values
sets the number of text values that can be entered. If you select **Multiple values**, select **Enable user to reorder values** to enable the user to change the order of the values.

Populated by
specifies the source of the values that are entered.

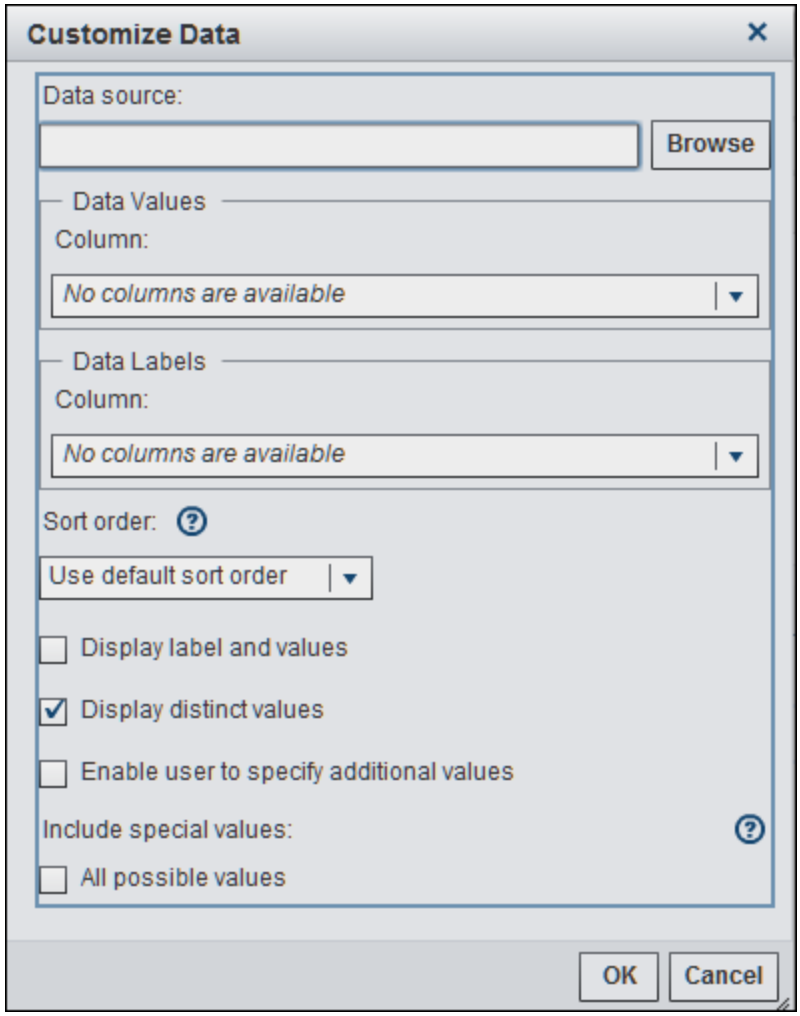
Select **User entry** to indicate that values are entered in by the user.

When you select **A predefined list**, the list does not change unless you add or remove values.



To display text other than the name of the list item, enter a value in the Label column. For example, if the list items are products, the Value could be the product number A12345 and the Label could be Child's Desk. When a predefined list is published to the common data model, the published value contains the concatenated display values. Click **Import Data** to import values from a SAS library. Click **Display label and values** to display the label and values with the list item. To enable the user to select values from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

When you select **A dynamic list**, you can include up to 5,000 items from an external list. The list displays the contents of the SAS Folders hierarchy in the **Folders** tab of SAS Management Console. Changes in this external list are reflected in the list of values that the user can select.



Click **Browse** to select a data source. Select a column in the Data Values and the Data Labels section to display those columns. Select a sort order. To display a value other than the text in the **Value** field, select **Display label and values** and **Display distinct values**. To enable a user to select more than one value from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

Specify Constraints

The following items are the possible properties in the Constraints section.

Allow only integer values
indicates that only integer values can be entered in a numeric or a numeric range custom detail.

Number of lines
specifies whether to display single or multiple lines. . If you select **Multiple lines**, specify the **Maximum line count** and **Number of lines displayed**.

Minimum length
sets the minimum number of characters that are allowed in the field.

Maximum length
sets the maximum number of characters that are allowed in the field.

Maximum line count
is the maximum number of text lines that can be entered in a field.

Number of lines displayed
is the number of text lines that are displayed in the field.

Date type
sets the unit to **Day**, **Week**, **Month**, **Quarter**, or **Year**.

Include relative dates
enables you to select a date that is relative to the current date (for example, **Next week**).

Minimum decimal places
sets the minimum number of decimal places that are allowed in the field.

Maximum decimal places
sets the maximum number of decimal places that are allowed in the field.

Minimum value allowed
is the minimum value for the field.

Maximum value allowed
is the maximum value for the field.

Combined field
is another text field that this field can be combined with.

Maximum combined length
is the combined length of two combined text fields.

Specify Appearance

The Appearance section offers a choice of displays for selection groups and group containers. A selection group can be displayed as a drop-down list or a set of radio buttons. A group container can be displayed as a labeled box, a collapsible section, or an unlabeled group.

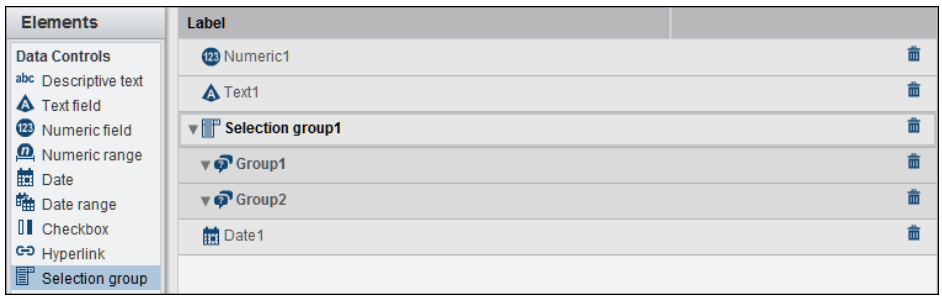
Specify Default Values

In the Default Values section, you specify a default value for a selection group. Click  to specify which group is displayed first by default.

Organize Custom Details

A selection group is a collection of other groups that is displayed as a list or a series of radio buttons. Double-click **Selection group** to add it to the **Label** pane.

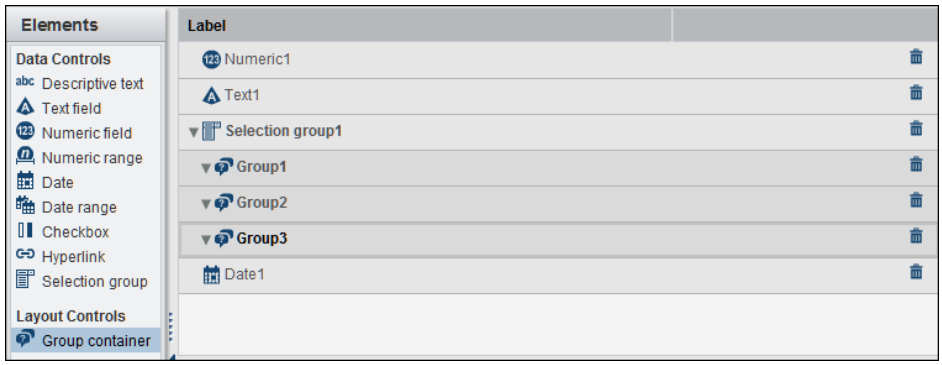
Display 7.20 *Selection Groups*



The selection group is prepopulated with groups that you can modify and add items to. Select items from the **Elements** pane and drag them to a group.

A group container collects custom details into a group. Double-click **Group container** to add it to the **Label** pane.

Display 7.21 *Group Container*

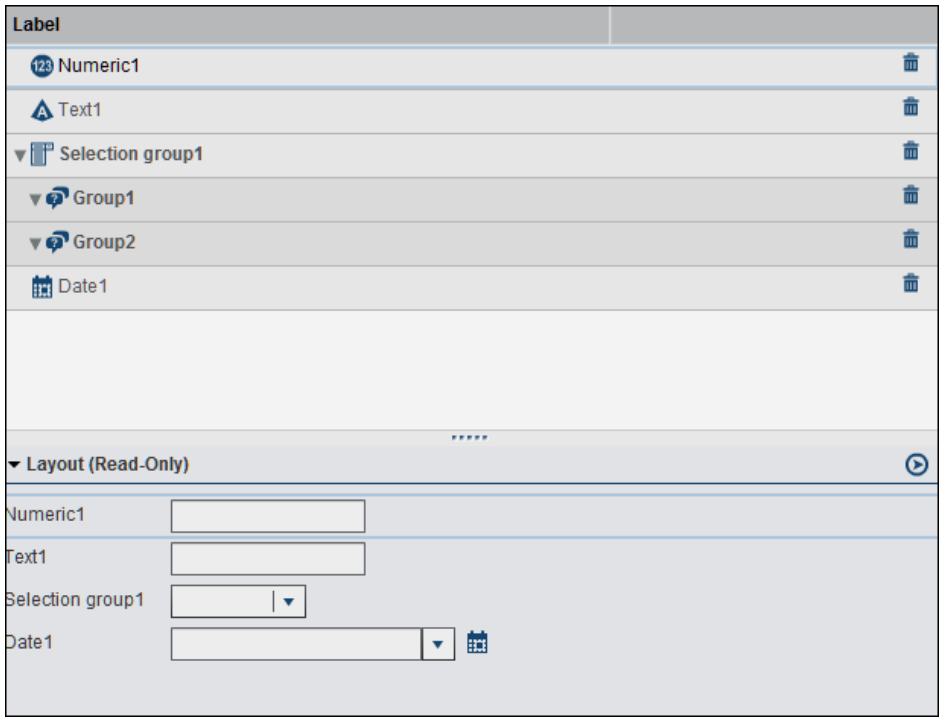


Select items from the **Elements** pane and drag them to a group.

Preview Custom Details

The Layout pane displays the custom details as they appear on the Custom Details page.

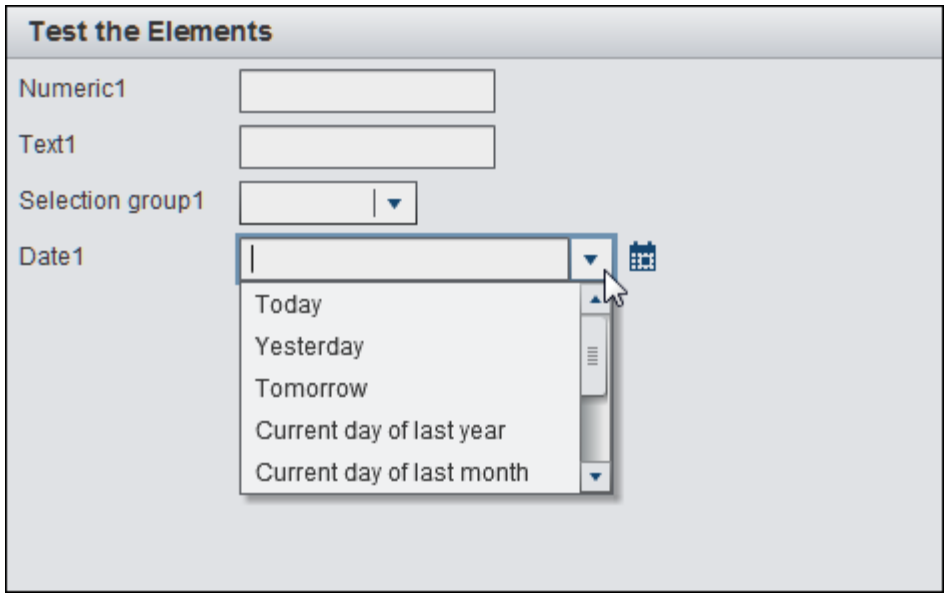
Display 7.22 *Layout*



A red asterisk (*) indicates that a field is required.

Click ▶ to open a Test the Elements window where you can test the custom details by interacting with them.

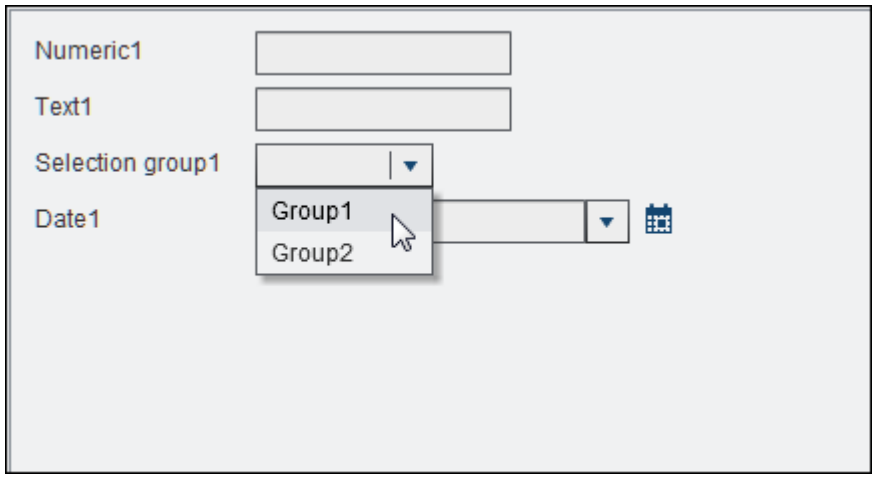
Display 7.23 *Test the Elements*



Set Default Values

On the Custom Details page, you specify default values for the custom details that you have created.

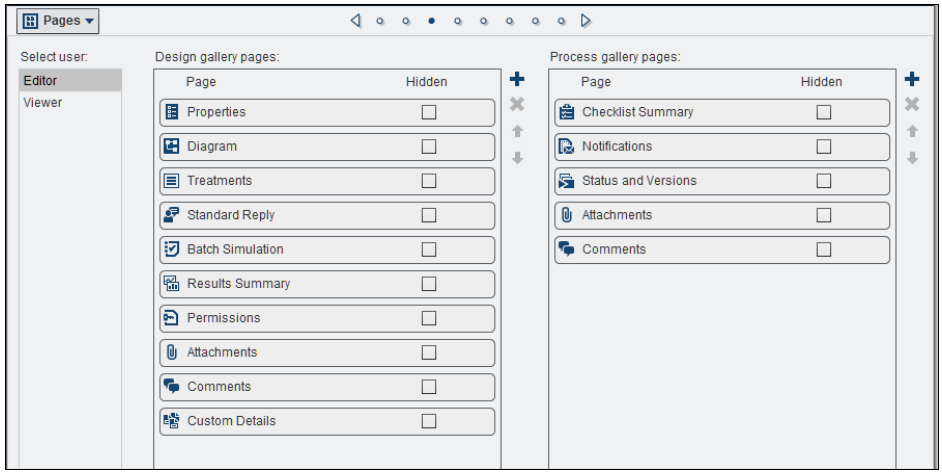
Display 7.24 *Default Values*



Select Pages

On the Pages page, you select the pages that are listed in the Page Manager for a flow.

Display 7.25 *Pages*



Select **Editor**, **Viewer**, or **Approver** and select the pages that each role can have access to.

By default, each role has access to different pages in the Design gallery and Process gallery. Users with **Editor** access can make changes to a flow. Users with **Viewer** access can view, but not edit a flow. Users with **Approver** access can edit and approve a flow **Approver** is listed if you have selected **Add ability to submit flow for approval** on the Definition Properties page. If each role should have access to the same pages, select **Same as editor** for **Viewer** and **Approver**.

Select the **Hidden** check box next to each page to add it to the **Hidden pages** list for a flow. The flow user can move the page from the **Hidden pages** list to the **Shown pages** list.

Click ✚ to select pages to add to the Design gallery or the Process gallery.

The following pages are required for following roles:

Editor role

- Properties
- Diagram
- Approval, if **Add ability to submit flow for approval** is selected on the Properties page of the definition.
- Standard Reply

Viewer role

Properties

Approver role

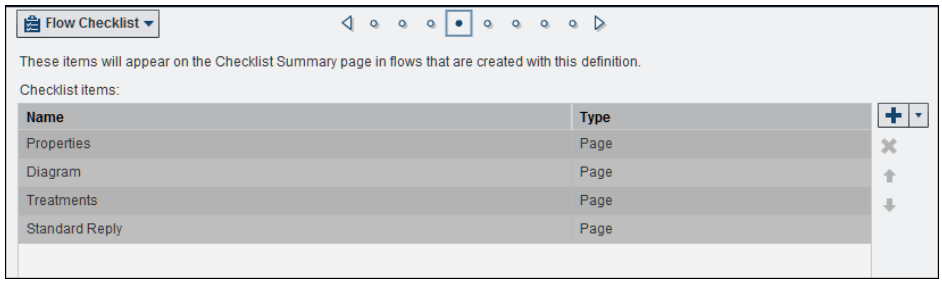
- Properties
- Approval

Note: Any changes that you make to page selections apply only to flows that are created in the future. Flows that currently use this flow definition are not affected.

Add Checklist Items

The Flow Checklist page displays the pages and custom steps that are in the checklist.

Display 7.26 *Flow Checklist Page*



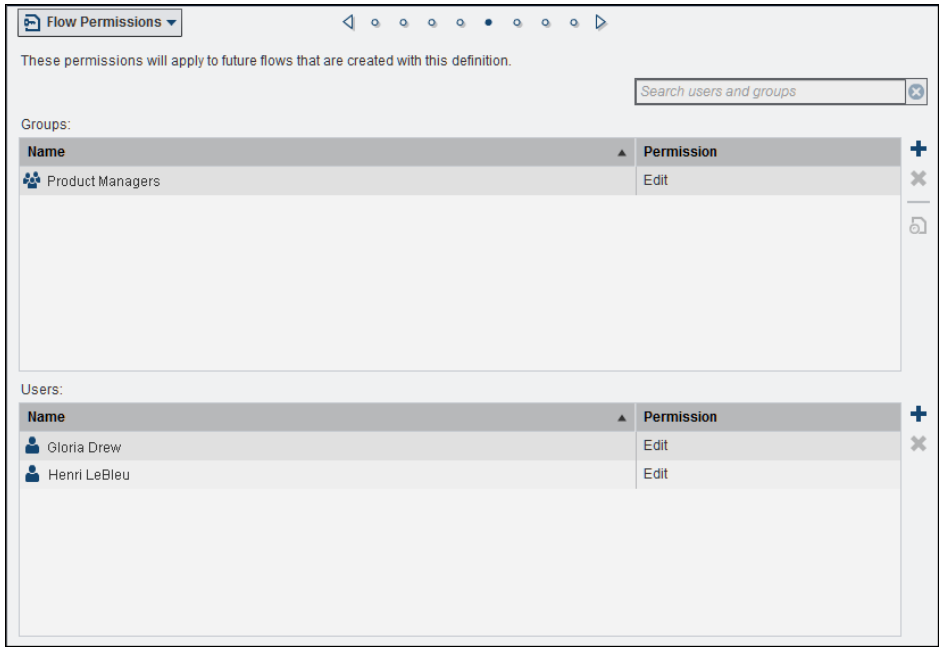
Click ✚ and select **Add page step** to add an existing page to the checklist.

Select **Add custom step** to add a custom step. Edit the name of the custom step to be more descriptive.

Set Access Permissions for the Flow

The Flow Permissions page displays the names of users and groups who automatically have access to the flows that are created with this definition. You can set three types of permissions on this page: **Edit**, **View**, and **Approve**.

Display 7.27 *Flow Permissions*



If no users or groups are added to this page, the creator of a flow automatically has Edit permission.

If you have selected **Add ability to submit flow for approval** on the Definition Properties page, at least one user or group must have Approve permission. Both groups and users can have Approve permission. After a flow has been created, an existing approver can add or remove other approvers on the Permissions page in the flow.

To view the users in a group, select the group and click .

In order to edit user or group permissions, you must have Edit access. The owner automatically has Edit permission. The owner's permission cannot be edited. To grant View or Edit permission to a user or user group, click the **Permission** cell and select the permission. By default, all users and groups that you select have Edit permission.

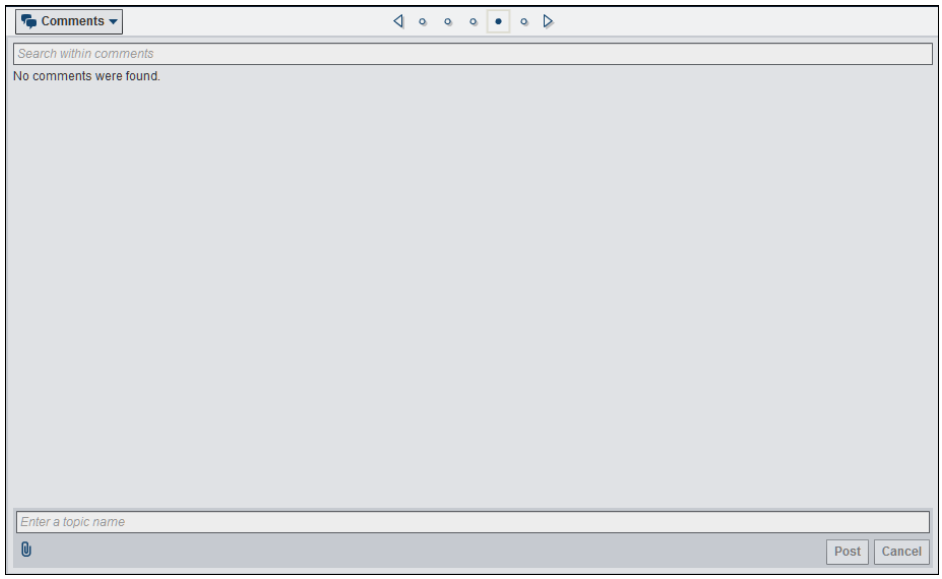
In general, the permission that you set for an individual user overrides the permission that is set for a group that the user is a member of. For more information about the relationship of permissions between users and groups, see *SAS Intelligence Platform: Security Administration Guide* at `SAS Intelligence Platform`.

To add a user to the list, click ✚ and select a user. To add a group to the list, click ✚ and select a group.

Add Comments

On the Comments page, you view and add comments. You add comments after saving.

Display 7.28 *Comments*



Enter a topic name to add a new comment.

Display 7.29 *New Topic*

Enter the text of the new comment.

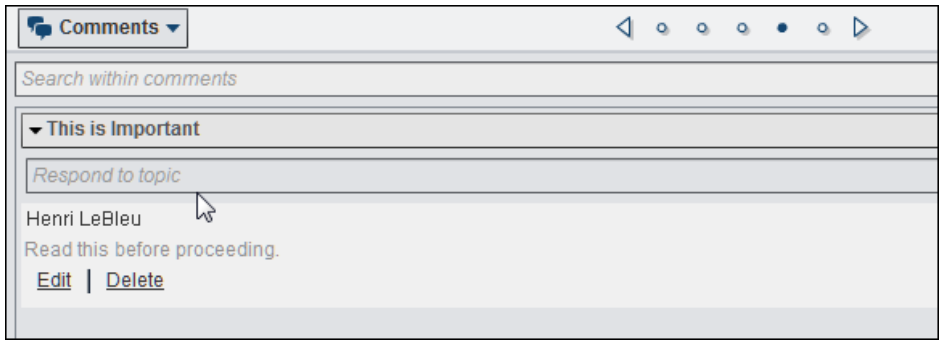
Display 7.30 *Comment Text*

Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

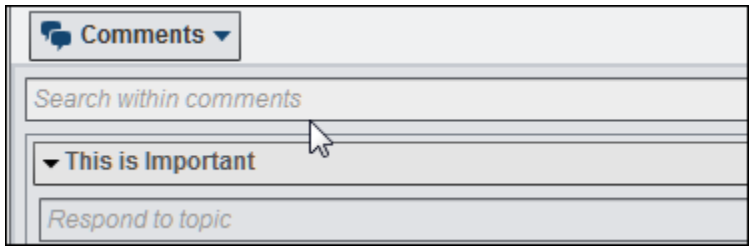
To reply to an existing comment, type text in the field below the comment title.

Display 7.31 *Comments List*



Type in the search field to find text in comments.

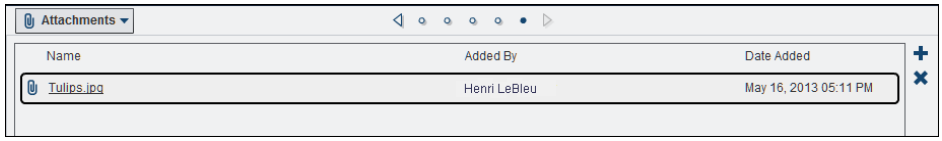
Display 7.32 *Search Comments*



Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.33 *Attachments*



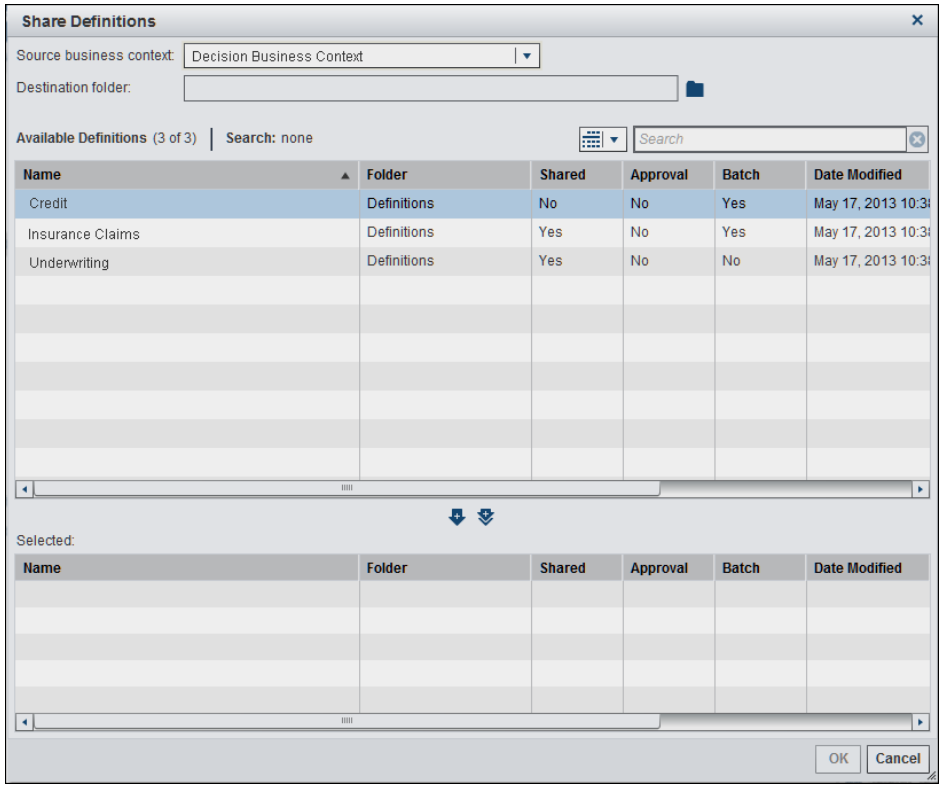
Click to select a file to attach.

Share a Flow Definition across Business Contexts

A flow definition can be used in more than one business context. A shared definition is a reference to the initial definition. If you have the appropriate permissions, any changes that you make to the shared definition are saved to the initial definition.

To share a definition that was created in a different business context, click and select **Share decision flow definition**.

Display 7.34 *Share Definitions*

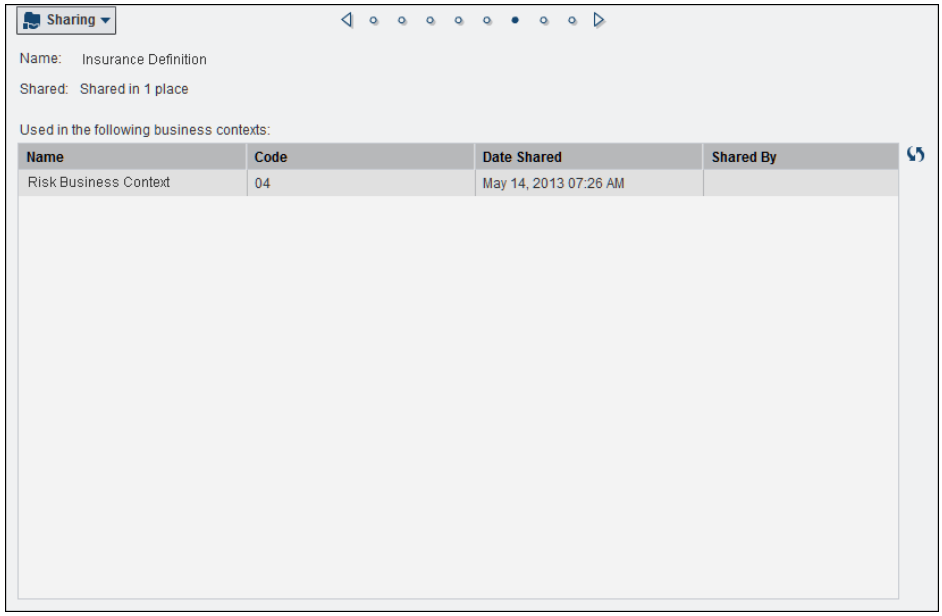


Select the **Source business context** that contains the flow definitions that you want to share. Click to select the storage location for the shared definition within the current business context. Select the definitions from the Available Definitions table and click the arrows to add them to the list of selected definitions.

If you delete a shared definition, it is deleted only from the current business context.

The Sharing page of the flow definition lists other business contexts that share the definition.

Display 7.35 *Sharing Page*



A number in a red badge indicates the business contexts that share this definition but that you do not have permission to view.

Events

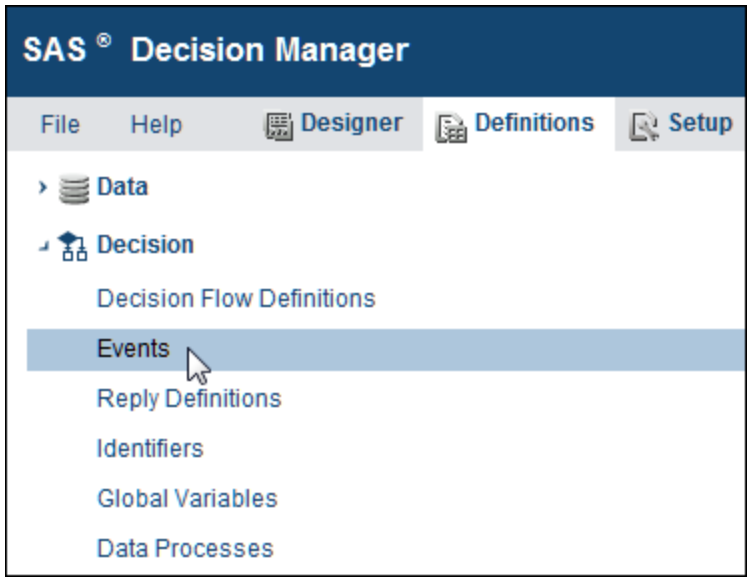
Overview of Events

An event represents an action that triggers the decision process.You define a web service event to determine the variables that begin a diagram flow. You then use a Start node in a diagram to select the event that you have defined.

Create an Event

To create an event, expand the Decision category in the Definitions workspace and select **Events**.

Display 7.36 *Event Definitions*

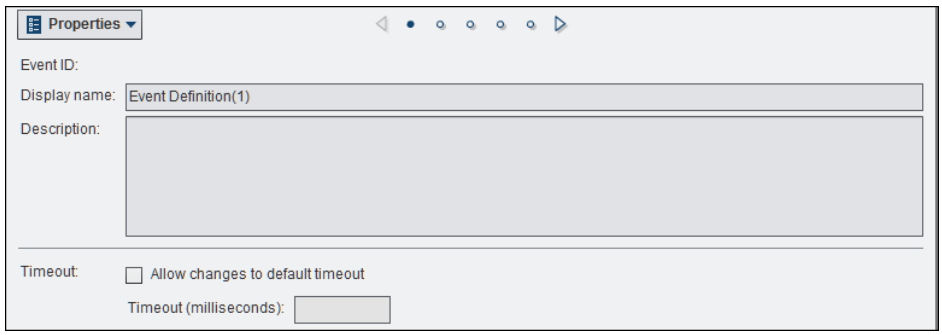


Click to define an event.

Specify Event Properties

The Properties page displays information about the event.

Display 7.37 *Event Properties*

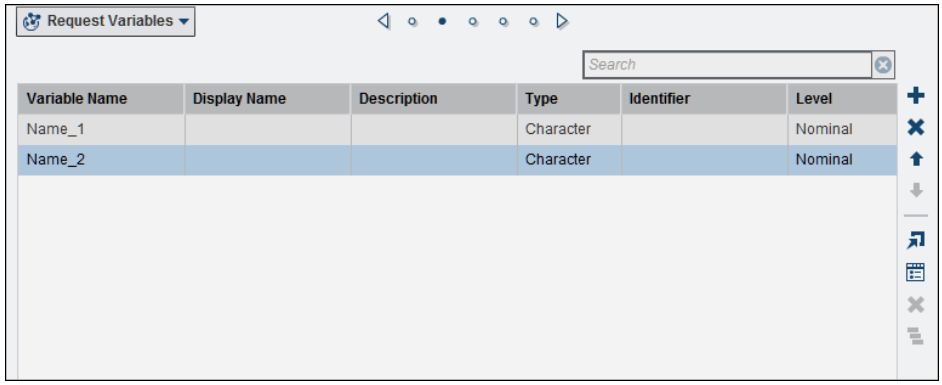


Select **Allow changes to default timeout** in the **Timeout** field to specify the number of milliseconds in the time-out interval for an event. The time-out interval is the amount of time that the event waits to receive input. Any changes that are made to the time-out interval are also reflected in the Decision Services Manager plug-in in SAS Management Console.

Supply Request Variables

On the Request Variables page, you supply request variables for the event. Request variables contain information that is received from an outside source.

Display 7.38 *Request Variables*



Click ✚ to add a variable to the Request Variables table.

To import variables from a SAS data set or supported database table, click and select the table that contains the request variables. The imported file must contain column names that match the column names, without blank spaces, in the Request Variables table. For example, in an English locale, the column names would be the following:

- Variable Name
- Display Name
- Description
- Type
- Identifier
- Level

Each column must contain valid values. A SAS data set table must contain six columns. Each SAS column should be character type. Extra columns are ignored.

The display name is displayed in the diagram nodes. The variable name can include letters, digits, and the following special characters: `.!$%()_-+=;,`

Click the **Type** cell to select a type.

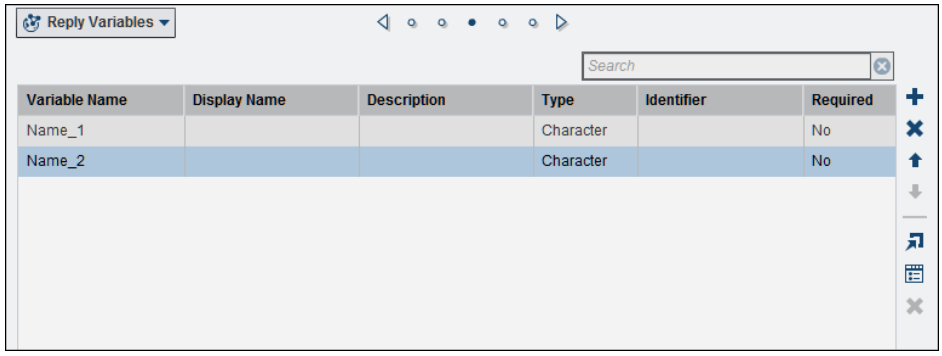
Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click ✖ to clear identifiers from the selected rows.

Click the **Level** cell to select a level. To set the same level for more than one variable, select the variables and click .

Supply Reply Variables

On the Reply Variables page, you supply reply variables for the event. Reply variables contain information that is returned from a flow to an outside source.

Display 7.39 *Reply Variables*



Click ✚ to add a variable to the Reply Variables table.

The display name is displayed in the diagram nodes. The variable name can include letters, digits, and the following special characters: `.!$%()_-+=;,`

Click the **Type** cell to select a type.

Click ↖ in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click ☰. Click ✖ to clear identifiers from the selected rows.

To force a reply for a reply variable, click the **Required** cell and select **Yes**. If a Start node in a diagram uses this event, all Reply nodes must provide a value, such as *Product ID*, for the reply variable.

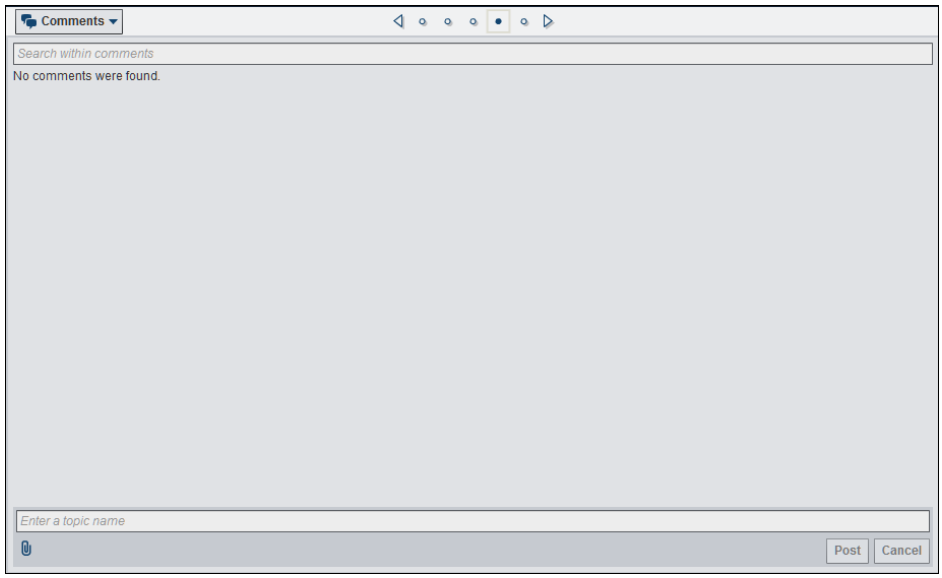
To import variables from a SAS data set or supported database table, click ↗ and select the table that contains the reply variables. The imported file must contain column names that match the column names, without blank spaces, in the Reply Variables table. For example, in an English locale, the column names would be the following:

- Variable Name
- Display Name
- Description
- Type
- Identifier
- Required

Adding Comments

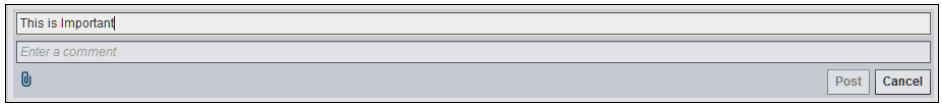
On the Comments page, you view and add comments. You add comments after saving.

Display 7.40 *Comments*



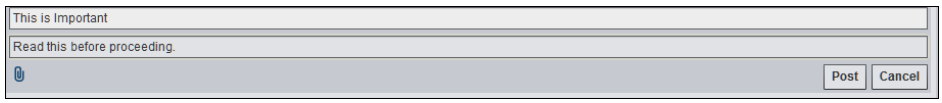
Enter a topic name to add a new comment.

Display 7.41 *New Topic*



Enter the text of the new comment.

Display 7.42 *Comment Text*

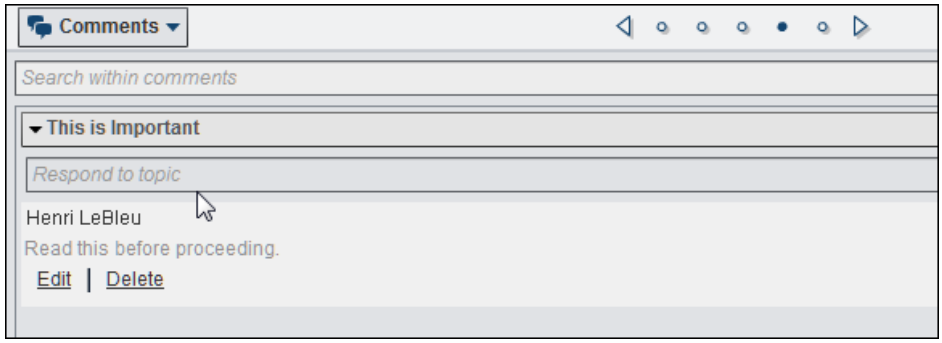


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.43 *Comments List*



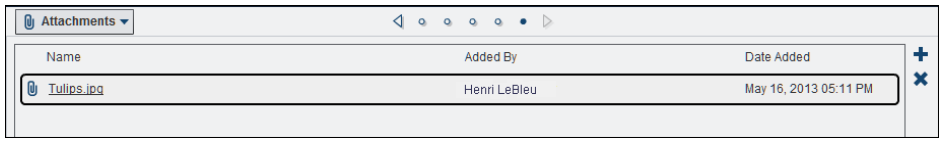
Type in the search field to find text in comments.

Display 7.44 *Search Comments*

Adding Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.45 *Attachments*



Click ✚ to select a file to attach.

Replies

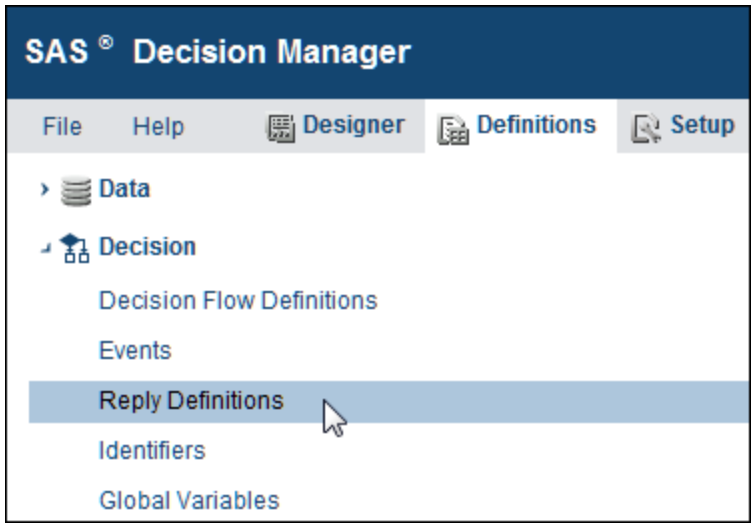
Overview of Defining Replies

A reply definition determines the channel, code, contact history options, responses, and custom details to be associated with an individual reply in a flow.

Create a Reply Definition

To create a reply definition, expand the Decision category in the Definitions workspace and select **Reply Definitions**.

Display 7.46 *Example: Sequence for Creating a Definition*

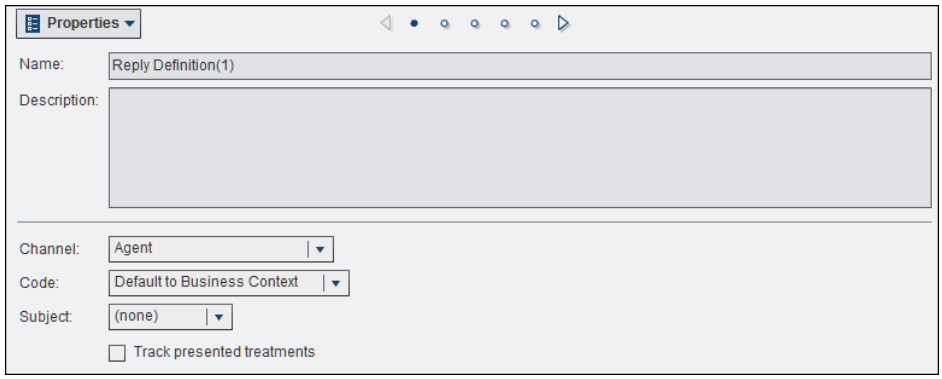


Click to create the definition.

Specify Reply Definition Properties

The Properties page displays information about the reply definition. You can edit the name when you save the reply definition.

Display 7.47 *Reply Definition Properties*



Select a communication medium from the **Channel** list. Replies that are based on this reply definition use this channel.

Select one of the following settings from the **Code** list.

Automatic - Editable
The reply code is automatically generated and can be edited. This setting overrides the setting for the business context.

Automatic - Not Editable
The reply code is automatically generated and cannot be edited. This setting overrides the setting for the business context.

Manual - Editable
The reply code is entered by the user and can be edited. This setting overrides the setting for the business context.

Default to Business Context
The reply code defaults to the setting for the current business context. Valid characters for code are alphanumeric characters, numerals, underscores, and periods.

Select a subject. The list of subjects is based on the underlying information map. Select **(none)** as the subject if you do not want to track contact history.

The Reply node remains in a **Not ready** state until all required values have been supplied.

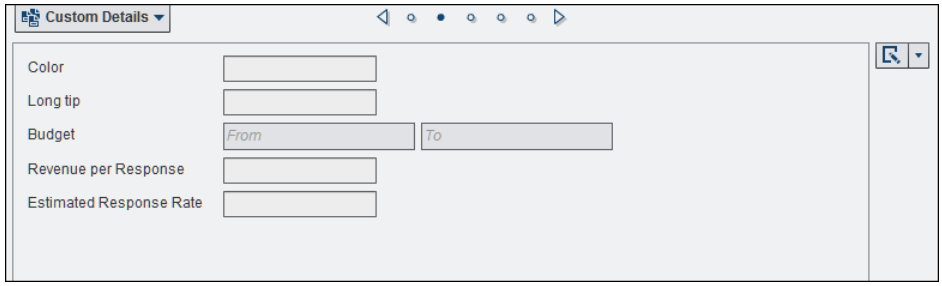
Select **Track presented treatments** to confirm the treatments that were presented to the customer. For example, a call center system contacts SAS Real-Time Decision Manager to get a list of potential offers for a customer. The call center operator indicates which offers were actually made to the customer. The call center system then contacts SAS Real-Time Decision Manager and confirms the offers that were made. This information is recorded in the presented treatment history in the common data model. For more information, see *SAS Marketing Automation and SAS Real-Time Decision Manager Administrator's Guide*. When this option is selected, the value of the TRACK_PRESENTED_TREATMENTS_FLG column in the CI_CELL_PACKAGE table is set to **Y** in the common data model.

Add Custom Details

Overview of Adding Custom Details

On the Custom Details page, you add user-defined fields.

Display 7.48 *Custom Details Page*

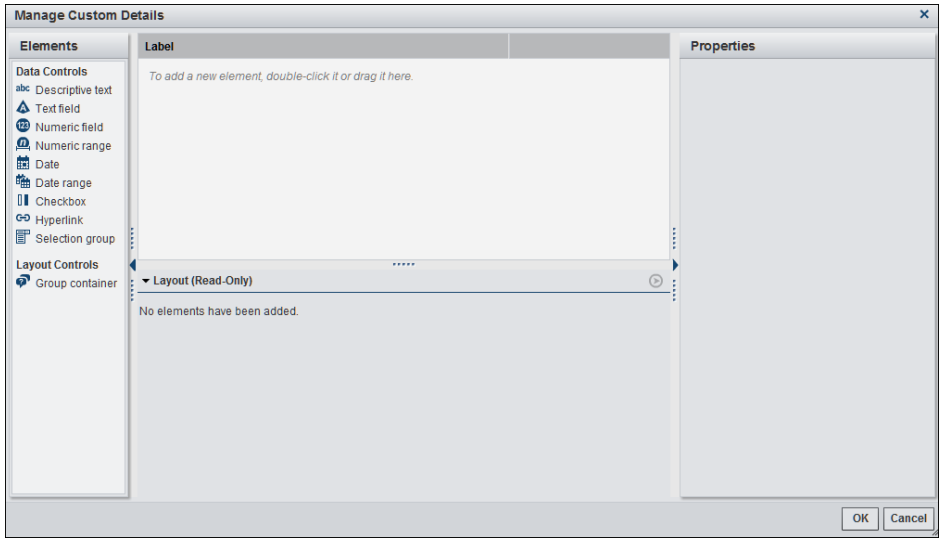


To add a custom detail, click  .

Manage Custom Details

In the Manage Custom Details window, you supply information about the custom details.

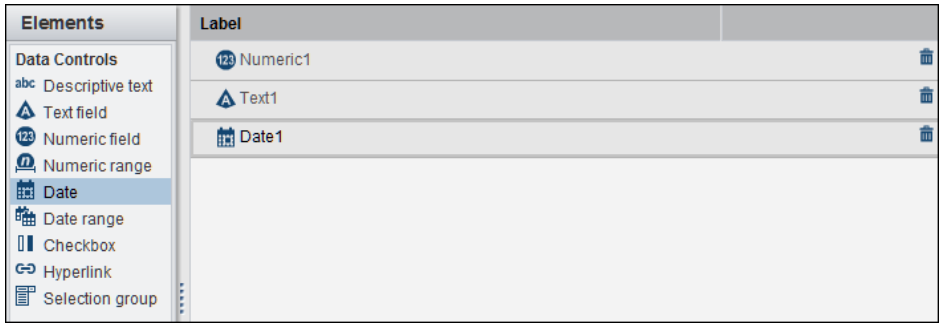
Display 7.49 *Manage Custom Details*



Select an Element

To select the type of custom detail, double-click it or drag an element from the **Elements** pane to the **Label** pane.

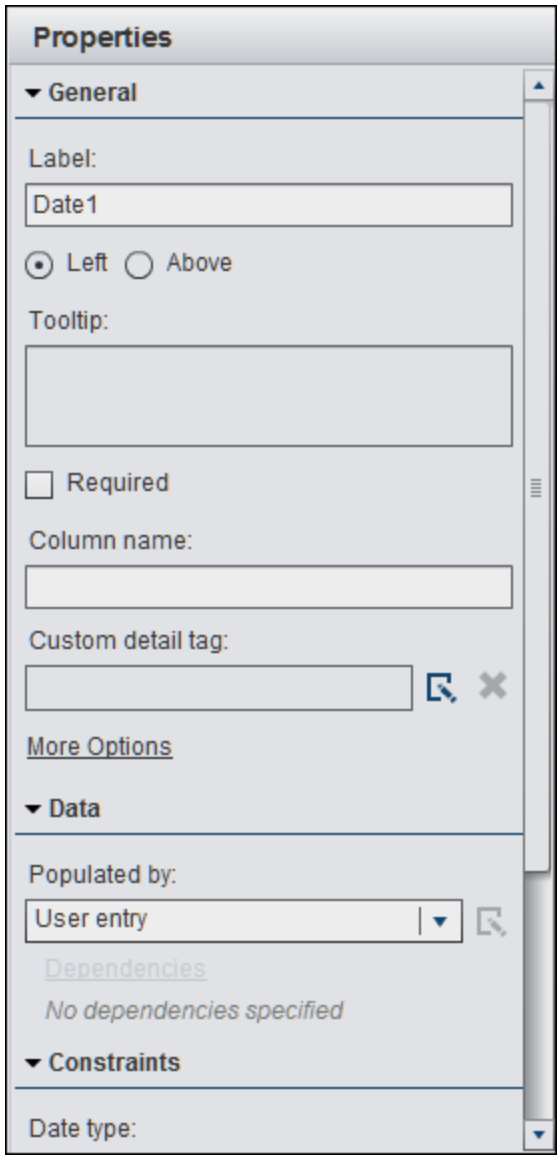
Display 7.50 *Select Element*



Specify Properties

In the **Properties** pane, specify the details for the selected element. The details vary, depending on the element and the software component. As you set the properties, you can review the results in the **Layout** pane.

Display 7.51 *Custom Detail Properties*



Specify General Properties

The following items are the possible properties in the General section. Click **More Options** to display more properties.

Label
is the name that is displayed with the field. Select **Left** or **Above** to set the location of the label in relation to the custom detail.

Note: The names of custom details that are passed to SAS Marketing Optimization must be no longer than 26 characters.

Description
is the description of the field.

Tooltip
is the text that is displayed when you rest the mouse pointer on the field.

Required
indicates that a value is required.

Dynamic
indicates that a value is dynamic. Dynamic custom details can be modified. Values that are not dynamic cannot be changed. This option is available only for treatments.

Column name
is the name of the column that is displayed in a published report.

Minimum column name
is the name of the column that displays the minimum value in a range.

Maximum column name
is the name of the column that displays the maximum value in a range.

Custom detail tag
is the custom detail tag that is associated with the custom detail. Click  to select a custom detail tag.

Minimum custom detail tag
is the custom detail tag that is associated with the minimum value in a range. Click  to select a custom detail tag.

Maximum custom detail tag
is the custom detail tag that is associated with the maximum value in a range. Click  to select a custom detail tag.

Width
is the width of a field.

Hint
is the text that is displayed beneath the field that indicates the value that should be entered.

In-field hint
is the text that is displayed in the field that indicates the value that should be entered.

Specify Data

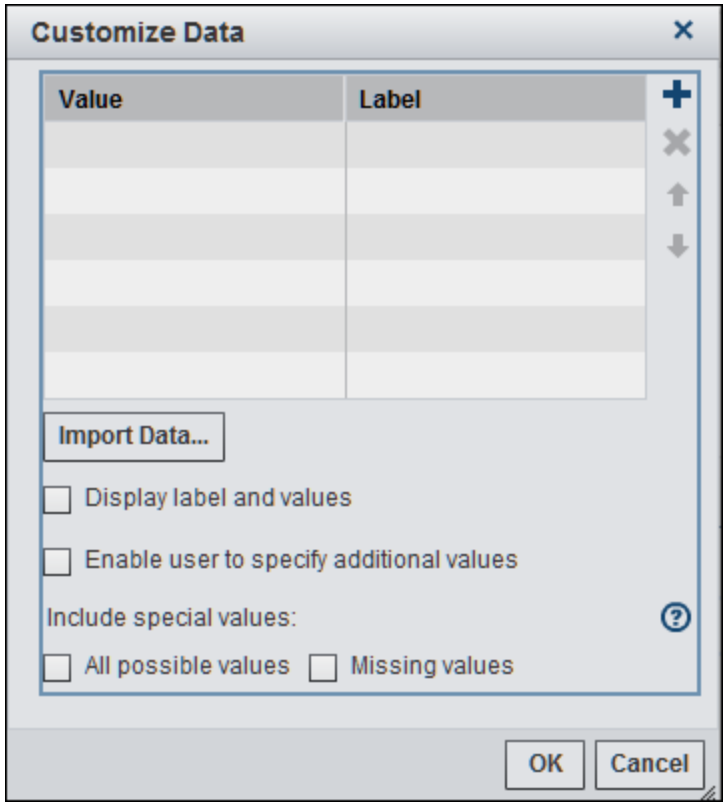
These are the possible properties in the Data section:

Number of values
sets the number of text values that can be entered. If you select **Multiple values**, select **Enable user to reorder values** to enable the user to change the order of the values.

Populated by
specifies the source of the values that are entered.

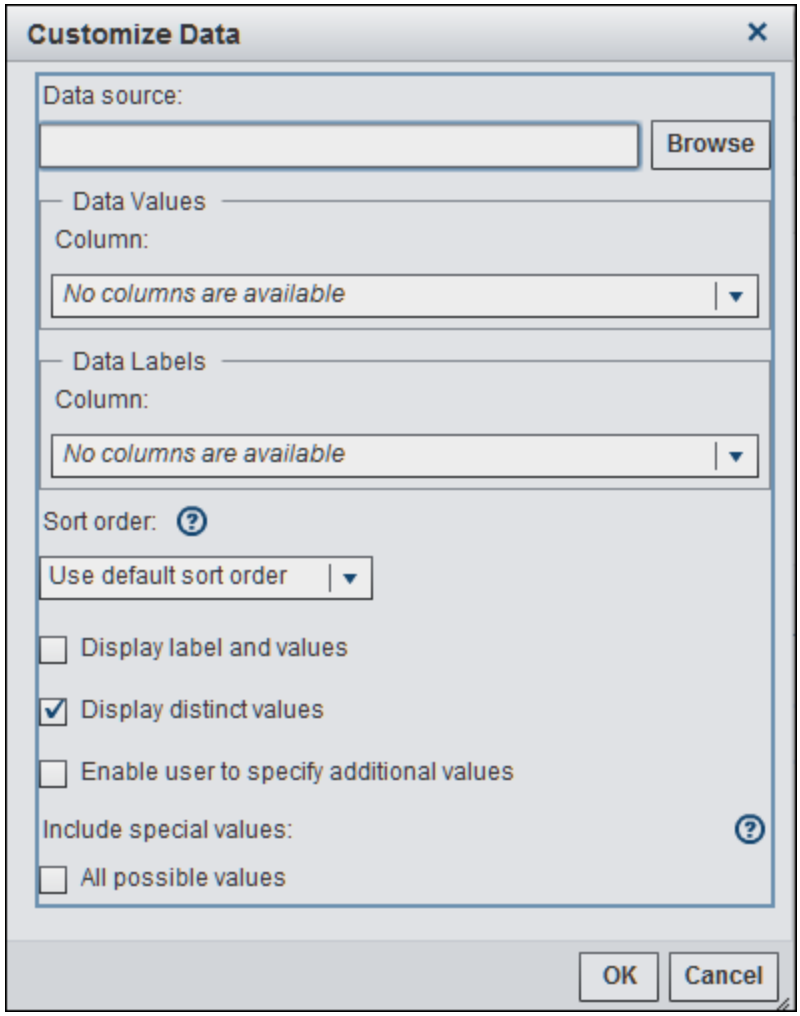
Select **User entry** to indicate that values are entered in by the user.

When you select **A predefined list**, the list does not change unless you add or remove values.



To display text other than the name of the list item, enter a value in the Label column. For example, if the list items are products, the Value could be the product number A12345 and the Label could be Child's Desk. When a predefined list is published to the common data model, the published value contains the concatenated display values. Click **Import Data** to import values from a SAS library. Click **Display label and values** to display the label and values with the list item. To enable the user to select values from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

When you select **A dynamic list**, you can include up to 5,000 items from an external list. The list displays the contents of the SAS Folders hierarchy in the **Folders** tab of SAS Management Console. Changes in this external list are reflected in the list of values that the user can select.



Click **Browse** to select a data source. Select a column in the Data Values and the Data Labels section to display those columns. Select a sort order. To display a value other than the text in the **Value** field, select **Display label and values** and **Display distinct values**. To enable a user to select more than one value from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

Specify Constraints

The following items are the possible properties in the Constraints section.

Allow only integer values
indicates that only integer values can be entered in a numeric or a numeric range custom detail.

Number of lines
specifies whether to display single or multiple lines. . If you select **Multiple lines**, specify the **Maximum line count** and **Number of lines displayed**.

Minimum length
sets the minimum number of characters that are allowed in the field.

Maximum length
sets the maximum number of characters that are allowed in the field.

Maximum line count
is the maximum number of text lines that can be entered in a field.

Number of lines displayed
is the number of text lines that are displayed in the field.

Date type
sets the unit to **Day**, **Week**, **Month**, **Quarter**, or **Year**.

Include relative dates
enables you to select a date that is relative to the current date (for example, **Next week**).

Minimum decimal places
sets the minimum number of decimal places that are allowed in the field.

Maximum decimal places
sets the maximum number of decimal places that are allowed in the field.

Minimum value allowed
is the minimum value for the field.

Maximum value allowed
is the maximum value for the field.

Combined field
is another text field that this field can be combined with.

Maximum combined length
is the combined length of two combined text fields.

Specify Appearance

The Appearance section offers a choice of displays for selection groups and group containers. A selection group can be displayed as a drop-down list or a set of radio buttons. A group container can be displayed as a labeled box, a collapsible section, or an unlabeled group.

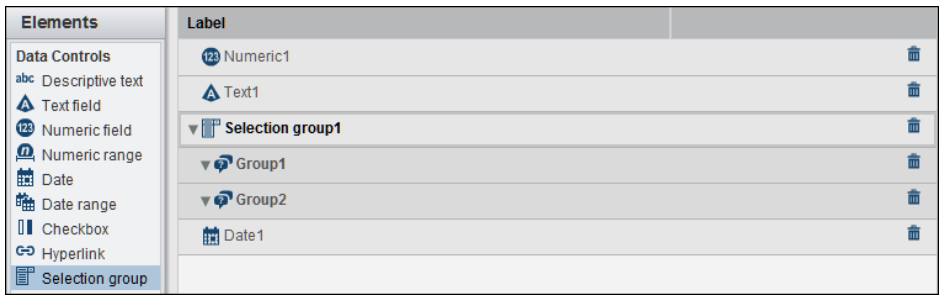
Specify Default Values

In the Default Values section, you specify a default value for a selection group. Click to specify which group is displayed first by default.

Organize Custom Details

A selection group is a collection of other groups that is displayed as a list or a series of radio buttons. Double-click **Selection group** to add it to the **Label** pane.

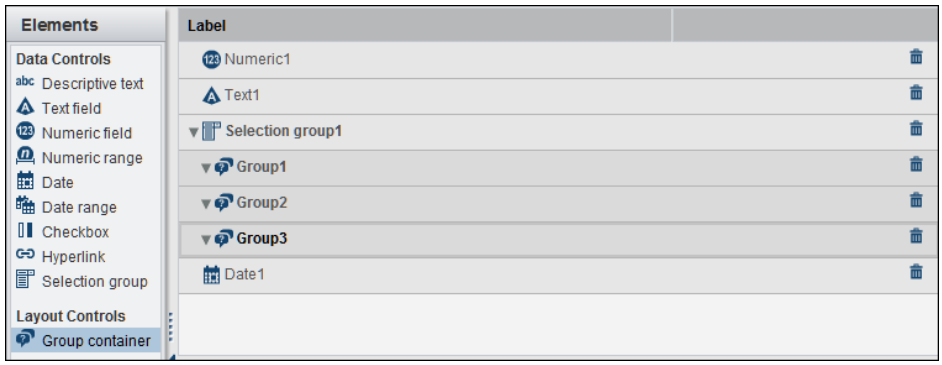
Display 7.52 *Selection Groups*



The selection group is prepopulated with groups that you can modify and add items to. Select items from the **Elements** pane and drag them to a group.

A group container collects custom details into a group. Double-click **Group container** to add it to the **Label** pane.

Display 7.53 *Group Container*

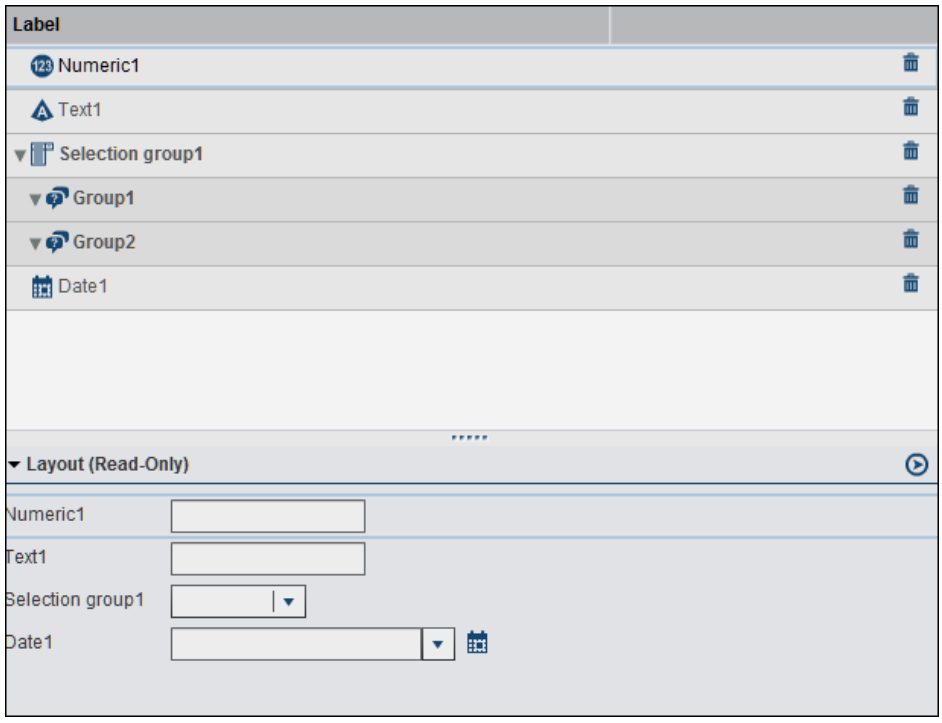


Select items from the **Elements** pane and drag them to a group.

Preview Custom Details

The Layout pane displays the custom details as they appear on the Custom Details page.

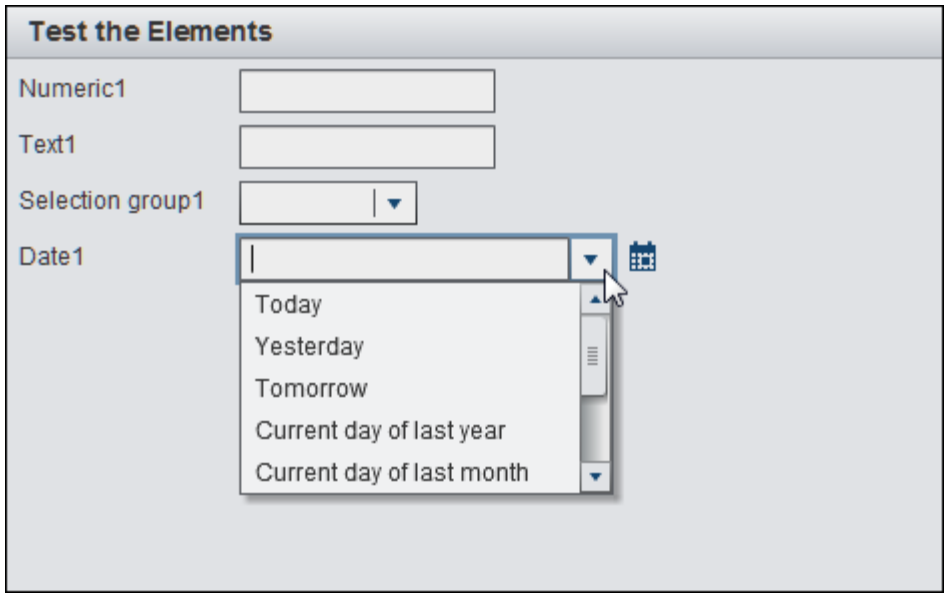
Display 7.54 *Layout*



A red asterisk (*) indicates that a field is required.

Click ▶ to open a Test the Elements window where you can test the custom details by interacting with them.

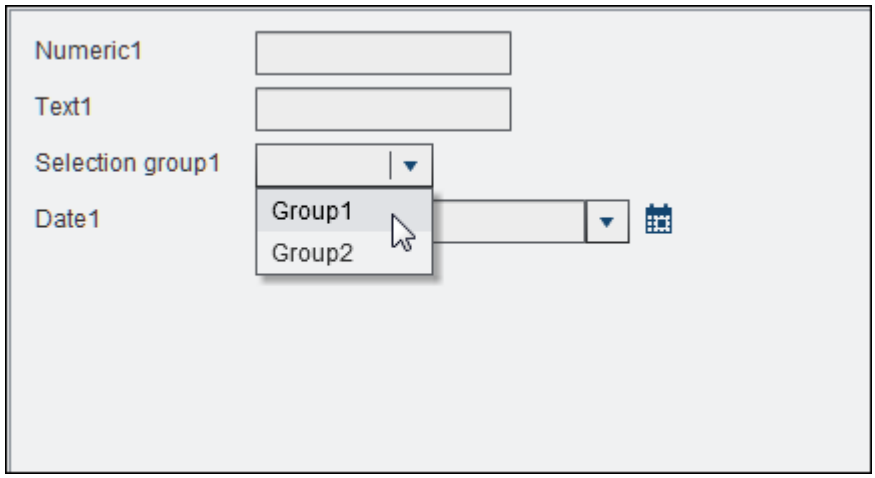
Display 7.55 *Test the Elements*



Set Default Values

On the Custom Details page, you specify default values for the custom details that you have created.

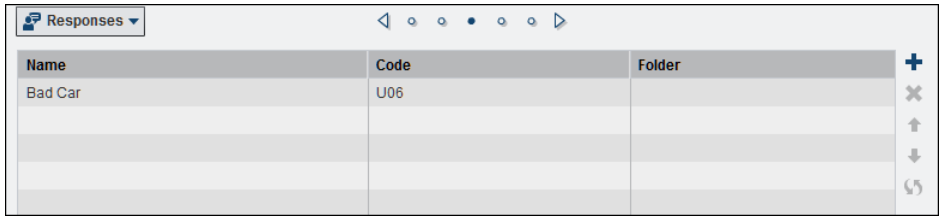
Display 7.56 *Default Values*



List Responses

The Responses page lists response definitions.

Display 7.57 *Responses*



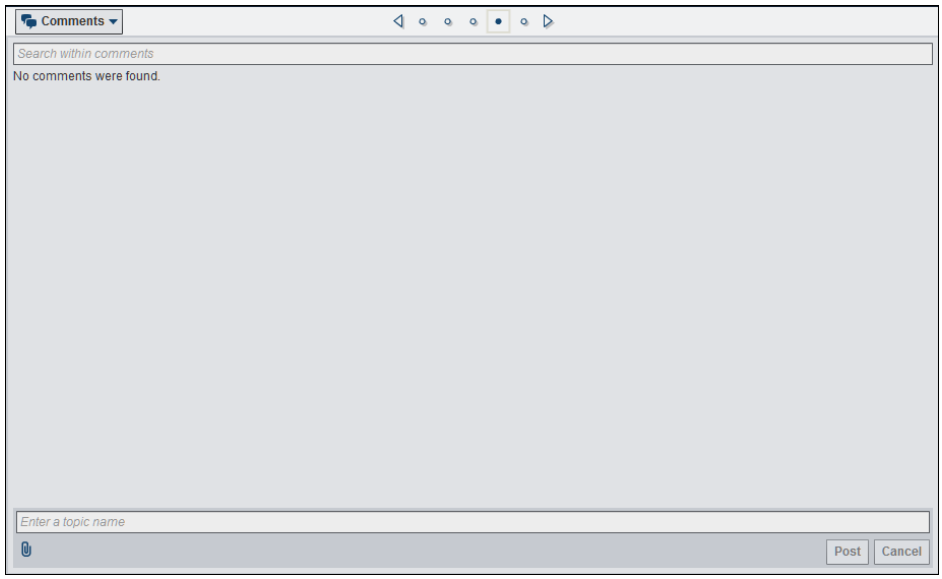
Click ✚ to select a response to add to the list.

For more information, see "Responses" on page 148.

Add Comments

On the Comments page, you view and add comments. You add comments after saving.

Display 7.58 *Comments*

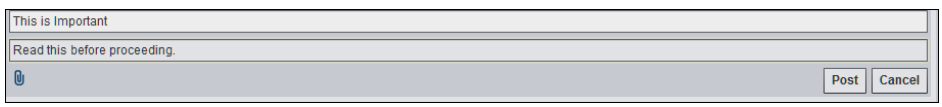


Enter a topic name to add a new comment.

Display 7.59 *New Topic*

Enter the text of the new comment.

Display 7.60 *Comment Text*

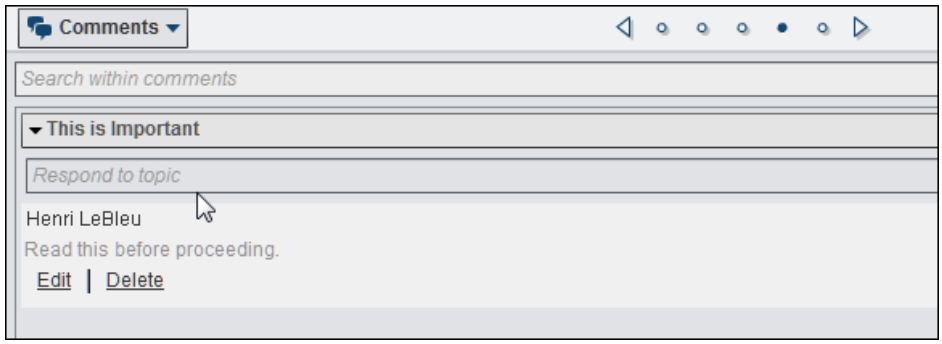


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

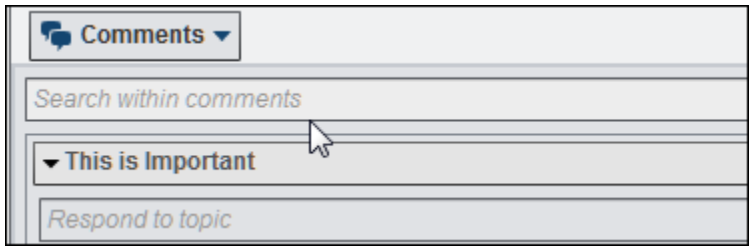
To reply to an existing comment, type text in the field below the comment title.

Display 7.61 *Comments List*



Type in the search field to find text in comments.

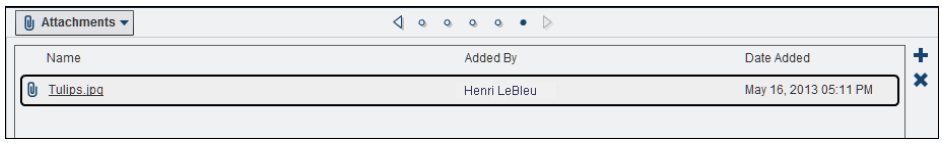
Display 7.62 *Search Comments*



Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.63 *Attachments*



Click to select a file to attach.

Identifiers

Overview of Identifiers

An identifier is a reference to a variable. You can use identifiers to create flows more efficiently.

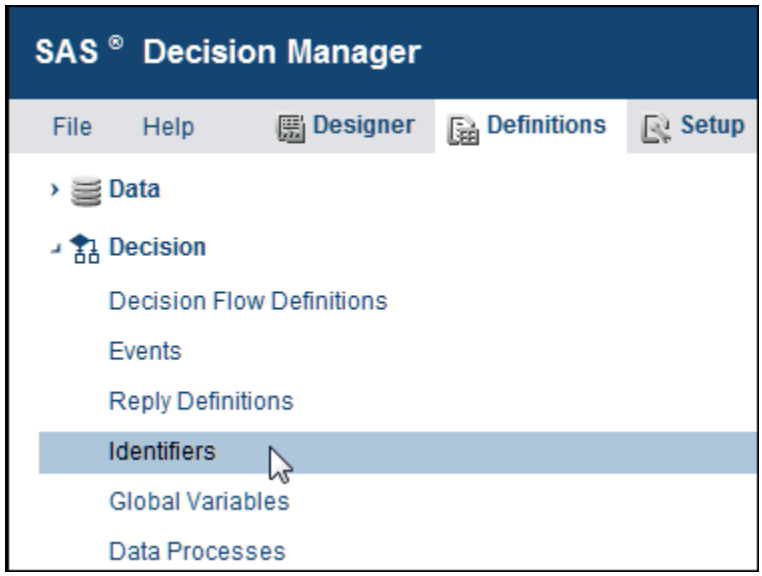
For example, an administrator can create a reply variable and assigned to it the identifier **replyID**. You can use **replyID** as an identifier in the Reply node, so that you can retrieve the reply variable value without having to know which node retrieved it.

You can also use identifiers as an alternative to adding a Process node. For example, suppose your administrator created an event variable with a **variableID** identifier. You have a data process that reads information from a database, and it reads one input variable, which is also assigned the **variableID** identifier. You can now use any output variable of that data process without having to add a Process node.

Create an Identifier

To create an identifier, expand the Decision category in the Definitions workspace and select **Identifiers**.

Display 7.64 *Create Identifier*

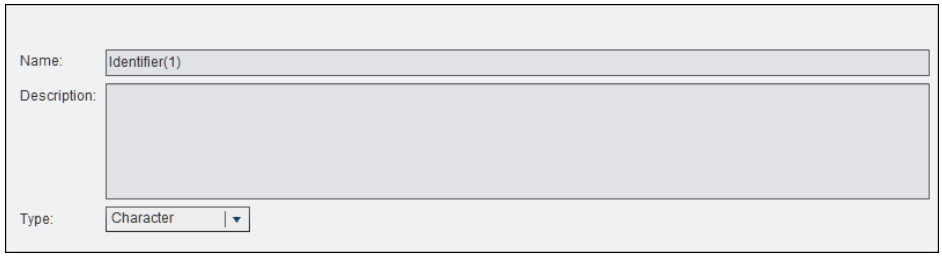


Click to create the identifier.

Specify Identifier Properties

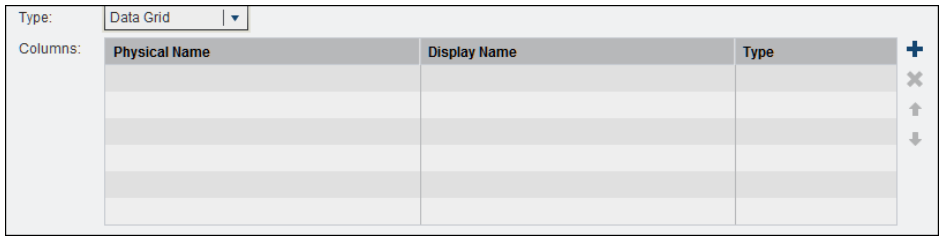
The Properties page displays information about the identifier.

Display 7.65 *Identifier Properties*



Select the type of identifier from the **Type** list. For more information, see "Data Types" on page 272. If you select **Data Grid**, you can add and remove columns, change column order, specify the physical and display name, and select a type.

Display 7.66 *Data Grid*



Note: Physical column names in double-byte character sets are not supported.

Global Variables

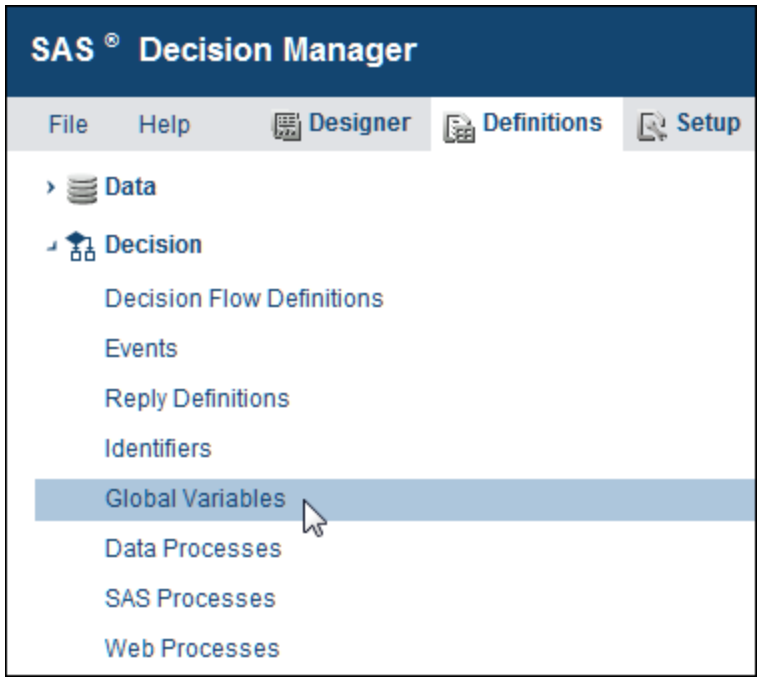
Overview of Global Variables

Global variables are variables that can be accessed by multiple flows. Global variables belong to a particular business context. A global variable that is created in one business context is not available to users of another business context.

Create a Global Variable

To create a global variable, expand the Decision category in the Definitions workspace and select **Global Variables**.

Display 7.67 *Create Global Variable*

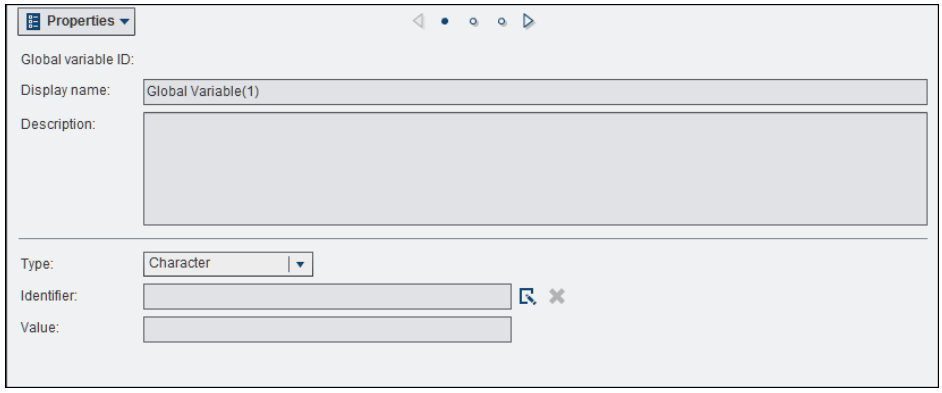


Click to create the variable.

Specify Global Variable Properties

The Properties page displays information about the global variable.

Display 7.68 *Global Variable Properties*



Select a type from the **Type** list. For more information, see "Data Types" on page 272.

To select an identifier for the global variable, click and select an identifier. You cannot select an identifier that has already been assigned to a global variable. For more information, see "Identifiers" on page 97.

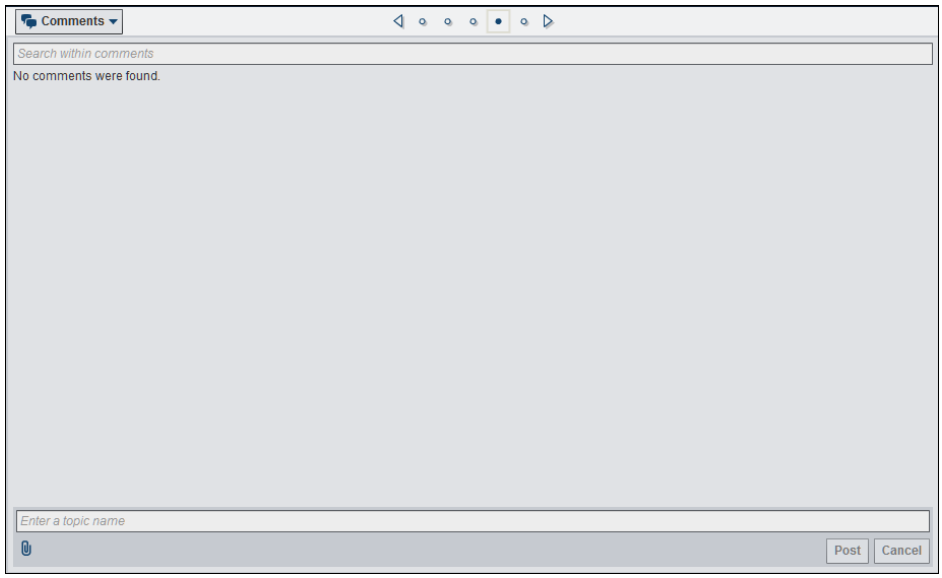
To remove the assignment of an identifier, click .

The contents of the **Value** field are determined by the type. Select or provide a value.

Add Comments

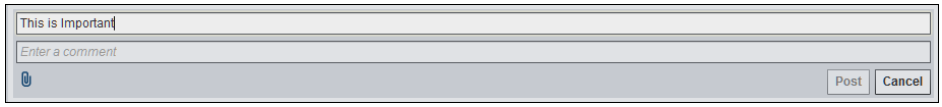
On the Comments page, you view and add comments. You add comments after saving.

Display 7.69 *Comments*



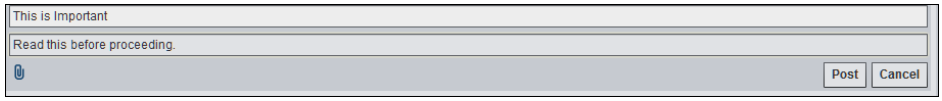
Enter a topic name to add a new comment.

Display 7.70 *New Topic*



Enter the text of the new comment.

Display 7.71 *Comment Text*

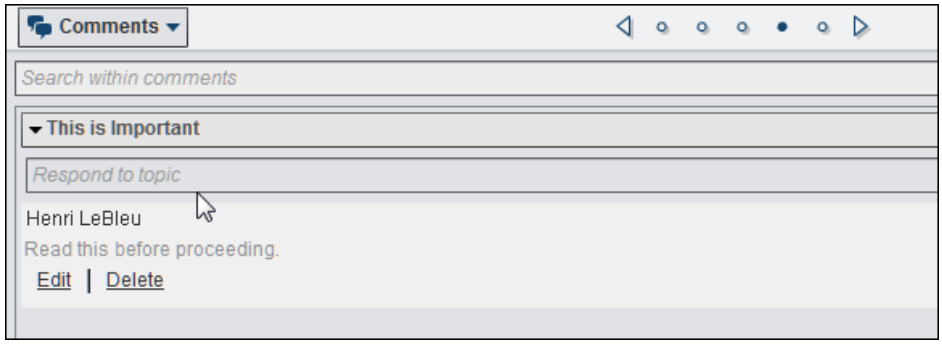


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

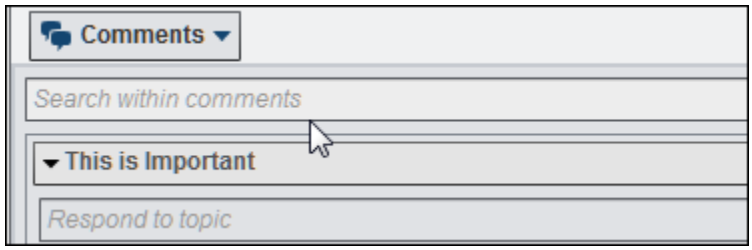
To reply to an existing comment, type text in the field below the comment title.

Display 7.72 *Comments List*



Type in the search field to find text in comments.

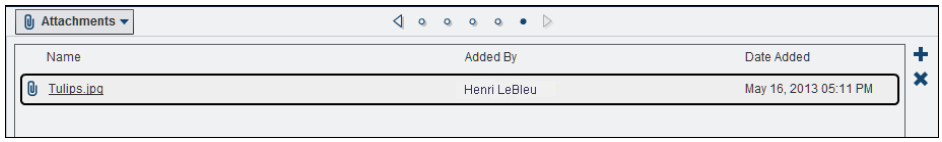
Display 7.73 *Search Comments*



Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.74 *Attachments*



Click ✚ to select a file to attach.

Data Processes

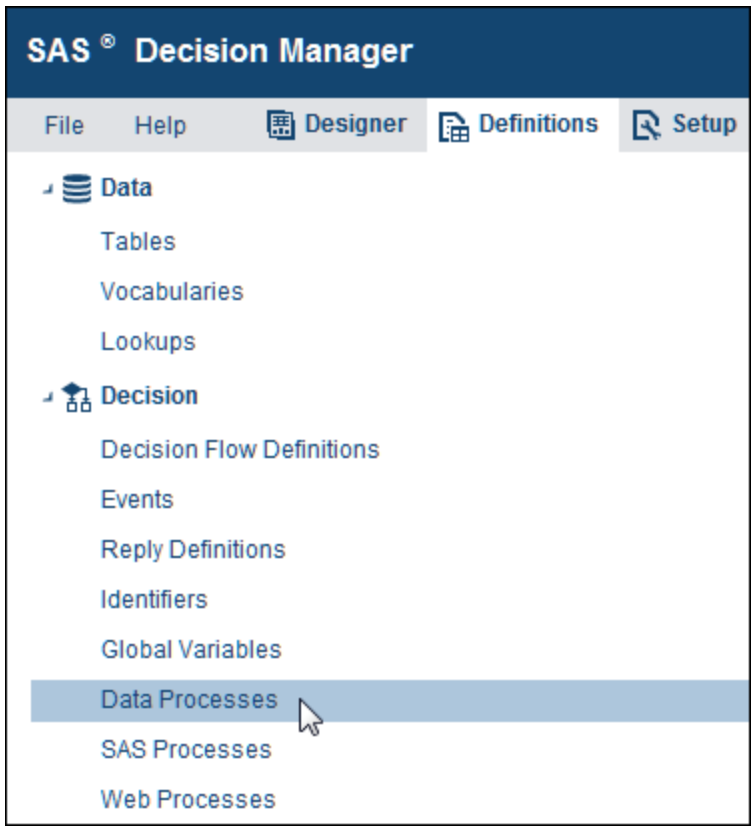
Overview of Data Processes

You define processes to use in flows. Instead of using implicit processes, you can add Process nodes to call processes explicitly. Data processes read and write tables in Oracle, DB2, Teradata, SQL Server, and SAS data sets.

Create a Data Process

To add a data process, expand the Decision category in the Definitions workspace and select **Data Processes**.

Display 7.75 *Data Processes*

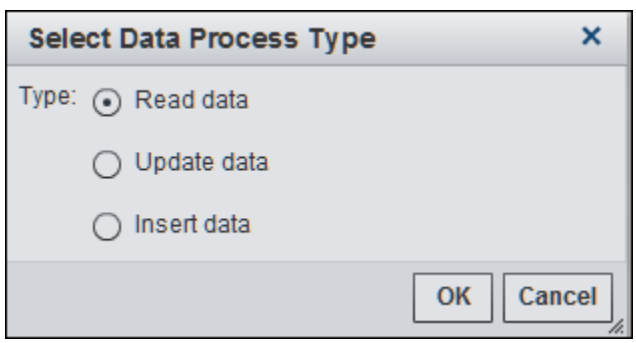


Click to create the data process.

Select Data Process Type

When you create a data process, you select the data process type.

Display 7.76 *Select Data Process Type*



Read data
returns a subset of the data from the table, based on the specified criteria and specified output columns. By default, all of the input variables in a Process node are required if the **Read data** type is selected.

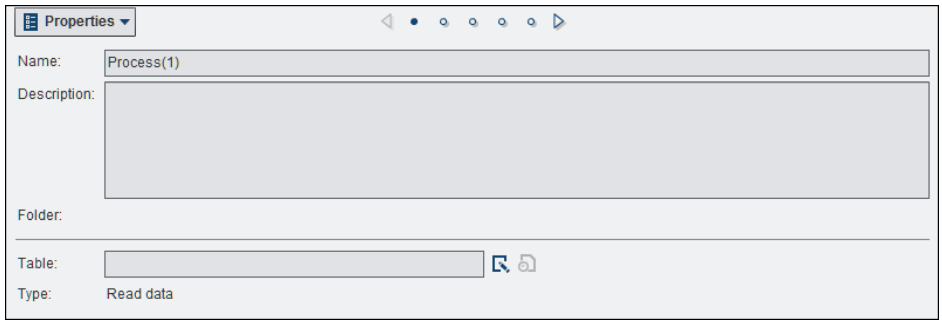
Update data
updates the data in a table. If a Process node uses the **Update data** type, the criteria and update variables are both displayed as input variables for the Process node. Criteria variables have a value in the Required column of the **Input variables** table.

Insert data
inserts rows into a table.

Specify Data Process Properties

The Data Process Properties page displays information about the data process.

Display 7.77 *Data Process Properties Page, Read Data Type*



Click  to select a table.

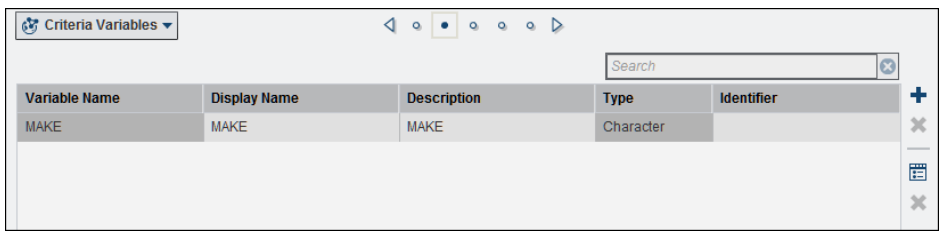
After you have selected a table, click **View table** to view the contents.

The following pages depend on the type of data process that you select. For the **Read data** type, see "Add Criteria Variables" on page 103 and "Retrieve Variables" on page 104. For the **Update data** type, see "Add Criteria Variables" on page 103 and "Update Variables" on page 105. For the **Insert data** type, see "Insert Variables" on page 105.

Add Criteria Variables

If you have selected the **Read data** or **Update data** type, you use the Criteria Variables page to restrict the data that is retrieved from the table. For example, you could select a primary key, such as CLIENTID, to retrieve customer or account information.

Display 7.78 *Criteria Variables Page*



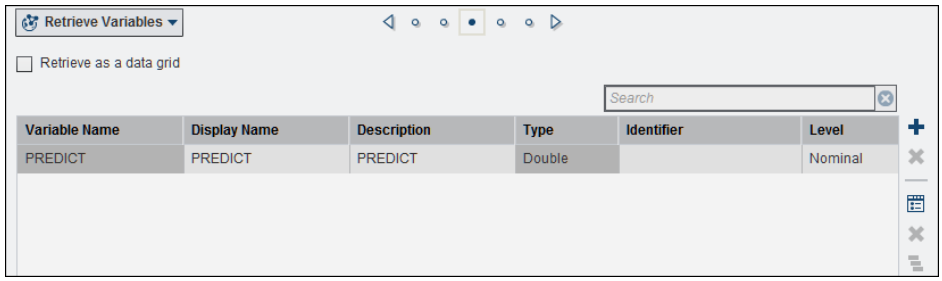
Click  to add a variable to the table.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Retrieve Variables

If you have selected the **Read data** type, you select the columns to display for each row. Returned variables are available for use in other parts of the flow. These variables can be assigned identifiers, such as age, in a Branch or a Filter node without having to add a Process node.

Display 7.79 *Retrieve Variables Page*



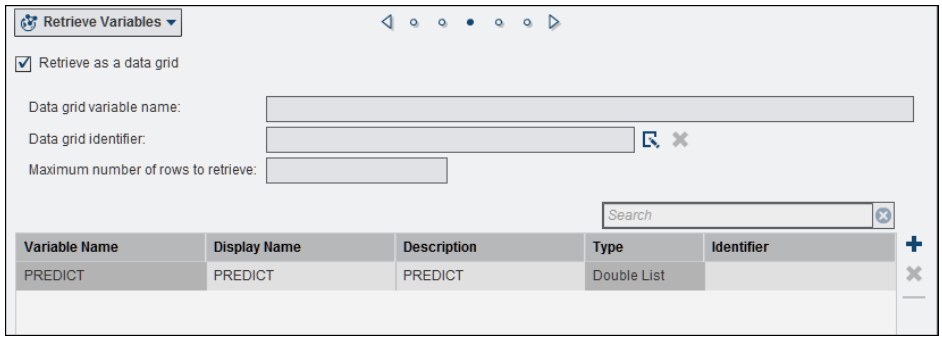
Click to add a variable to the table.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Select multiple rows and click to set the levels for more than one row.

Select **Retrieve as a data grid** to use a Process node to retrieve more than one row of data from a table.

Display 7.80 *Retrieve as a Data Grid*



Enter the name of the data grid variable to be returned from the data process. Click to select a data grid identifier to assign to the output data grid. Specify the maximum number of rows to retrieve from the data grid. The maximum amount of data that can be returned in a data grid is 32 kilobytes. The Retrieve Variables table defines the columns of the input table that will be in the output data grid. The data process returns a data grid variable that has the columns that are specified in the table.

In addition to returning the data grid variable, the values in each column are returned in a separate array variable (for example, in a character list variable). The name of the

column array variables corresponds to the variables that are defined in the Retrieve Variables table. The data grid variable or the table variables can be used downstream from the Process node. When the data process returns a data grid, the output data grid variable is not displayed in the output variable table in the Process node. Only the column array variables are displayed.

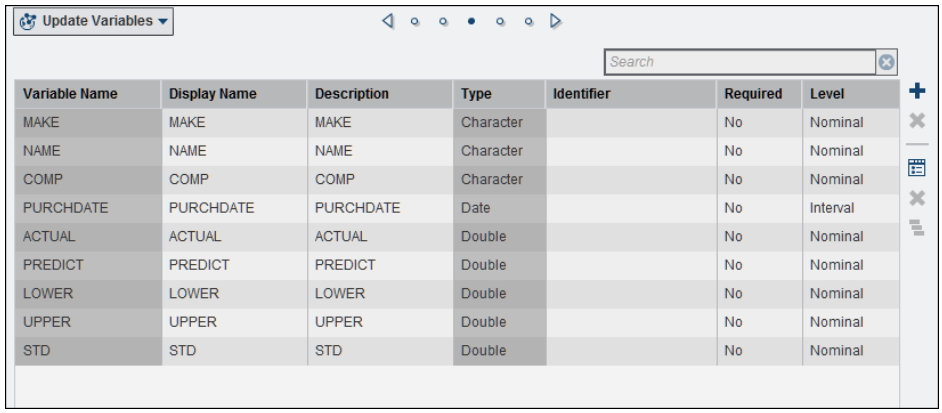
If you have selected a data grid identifier, click in the Identifier cell to assign an identifier to each variable in the Retrieve Variables table. Only data grid identifier columns whose type matches the table variables can be assigned. The data grid identifier or the table variable identifiers can then be used downstream from the Process node.

When a data process that returns a data grid is used in a Process node, you can use wildcards when you assign values to criteria variables. For example, if there is a criteria variable value for the COUNTRY column, you can enter **`United*`**, which returns rows where the country is **`United States`**, **`United Kingdom`**, or **`United Arab Emirates`**.

Update Variables

If you have selected the **Update data** type, you select the columns to update for each row.

Display 7.81 *Update Variables Page*



Click to add a variable to the table.

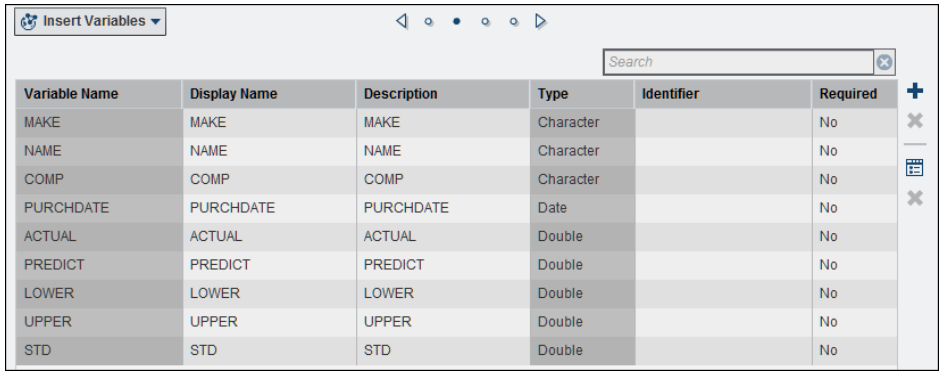
Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Select multiple rows and click to set the levels for more than one row.

Insert Variables

If you have selected the **Insert data** type, you select the columns to insert into the table.

Display 7.82 *Insert Variables Page*



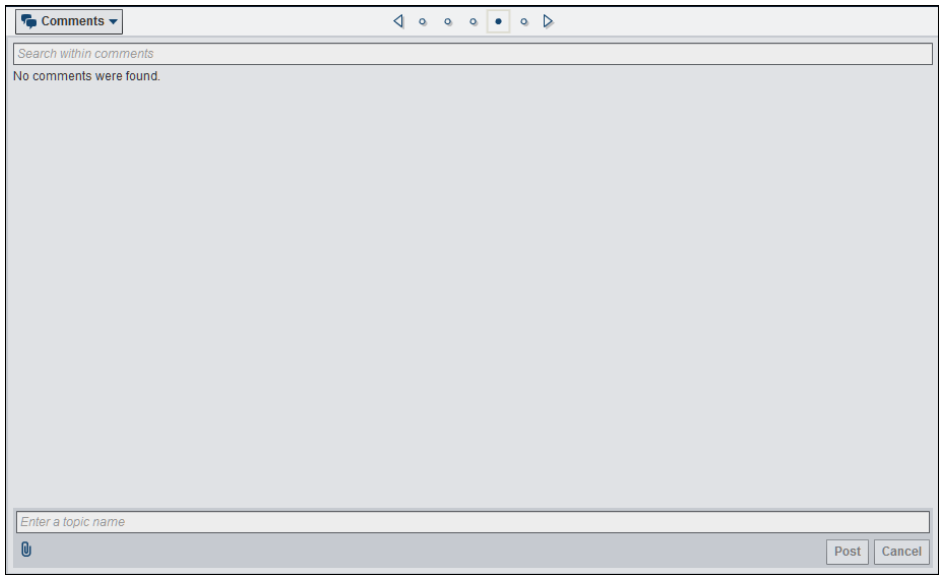
Click ✚ to add a variable to the table.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click ✖ to clear identifiers from the selected rows.

Add Comments

On the Comments page, you view and add comments. You add comments after saving.

Display 7.83 *Comments*



Enter a topic name to add a new comment.

Display 7.84 *New Topic*

Enter the text of the new comment.

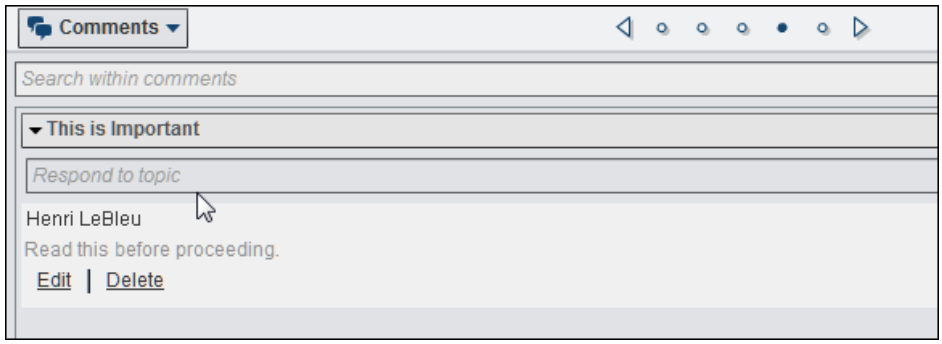
Display 7.85 *Comment Text*

Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.86 *Comments List*



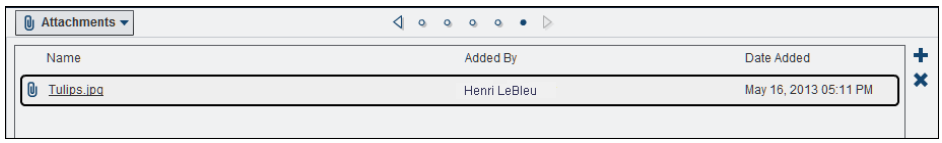
Type in the search field to find text in comments.

Display 7.87 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.88 *Attachments*



Click to select a file to attach.

SAS Processes

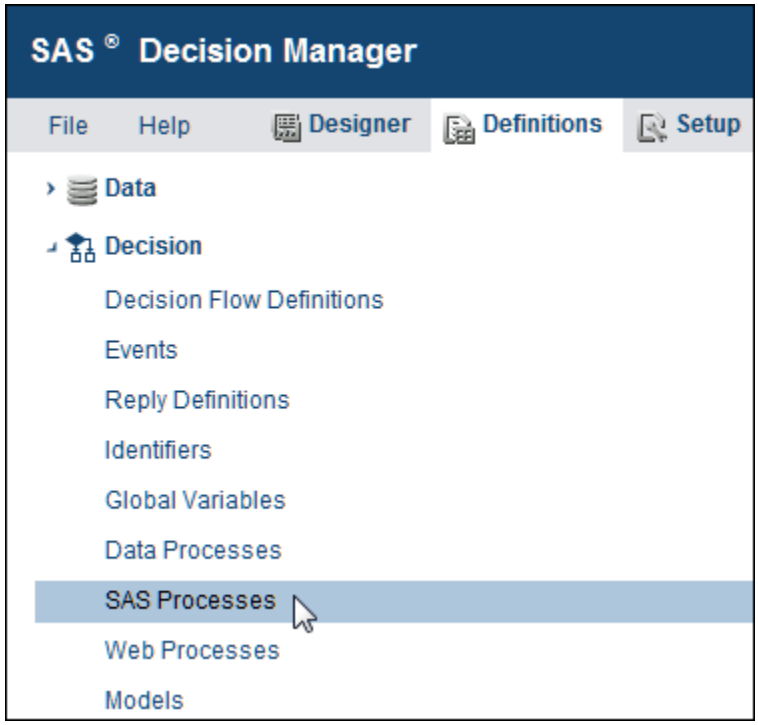
Overview of SAS Processes

You define SAS processes to use in flows. Instead of using implicit processes, you can add Process nodes to call processes explicitly.

Create a SAS Process

To create a SAS process, expand the Decision category in the Definitions workspace and select **SAS Processes**.

Display 7.89 *SAS Processes*

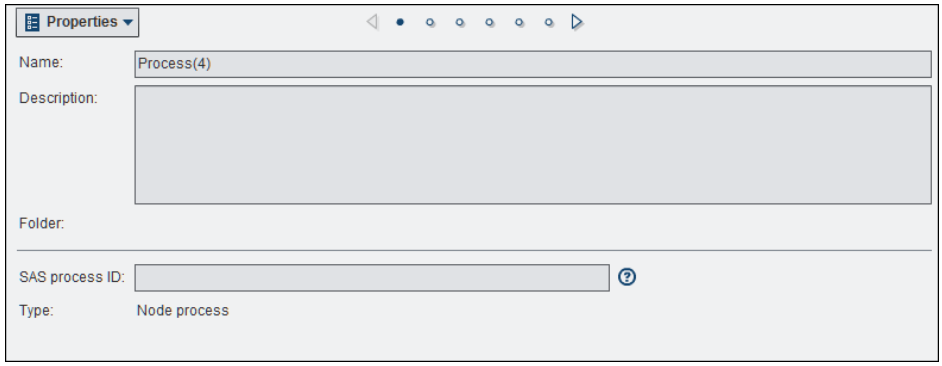


Click to create the SAS process.

Specify SAS Process Properties

The Properties page displays information about the SAS process.

Display 7.90 *Properties Page, Node Process Type*

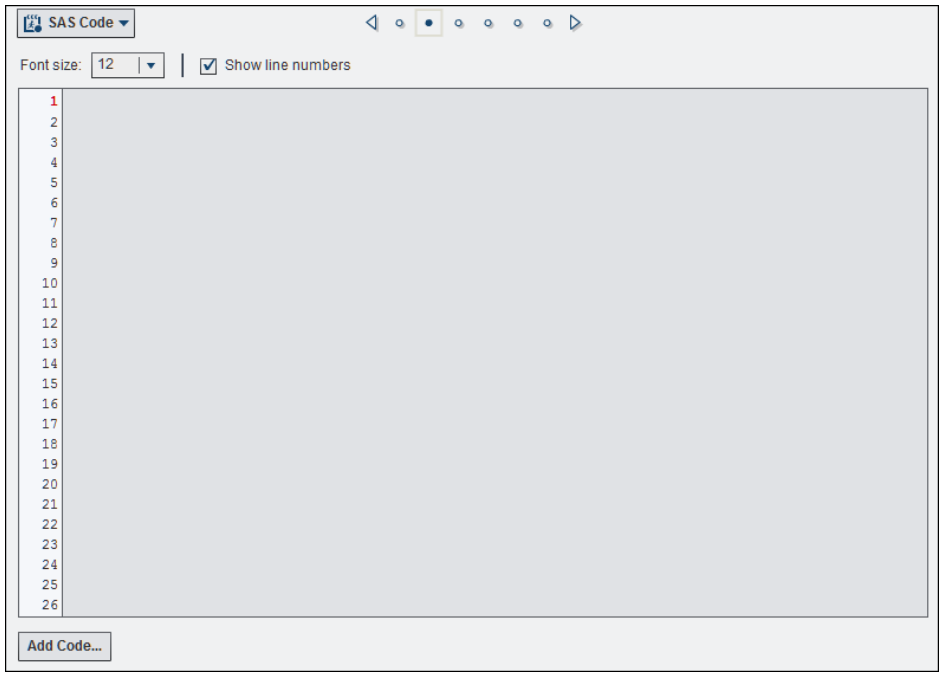


Supply a SAS process ID. The SAS process ID must match the DS2 package name that you enter on the SAS Code page.

Add Code

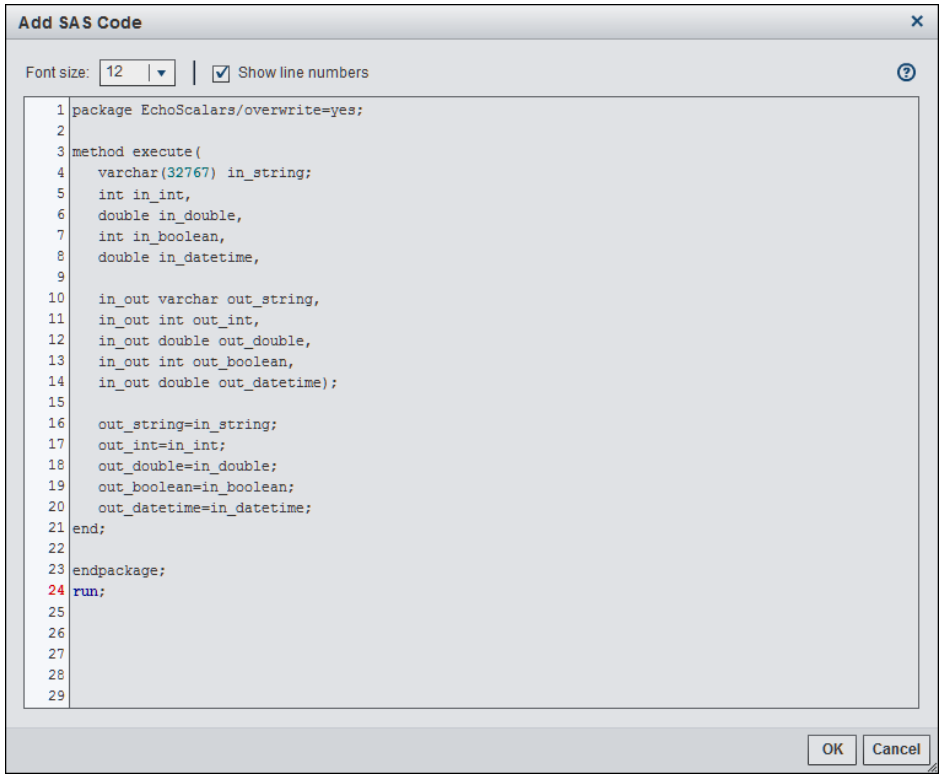
On the SAS Code page, you supply the DS2 code for the process.

Display 7.91 *SAS Code Page*



Click **Add Code** to add DS2 code to the page.

Display 7.92 *DS2 Code with Input and Output Variables*

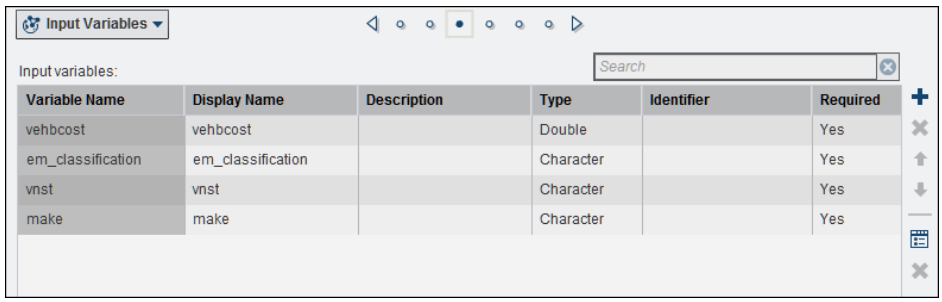


After you enter the code, the variables are automatically generated. You select these variables on the following pages.

Select Input Variables

On the Input Variables page, you select the variables that were generated by the DS2 code.

Display 7.93 *Input Variables Page*



Click ✚ to select a variable to add to the table.

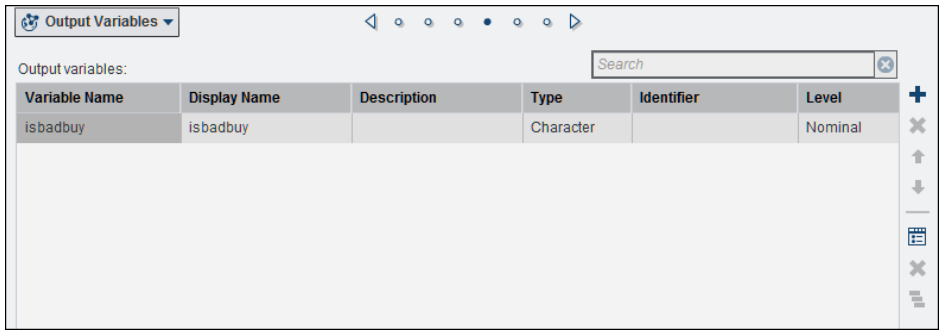
Select a variable and click to generate identifiers using the name of the variable.

View and Select Output Variables

The Output Variables page displays the output variables that are generated by the code on the Code page.

If you have selected **Node process** as the type, you can edit the listing of output variables.

Display 7.94 *Output Variables Page*



Click + to select a variable to add to the table.

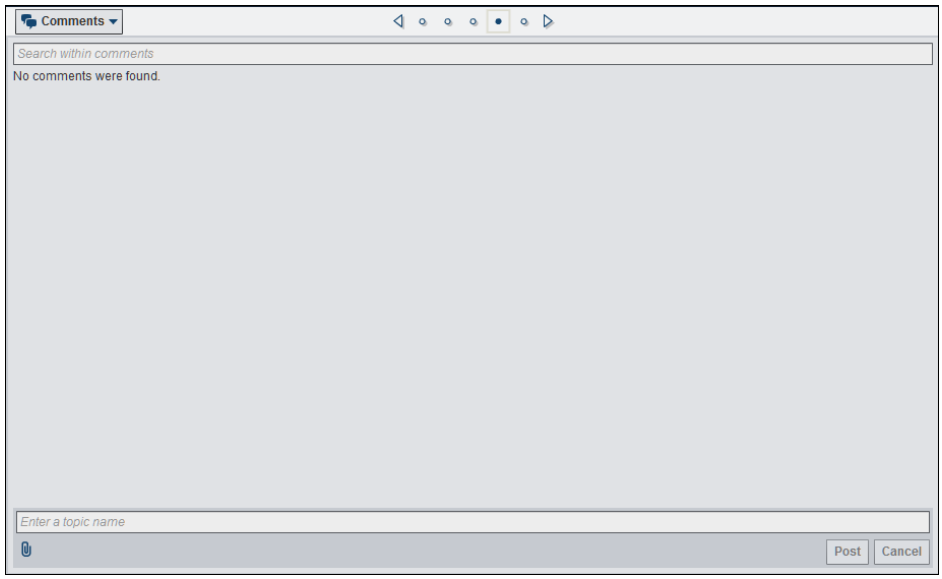
Click the **Type** cell to select a type.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click ✖ to clear identifiers from the selected rows.

Add Comments

On the Comments page, you view and add comments. You add comments after saving.

Display 7.95 *Comments*

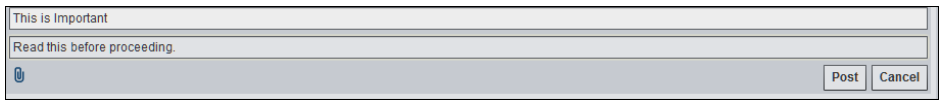


Enter a topic name to add a new comment.

Display 7.96 *New Topic*

Enter the text of the new comment.

Display 7.97 *Comment Text*

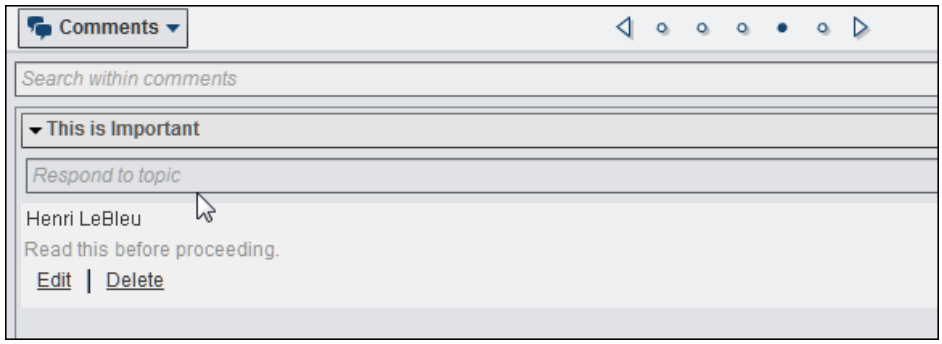


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.98 *Comments List*



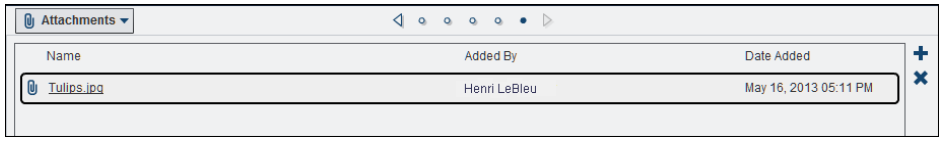
Type in the search field to find text in comments.

Display 7.99 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.100 *Attachments*



Click ✚ to select a file to attach.

Web Processes

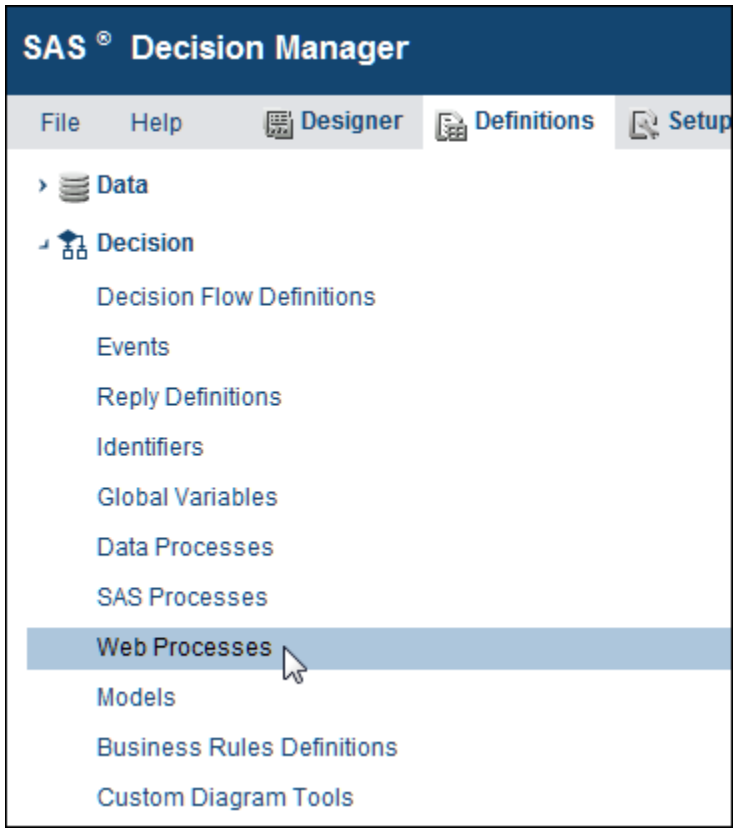
Overview of Web Processes

To request information to be used downstream in a decision flow, create a web process that invokes a remote web service. For more information about web services, see *SAS Decision Services Administrator's Guide*.

Create a Web Process

To add a web process, expand the Decision category in the Definitions workspace and select **Web Processes**.

Display 7.101 *Web Processes*

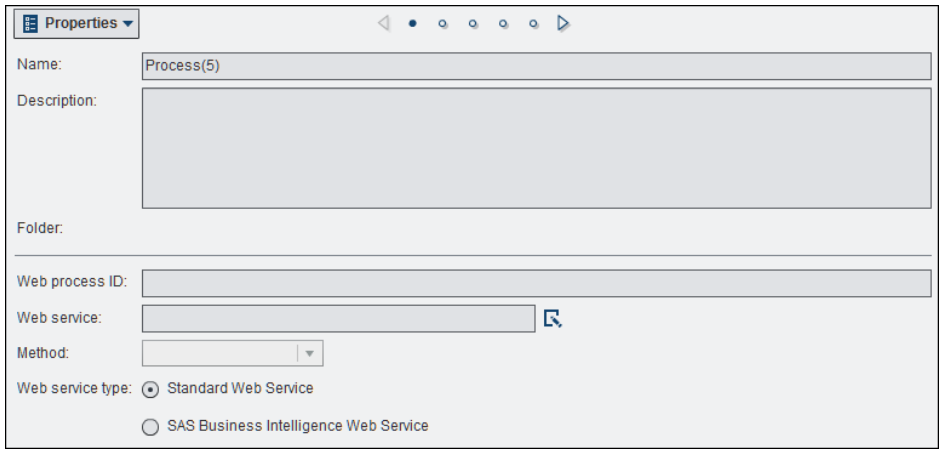


Click to create the web process.

Specify Web Process Properties

The Web Process Properties page displays information about the web process.

Display 7.102 *Web Process Properties Page*



Enter a web process ID. The web process ID must be unique within the SAS Decision Services repository.

Click to select a web service. A Web Services Description Language (WSDL) file identifies the external web service. The WSDL URL is the location of the WSDL file.

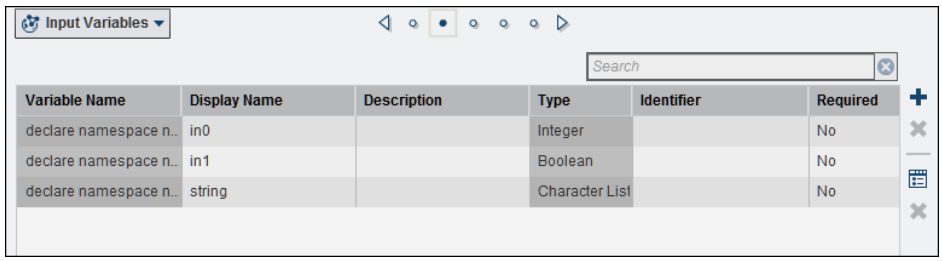
After you have selected a web service, select a method from the **Method** list.

Select **Standard Web Service** or **SAS Business Intelligence Web Service** as the web service type.

Specify Input Variables

The Input Variables page displays the input variables that are available with the web service.

Display 7.103 *Input Variables Page*



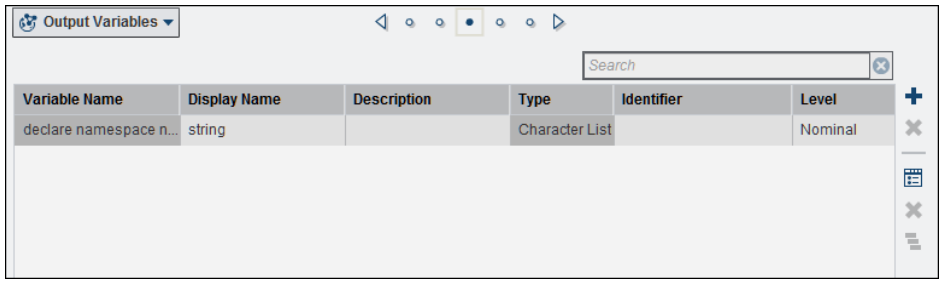
Click to add a variable to the table.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Specify Output Variables

The Output Variables page displays the output variables that are available with the web service.

Display 7.104 *Output Variables Page*



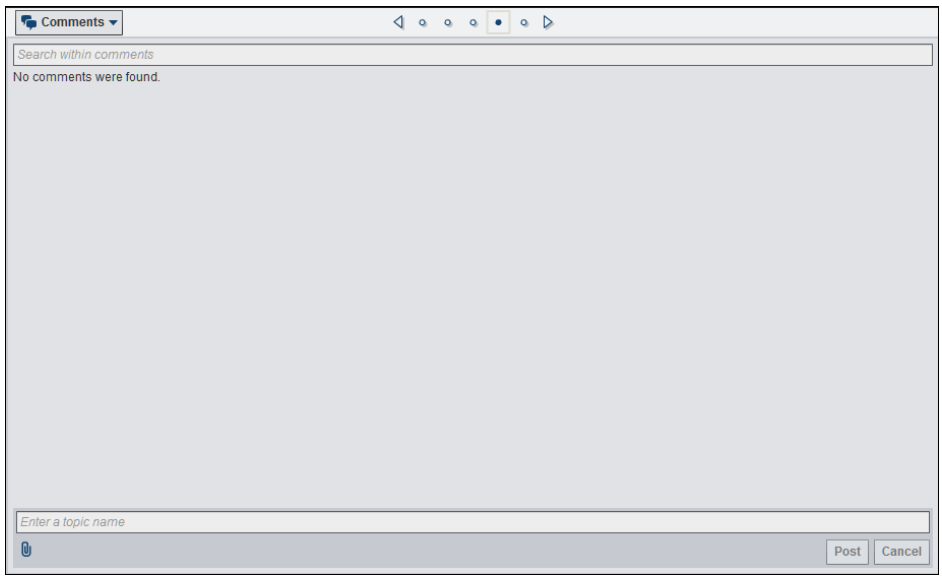
Click ✚ to add a variable to the table.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click ✖ to clear identifiers from the selected rows.

Add Comments

On the Comments page, you view and add comments. You add comments after saving.

Display 7.105 *Comments*

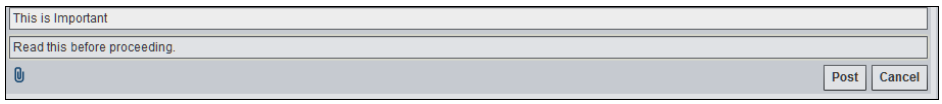


Enter a topic name to add a new comment.

Display 7.106 *New Topic*

Enter the text of the new comment.

Display 7.107 *Comment Text*

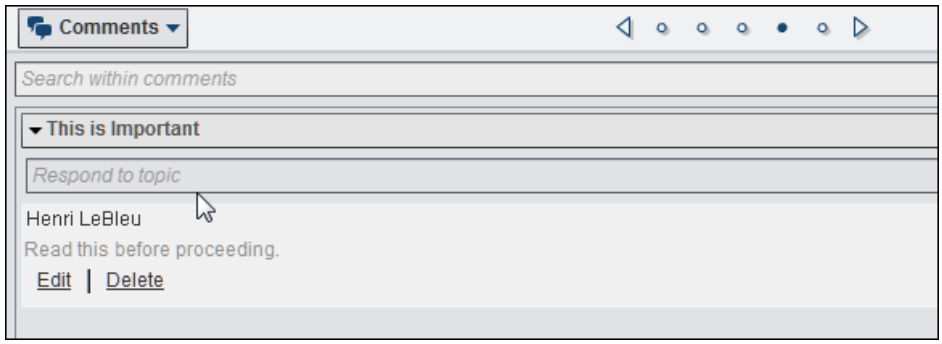


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.108 *Comments List*



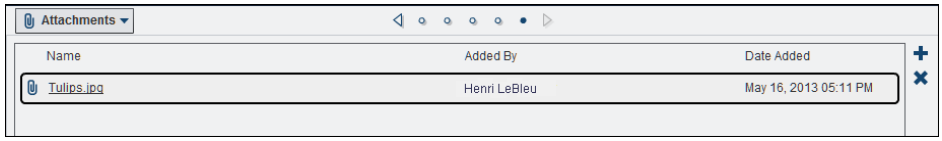
Type in the search field to find text in comments.

Display 7.109 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.110 *Attachments*



Click ✚ to select a file to attach.

Model Processes

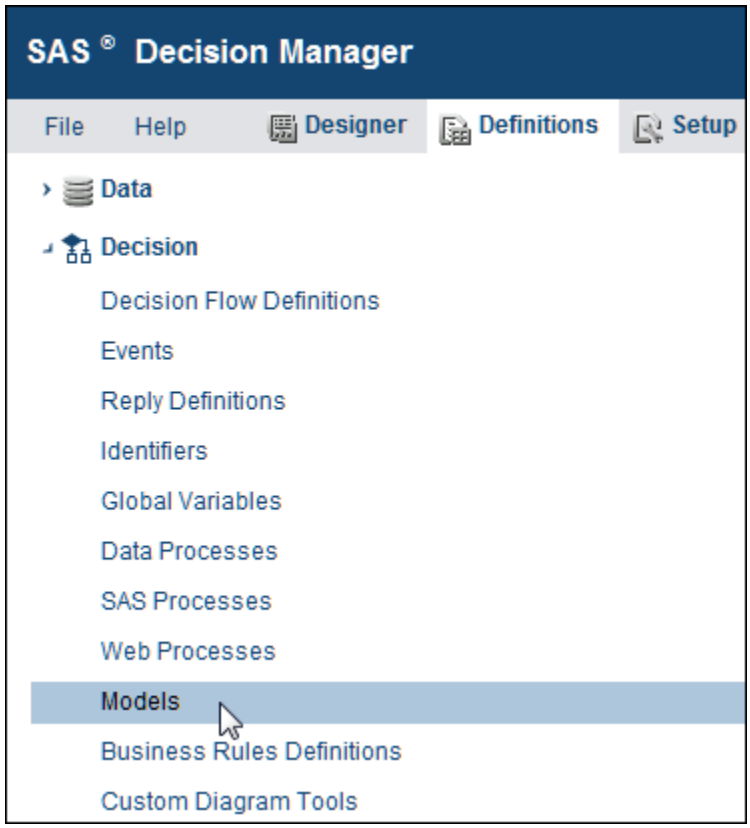
Overview of Model Processes

If you have licensed SAS Model Manager, you can build a model that produces a single score from many data inputs. You can define a model process that is based on the model and that can be used in decision flows.

Add a Model Process

To add a model process, expand the Decision category in the Definitions workspace and select **Models**.

Display 7.111 *Models*

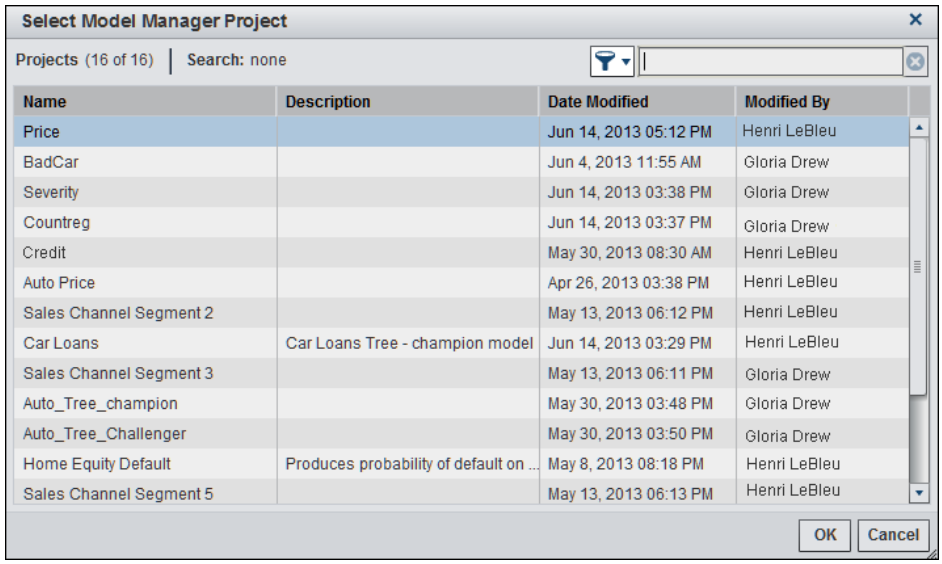


Click ✚ to add the model.

Select a Model Manager Project

When you add a model, you select a Model Manager project.

Display 7.112 *Select Model Manager Project*

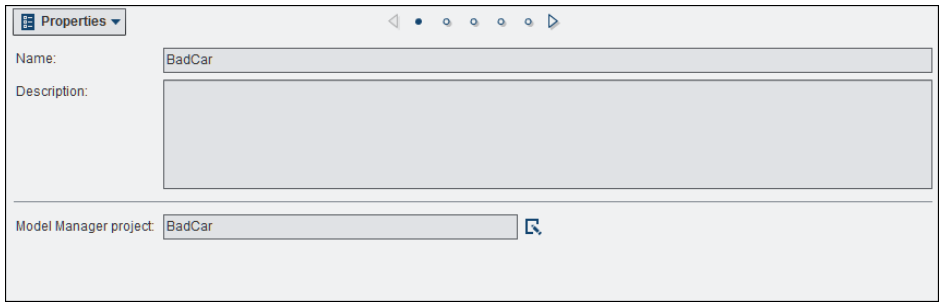


Click a project name to select it.

Specify Model Properties

The Properties page displays information about the model.

Display 7.113 *Properties*

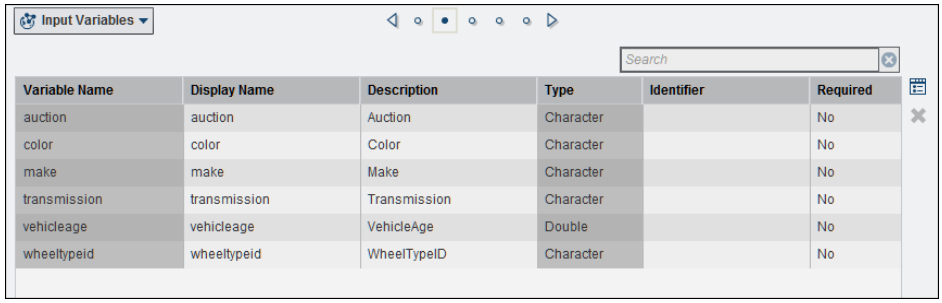


Click  to select a different Model Manager project.

Select Input Variables

The Input Variables page displays the input variables to be used in a process. The list of variables is determined by the Model Manager project.

Display 7.114 *Input Variables*

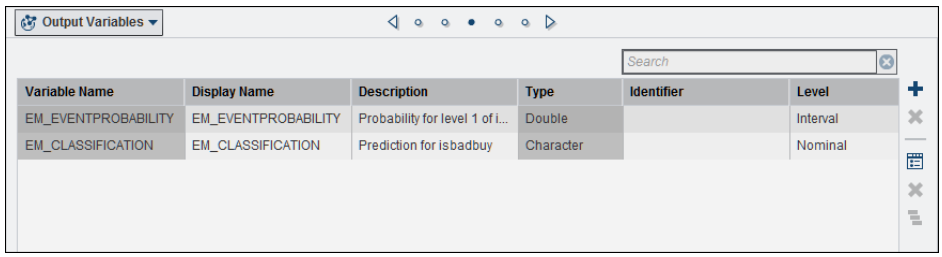


Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Select Output Variables

On the Output Variables page, select the output variables to be used in a process.

Display 7.115 *Output Variables*



Click to select an output variable.

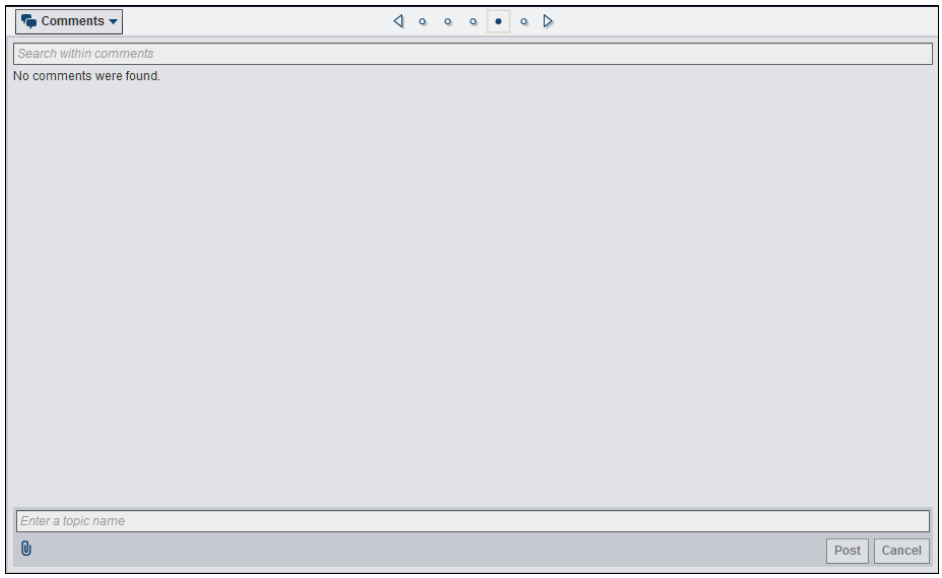
Click the **Level** cell and select a data type level.

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Add Comments

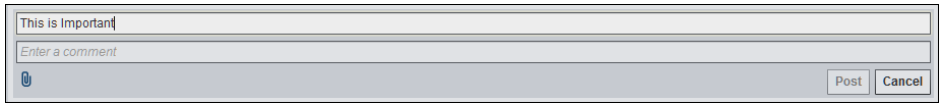
On the Comments page, you view and add comments. You add comments after saving.

Display 7.116 *Comments*



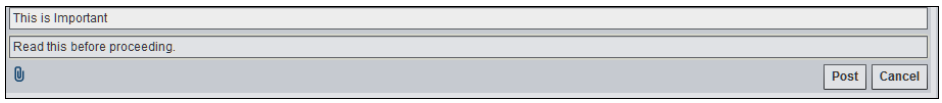
Enter a topic name to add a new comment.

Display 7.117 *New Topic*



Enter the text of the new comment.

Display 7.118 *Comment Text*

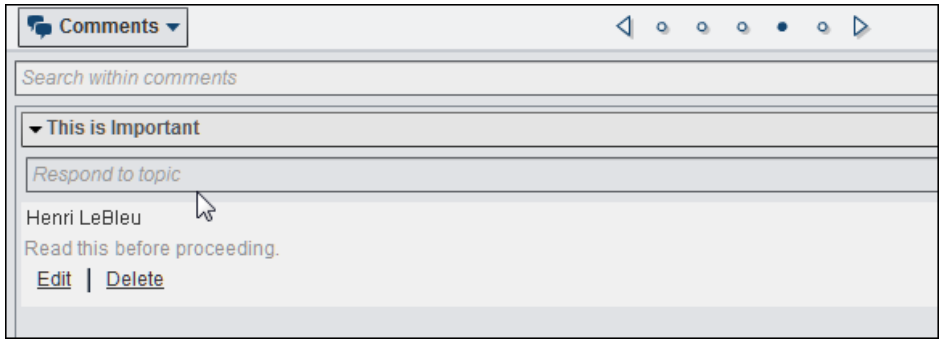


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.119 *Comments List*



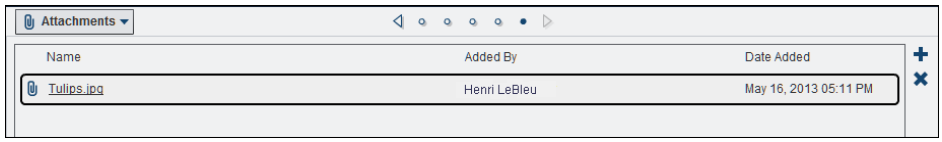
Type in the search field to find text in comments.

Display 7.120 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.121 *Attachments*



Click ✚ to select a file to attach.

Business Rules

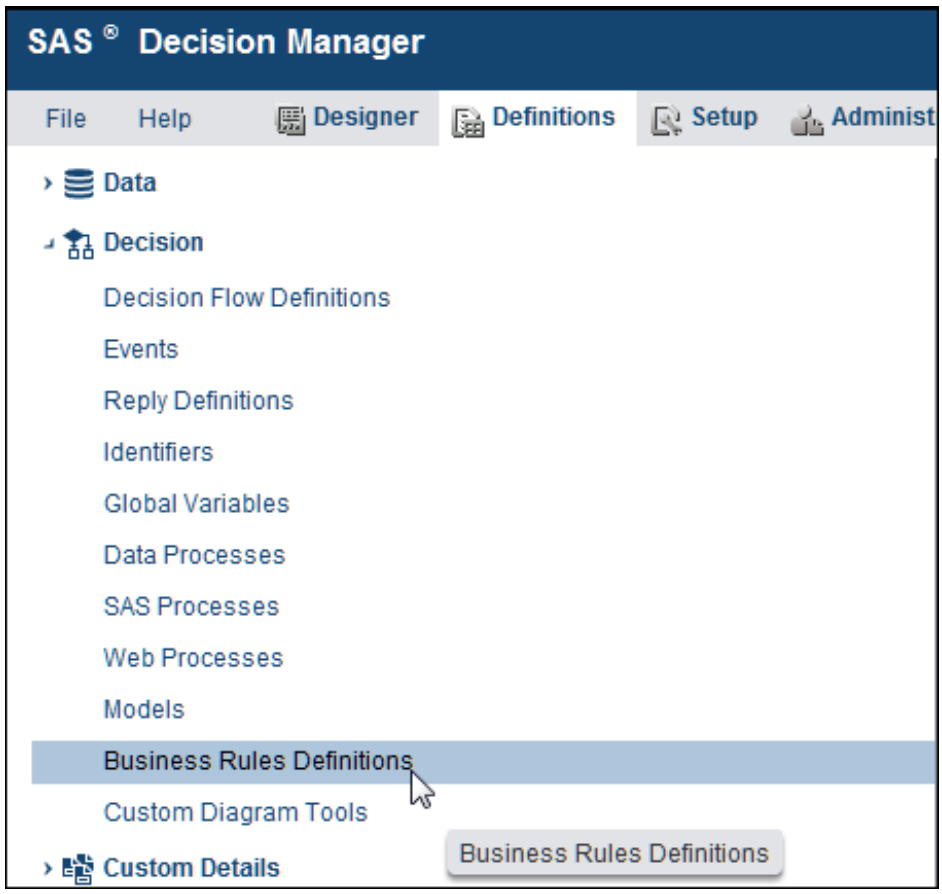
Overview of Business Rules Definitions

A business rules definition specifies a rule flow that applies rules to a list of input variables. You select the business rules definition in the Business Rules node in a decision flow diagram.

Create a Business Rules Definition

To create a new business rules definition, expand the Decision category in the Definitions workspace, and select **Business Rules Definitions**.

Display 7.122 *Select Business Rules Definitions*

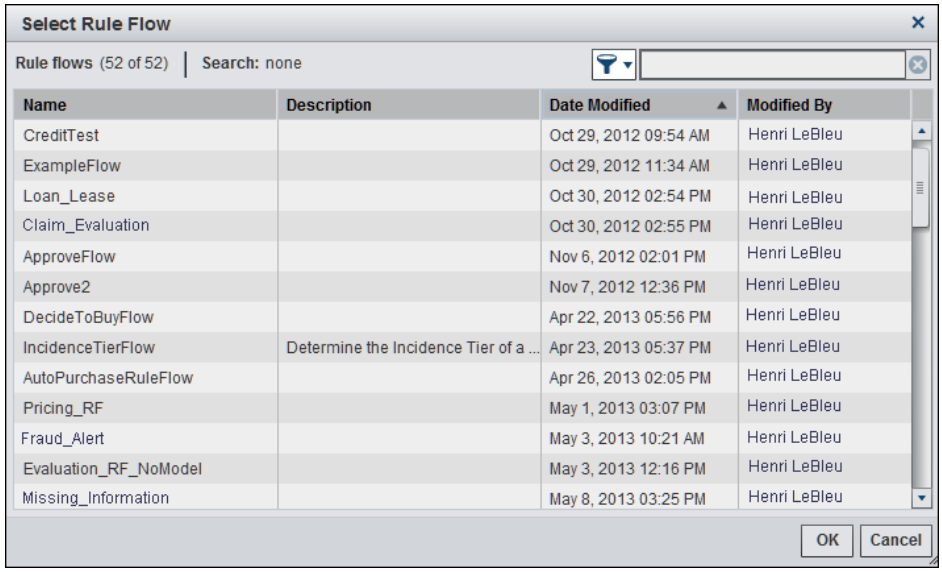


Click and select **New business rules definition**.

Select a Business Rules Flow

When you create a business rules definition, you select a rule flow.

Display 7.123 *Select Rule Flow*



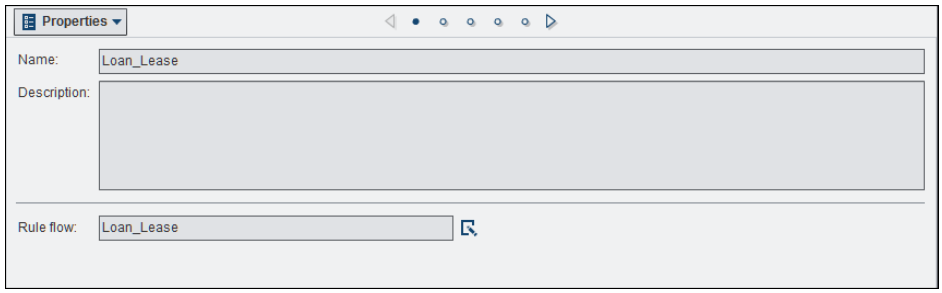
Click a rule flow name to select it.

The rule flows are created in the Business Rules category of the Designer workspace.

Specify Business Rules Definition Properties

The Properties page displays information about the business rules definition.

Display 7.124 *Business Rules Definition Properties Page*



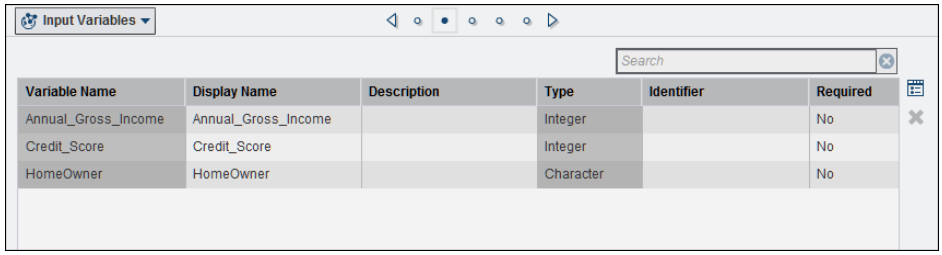
If a rule flow has changed since the definition was created, a message is displayed, and you can update the definition to include the changes.

Click to select a different rule flow.

Select Input Variables

The Input Variables page displays the input variables to be used by the Business Rules node. The list of variables is determined by the rule flow.

Display 7.125 *Business Rules Definition Input Variables*

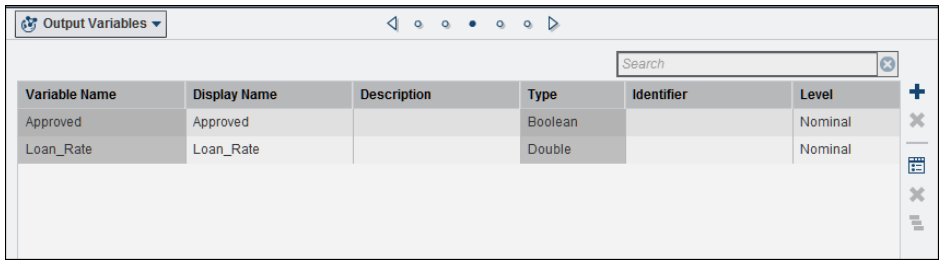


Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Select Output Variables

On the Output Variables page, select the output variables to be used by a business rule.

Display 7.126 *Business Rules Definition Output Variables*



Click to select an output variable. Click to remove the selected variables.

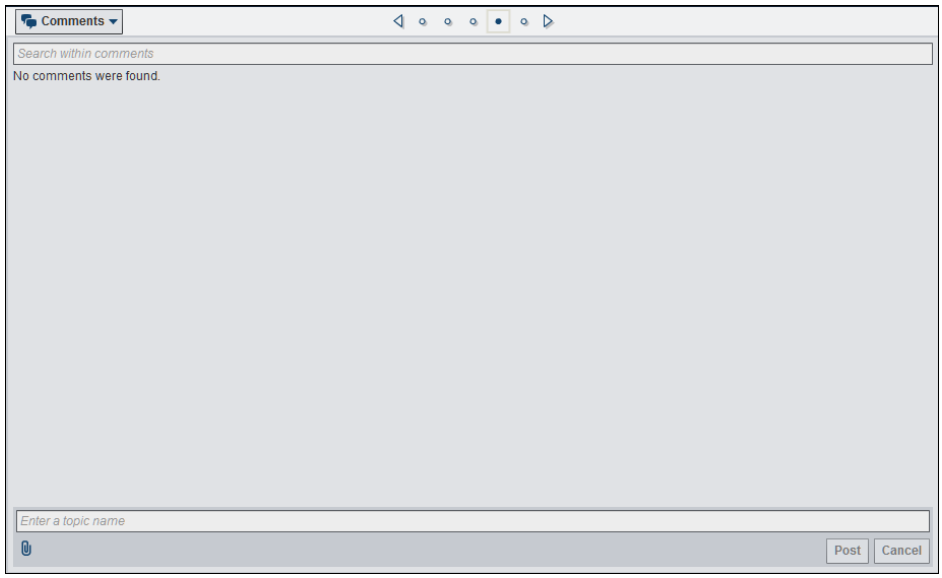
Click the **Level** cell to select a level. To set the same level for more than one variable, select the variables and click .

Click in the **Identifier** cell to select an identifier. For more information, see "Identifiers" on page 97. To generate identifiers that are based on the variable name, click . Click to clear identifiers from the selected rows.

Add Comments

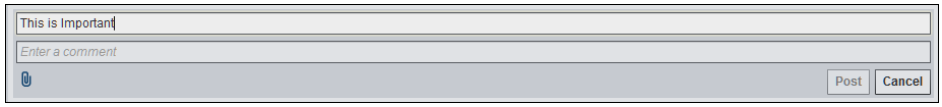
On the Comments page, you view and add comments. You add comments after saving.

Display 7.127 *Comments*



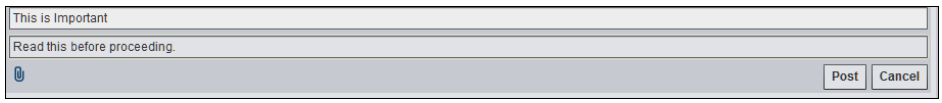
Enter a topic name to add a new comment.

Display 7.128 *New Topic*



Enter the text of the new comment.

Display 7.129 *Comment Text*

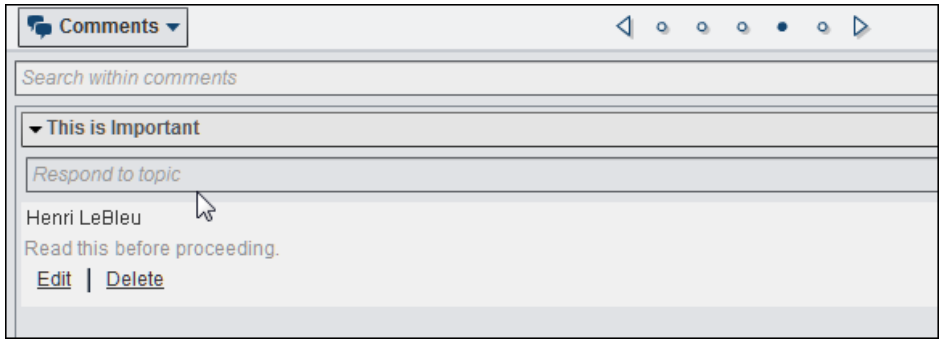


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.130 *Comments List*



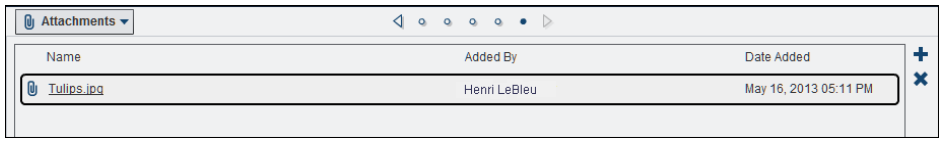
Type in the search field to find text in comments.

Display 7.131 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.132 *Attachments*



Click ✚ to select a file to attach.

Date and Time Values

Valid date and time values are dependent on the locale that has been set for your system.

Here are some examples of valid date values for the US locale:

- 1/22/13
- 1/22/2013
- 01/22/13
- January 22, 2013
- jan 22, 2013

Here are some examples of valid time values for the US locale:

- 9:30 am
- 9:30 AM
- 6:00 pm

To enter a date and time value, combine a date with a time. Here are some examples of combined date and time values:

- 1/22/13 9:30 am
- jan 22, 2013 9:30 AM

Military time values are not supported.

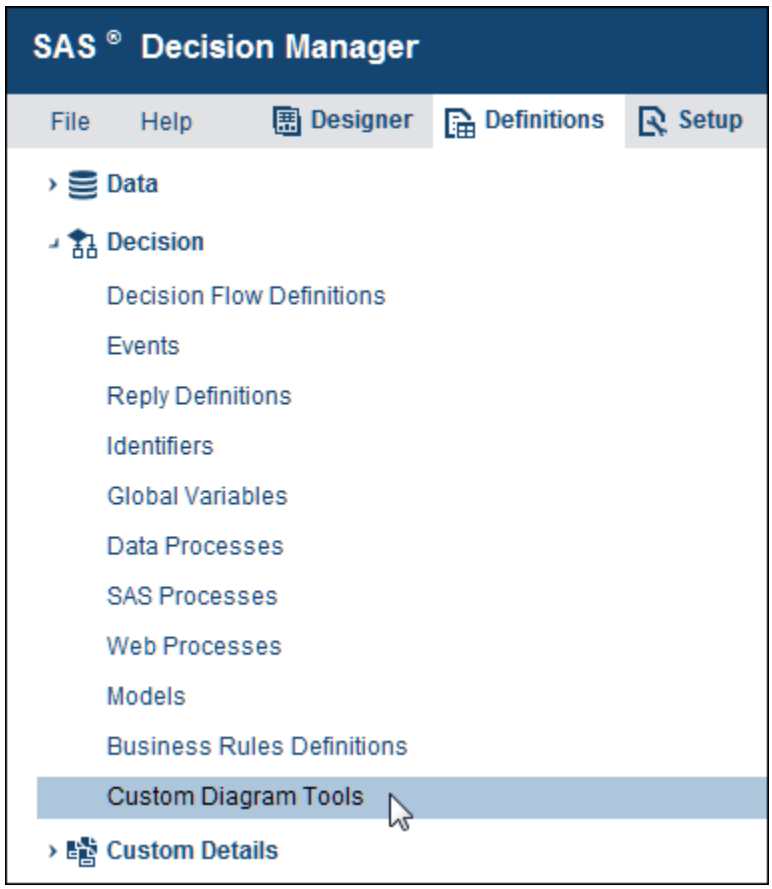
Custom Diagram Tools

Overview of Custom Diagram Tools

You can create a custom diagram tool from a decision process. The custom tool can then be used in flow diagrams.

To create a custom diagram tool, expand the **Decision** category in the Definitions workspace, and select **Custom Diagram Tools**.

Display 7.133 *Custom Diagram Tools*

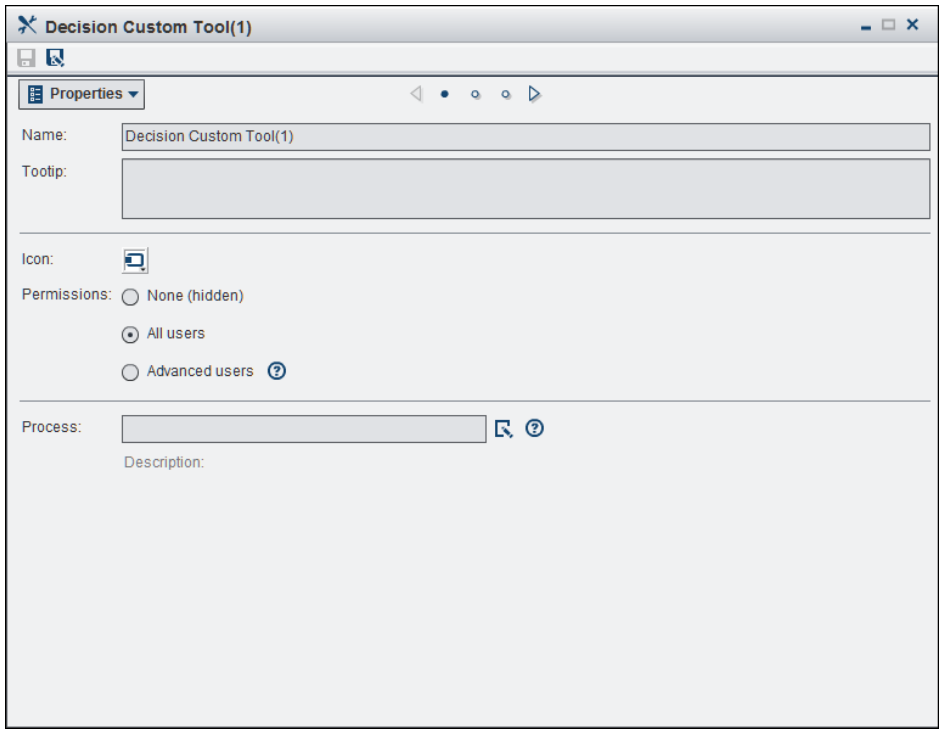


Click to create a new tool.

Specify Custom Diagram Tool Properties

The Properties page displays information about the tool.

Display 7.134 *Custom Tool Properties*



Type tooltip text in the **Tooltip** field. This text is displayed when you rest the mouse pointer on the tool on the Diagram page of a flow.

Click the image next to **Icon** to select an icon.

Select one of the following permission settings from the **Permissions** list:

None
specifies that the tool is not displayed on the Diagram page of a flow.

Advanced users
specifies that only advanced users can view the tool.

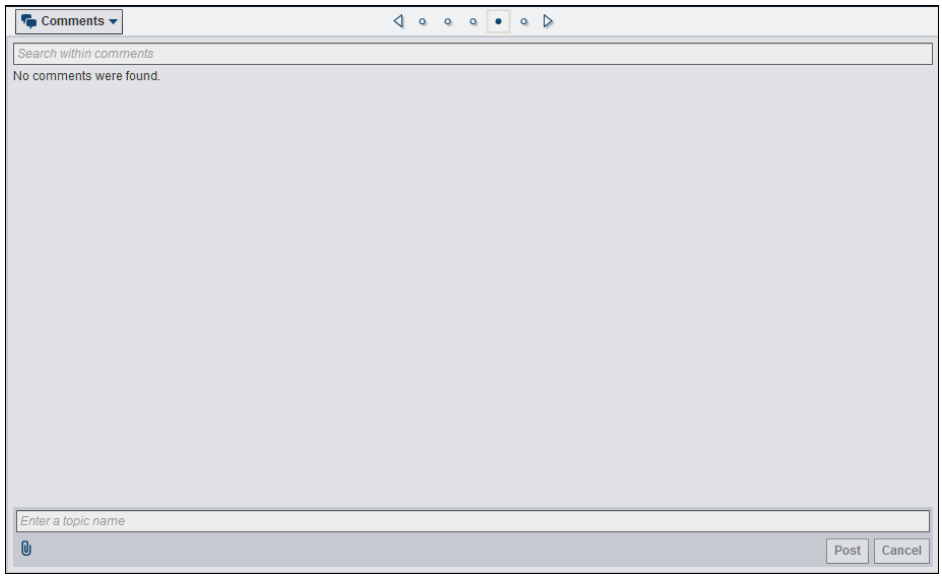
All users
specifies that all users can view the tool. This is the default setting.

Click to select the process that executes when the tool is run.

Add Comments

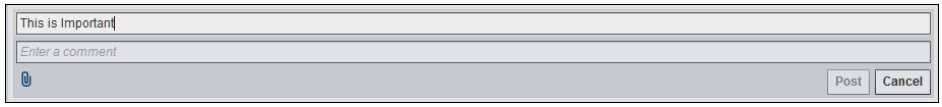
On the Comments page, you view and add comments. You add comments after saving.

Display 7.135 *Comments*



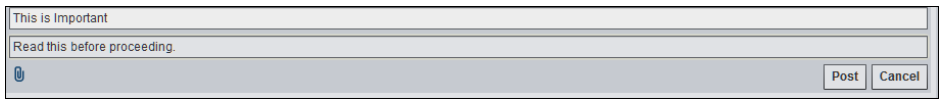
Enter a topic name to add a new comment.

Display 7.136 *New Topic*



Enter the text of the new comment.

Display 7.137 *Comment Text*

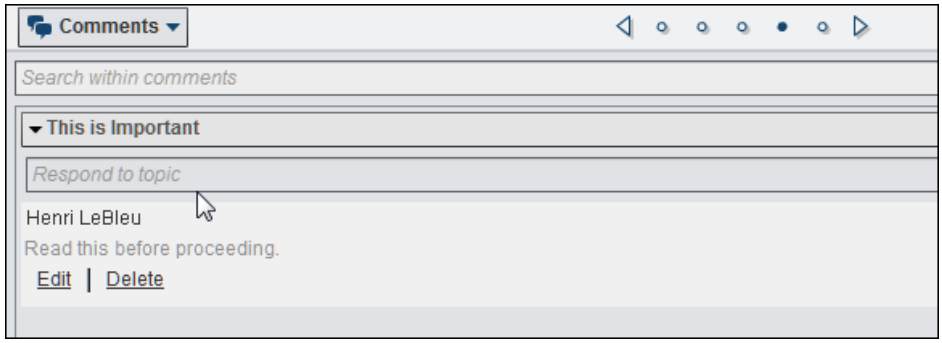


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.138 *Comments List*



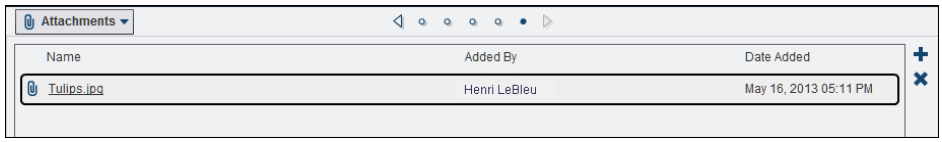
Type in the search field to find text in comments.

Display 7.139 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.140 *Attachments*

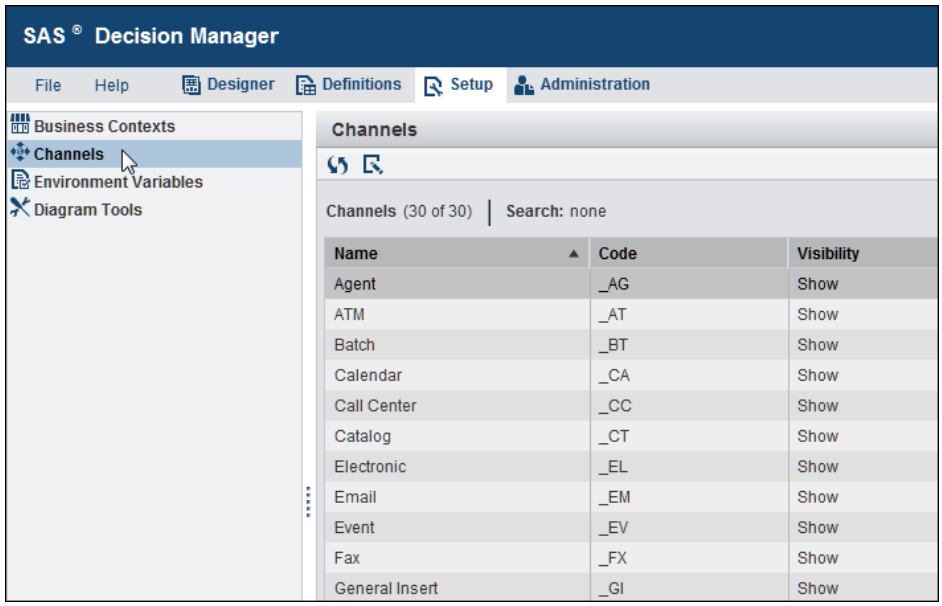


Click ✚ to select a file to attach.

Show or Hide Channels

The available communication channels are listed in the Channels category of the Setup workspace.

Display 7.141 *Channels*

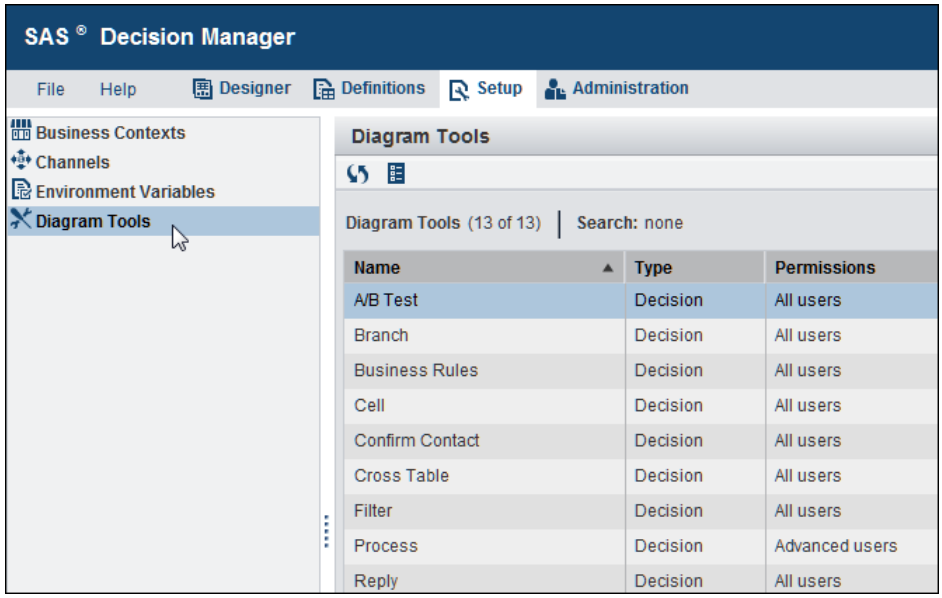


All channels are visible by default. Right-click a channel row and select **Hide Channel** to hide a channel from view. Hidden channels cannot be selected in definitions.

Diagram Tools

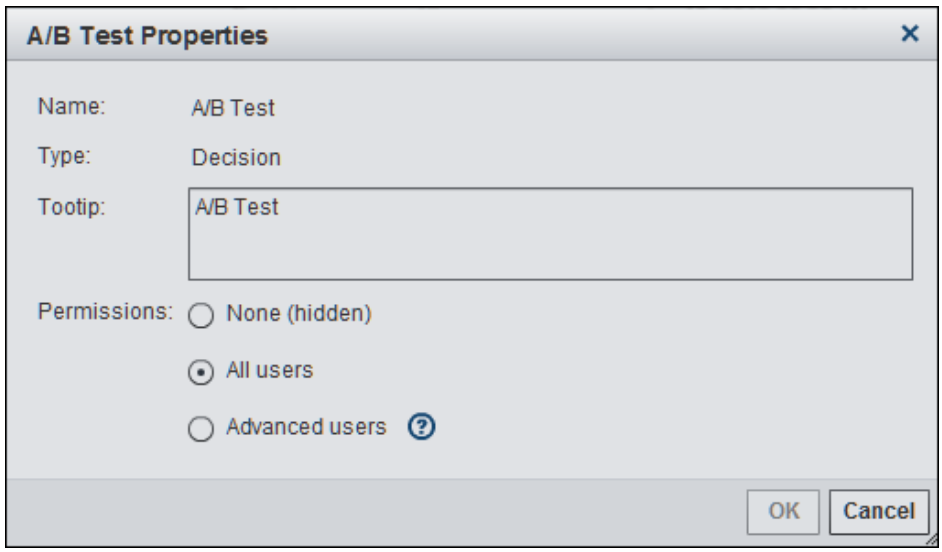
Diagram nodes are listed in the Diagram Tools category of the Setup workspace.

Display 7.142 *Diagram Tools*



Select a tool and click to display the properties of the tool.

Display 7.143 *Tool Properties*



Type tooltip text in the **Tooltip** field. This text is displayed when you rest the mouse pointer on the tool on the Diagram page of a flow.

None
specifies that the tool is not displayed on the Diagram page of a flow.

Advanced users
specifies that only advanced users can view the tool.

All users
specifies that all users can view the tool. This is the default setting.

Custom Detail Groups

Overview of Custom Details

Custom details are user-defined fields that you can create for use in flows.

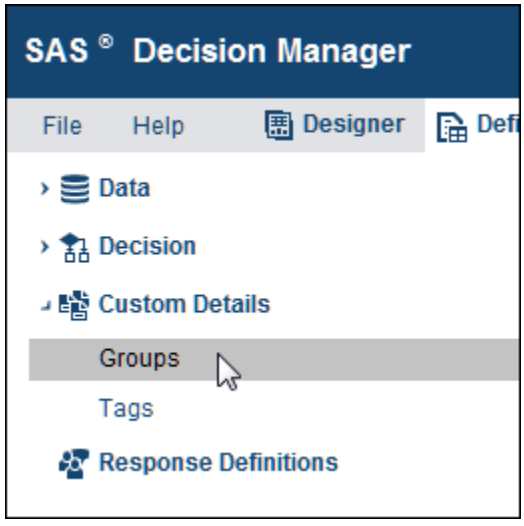
A custom detail group is a collection of custom details that can be reused wherever custom details can be added. You can assign the entire group without having to assign each custom detail. For example, you can create a custom detail group that contains budgetary data. Individual custom details could be Total Costs, Expected Revenue, Cost per Item, and Shipping Cost.

A custom detail tag is a placeholder for a custom detail. You create a tag and then you assign the tag to a custom detail. In decision flows, you can assign the tag to a variable. For example, you can assign tags to reply variables in order to return the underlying custom detail, or you can assign tags to custom details of dynamic treatments.

Create a Custom Detail Group

To create a custom detail group, select the Custom Details category in the Definitions workspace. Select **Groups**.

Display 7.144 *Custom Detail Groups*

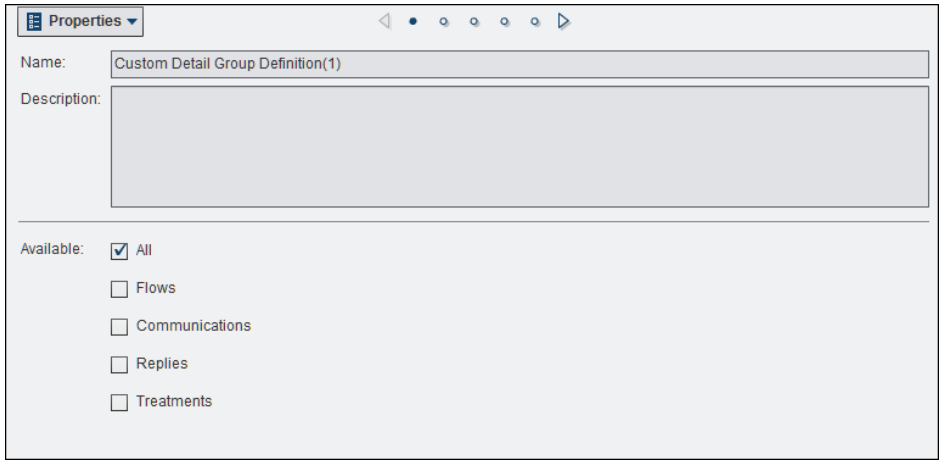


Click to create the custom detail group.

Specify Custom Detail Group Properties

The Properties page displays information about the custom detail group.

Display 7.145 *Custom Detail Group Properties*



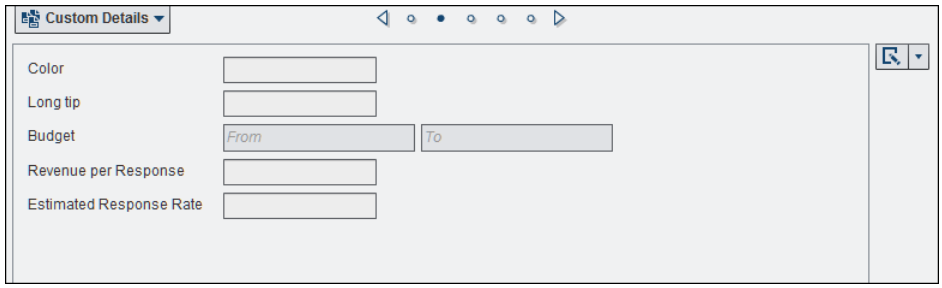
In the Available section, select the components that will have access to the custom detail group.

Add Custom Details

Overview of Adding Custom Details

On the Custom Details page, you add user-defined fields.

Display 7.146 *Custom Details Page*



To add a custom detail, click and select **Manage custom details**.

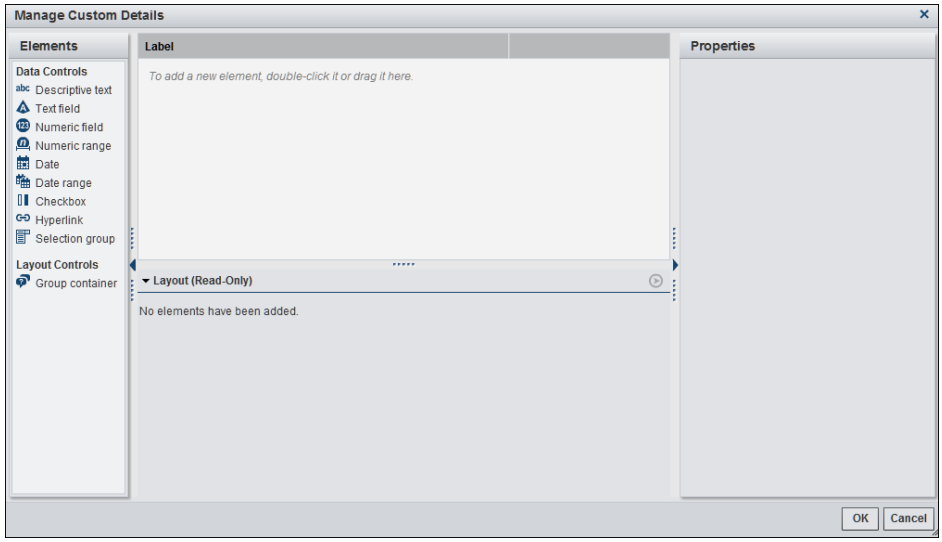
To append a custom detail group to the custom detail, select **Add custom detail groups**..

A next to a custom detail displays information about the associated custom detail tag.

Manage Custom Details

In the Manage Custom Details window, you supply information about the custom details.

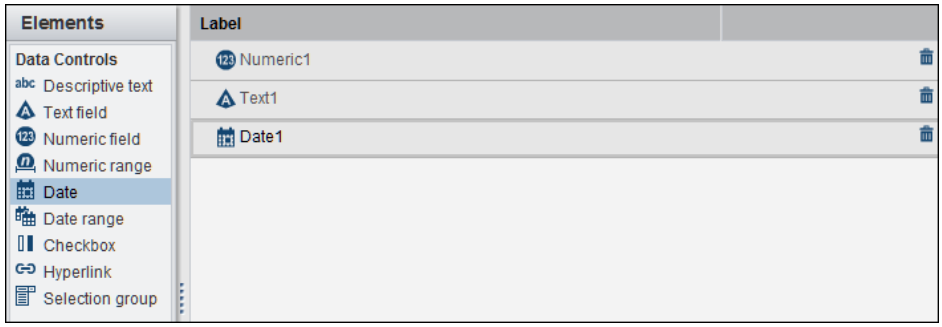
Display 7.147 *Manage Custom Details*



Select an Element

To select the type of custom detail, double-click it or drag an element from the **Elements** pane to the **Label** pane.

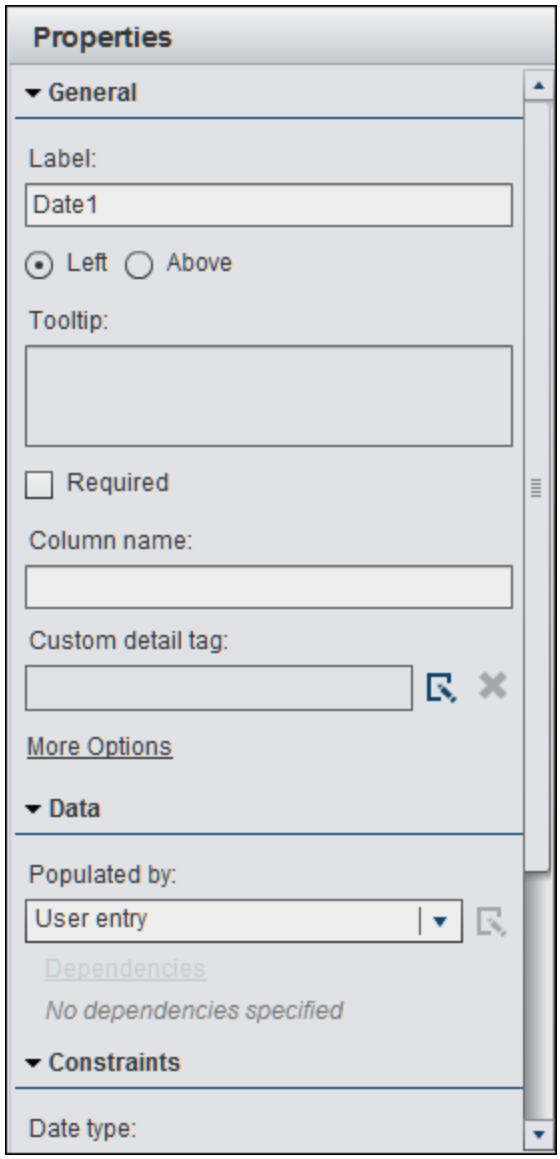
Display 7.148 *Select Element*



Specify Properties

In the **Properties** pane, specify the details for the selected element. The details vary, depending on the element and the software component. As you set the properties, you can review the results in the **Layout** pane.

Display 7.149 *Custom Detail Properties*



Specify General Properties

The following items are the possible properties in the General section. Click **More Options** to display more properties.

Label
is the name that is displayed with the field. Select **Left** or **Above** to set the location of the label in relation to the custom detail.

Note: The names of custom details that are passed to SAS Marketing Optimization must be no longer than 26 characters.

Description
is the description of the field.

Tooltip
is the text that is displayed when you rest the mouse pointer on the field.

Required
indicates that a value is required.

Dynamic
indicates that a value is dynamic. Dynamic custom details can be modified. Values that are not dynamic cannot be changed. This option is available only for treatments.

Column name
is the name of the column that is displayed in a published report.

Minimum column name
is the name of the column that displays the minimum value in a range.

Maximum column name
is the name of the column that displays the maximum value in a range.

Custom detail tag
is the custom detail tag that is associated with the custom detail. Click  to select a custom detail tag.

Minimum custom detail tag
is the custom detail tag that is associated with the minimum value in a range. Click  to select a custom detail tag.

Maximum custom detail tag
is the custom detail tag that is associated with the maximum value in a range. Click  to select a custom detail tag.

Width
is the width of a field.

Hint
is the text that is displayed beneath the field that indicates the value that should be entered.

In-field hint
is the text that is displayed in the field that indicates the value that should be entered.

Specify Data

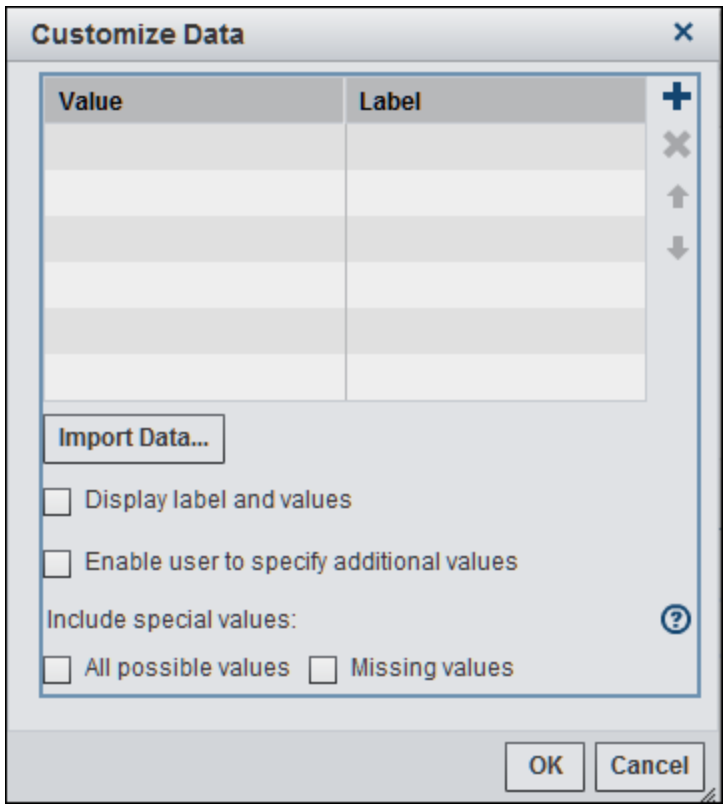
These are the possible properties in the Data section:

Number of values
sets the number of text values that can be entered. If you select **Multiple values**, select **Enable user to reorder values** to enable the user to change the order of the values.

Populated by
specifies the source of the values that are entered.

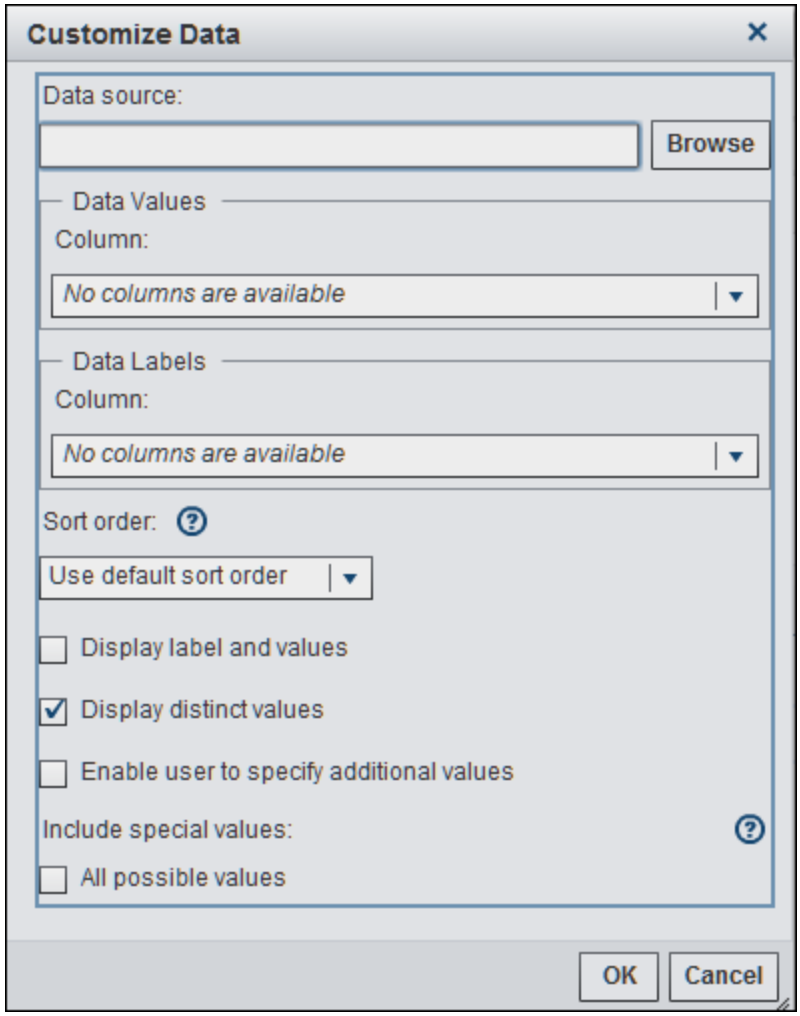
Select **User entry** to indicate that values are entered in by the user.

When you select **A predefined list**, the list does not change unless you add or remove values.



To display text other than the name of the list item, enter a value in the Label column. For example, if the list items are products, the Value could be the product number A12345 and the Label could be Child's Desk. When a predefined list is published to the common data model, the published value contains the concatenated display values. Click **Import Data** to import values from a SAS library. Click **Display label and values** to display the label and values with the list item. To enable the user to select values from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

When you select **A dynamic list**, you can include up to 5,000 items from an external list. The list displays the contents of the SAS Folders hierarchy in the **Folders** tab of SAS Management Console. Changes in this external list are reflected in the list of values that the user can select.



Click **Browse** to select a data source. Select a column in the Data Values and the Data Labels section to display those columns. Select a sort order. To display a value other than the text in the **Value** field, select **Display label and values** and **Display distinct values**. To enable a user to select more than one value from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

Specify Constraints

The following items are the possible properties in the Constraints section.

Allow only integer values
indicates that only integer values can be entered in a numeric or a numeric range custom detail.

Number of lines
specifies whether to display single or multiple lines. . If you select **Multiple lines**, specify the **Maximum line count** and **Number of lines displayed**.

Minimum length
sets the minimum number of characters that are allowed in the field.

Maximum length
sets the maximum number of characters that are allowed in the field.

Maximum line count
is the maximum number of text lines that can be entered in a field.

Number of lines displayed
is the number of text lines that are displayed in the field.

Date type
sets the unit to **Day**, **Week**, **Month**, **Quarter**, or **Year**.

Include relative dates
enables you to select a date that is relative to the current date (for example, **Next week**).

Minimum decimal places
sets the minimum number of decimal places that are allowed in the field.

Maximum decimal places
sets the maximum number of decimal places that are allowed in the field.

Minimum value allowed
is the minimum value for the field.

Maximum value allowed
is the maximum value for the field.

Combined field
is another text field that this field can be combined with.

Maximum combined length
is the combined length of two combined text fields.

Specify Appearance

The Appearance section offers a choice of displays for selection groups and group containers. A selection group can be displayed as a drop-down list or a set of radio buttons. A group container can be displayed as a labeled box, a collapsible section, or an unlabeled group.

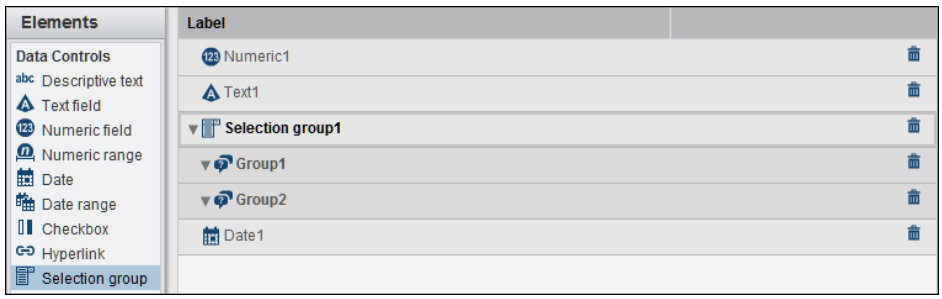
Specify Default Values

In the Default Values section, you specify a default value for a selection group. Click to specify which group is displayed first by default.

Organize Custom Details

A selection group is a collection of other groups that is displayed as a list or a series of radio buttons. Double-click **Selection group** to add it to the **Label** pane.

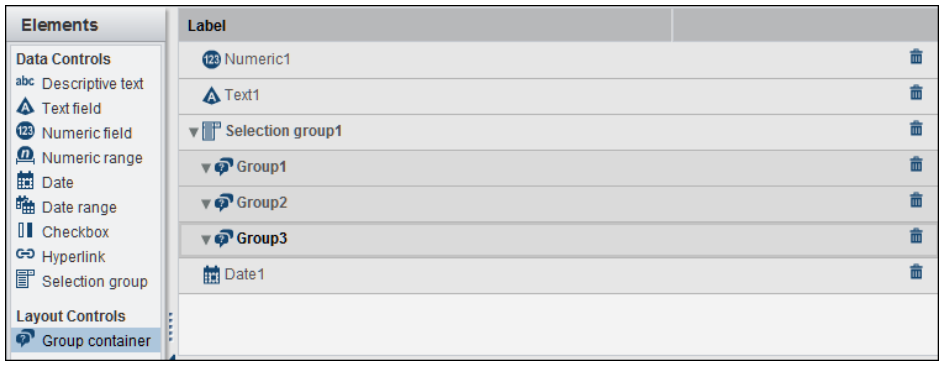
Display 7.150 *Selection Groups*



The selection group is prepopulated with groups that you can modify and add items to. Select items from the **Elements** pane and drag them to a group.

A group container collects custom details into a group. Double-click **Group container** to add it to the **Label** pane.

Display 7.151 *Group Container*

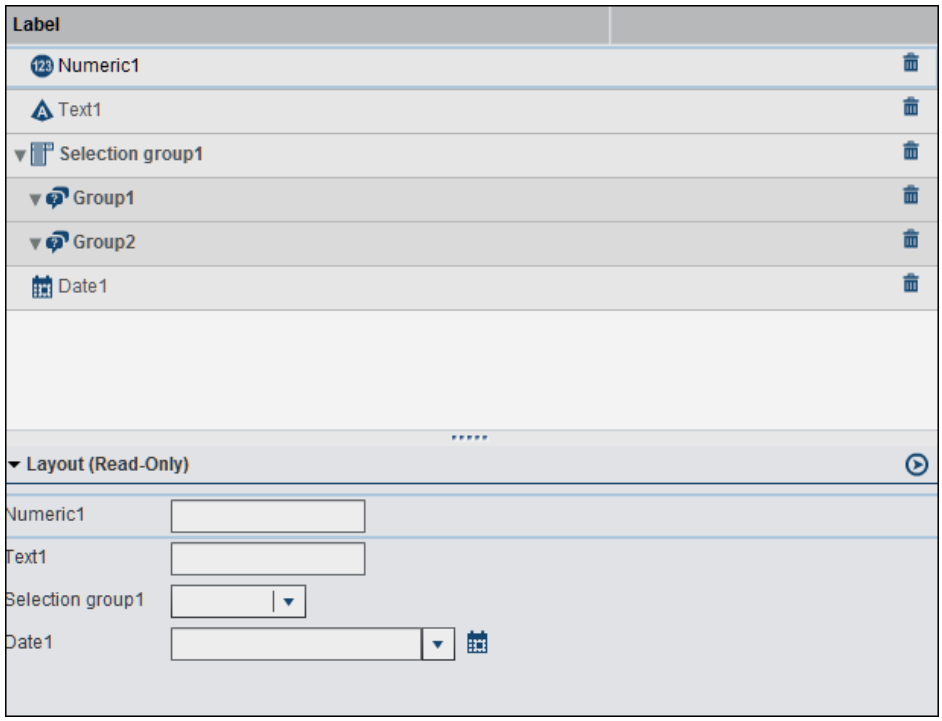


Select items from the **Elements** pane and drag them to a group.

Preview Custom Details

The Layout pane displays the custom details as they appear on the Custom Details page.

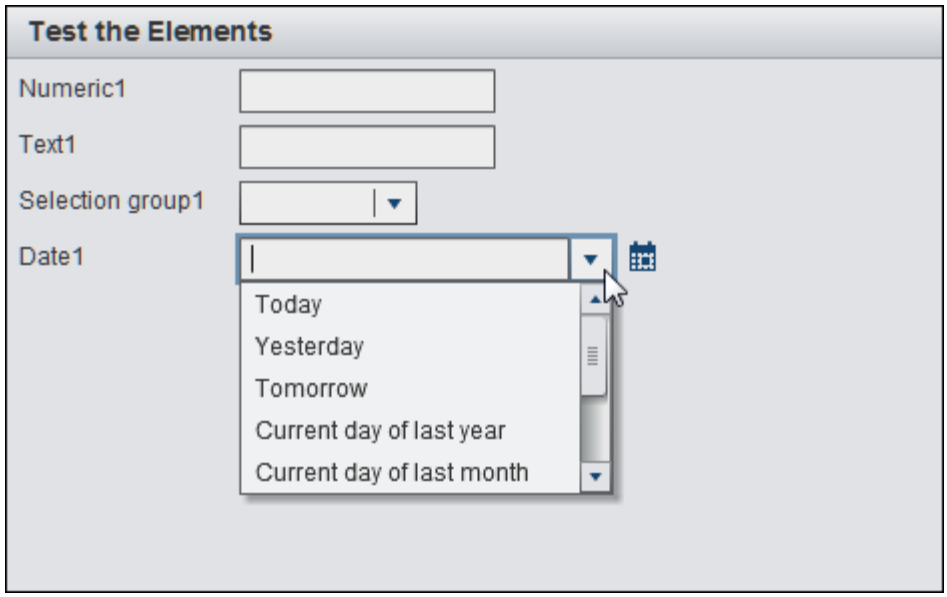
Display 7.152 *Layout*



A red asterisk (*) indicates that a field is required.

Click to open a Test the Elements window where you can test the custom details by interacting with them.

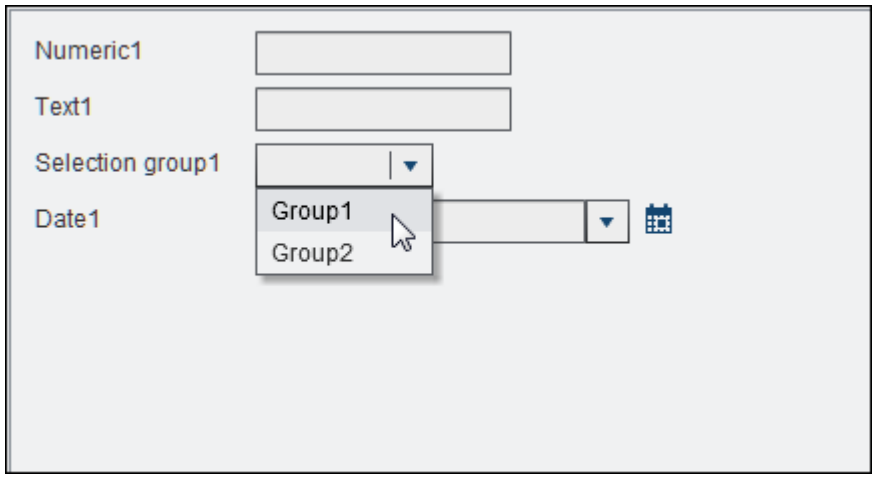
Display 7.153 *Test the Elements*



Set Default Values

On the Custom Details page, you specify default values for the custom details that you have created.

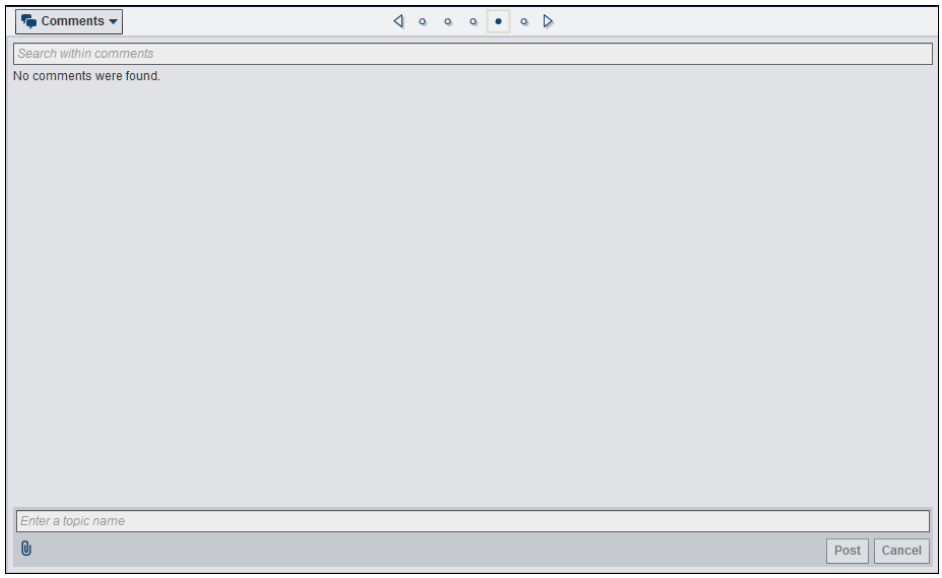
Display 7.154 *Default Values*



Add Comments

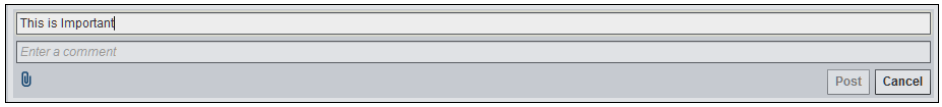
On the Comments page, you view and add comments. You add comments after saving.

Display 7.155 *Comments*



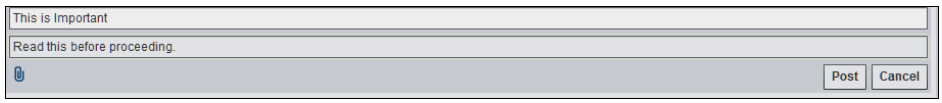
Enter a topic name to add a new comment.

Display 7.156 *New Topic*



Enter the text of the new comment.

Display 7.157 *Comment Text*

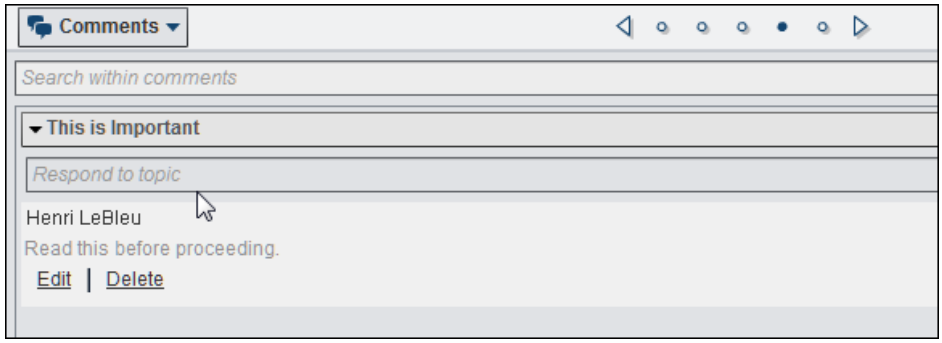


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.158 *Comments List*



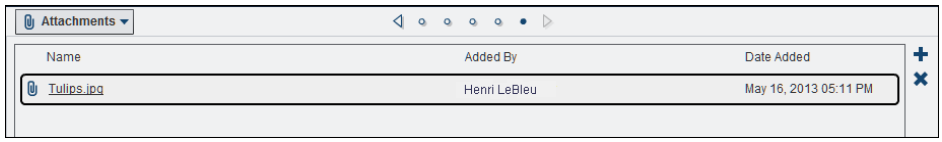
Type in the search field to find text in comments.

Display 7.159 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.160 *Attachments*



Click + to select a file to attach.

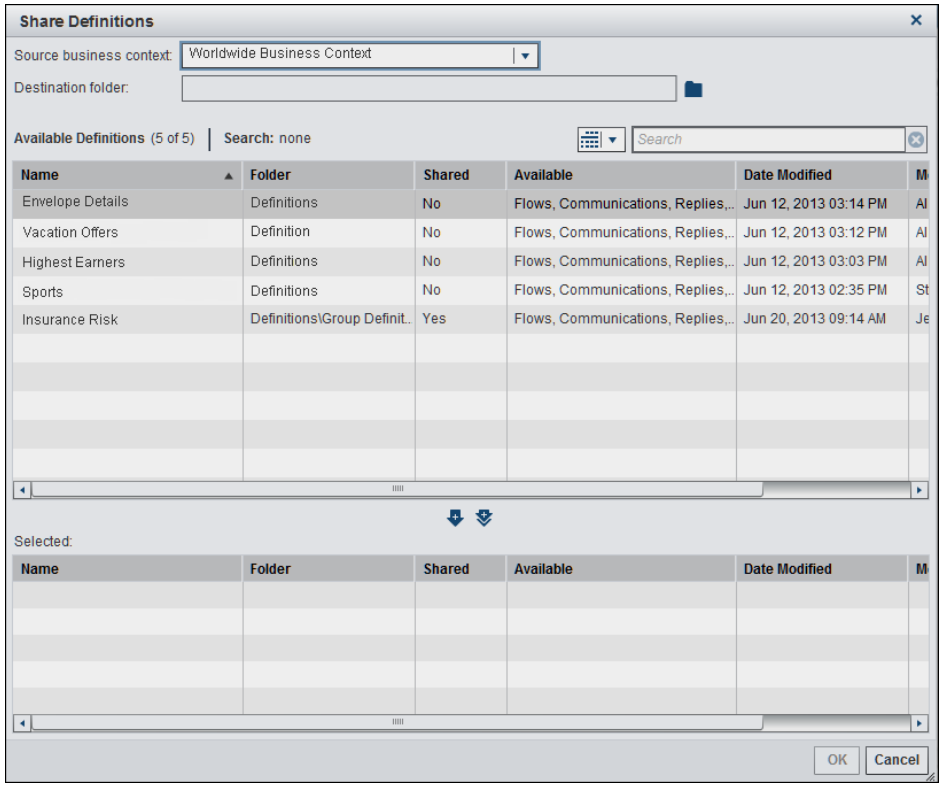
Share a Custom Detail Group Definition across Business Contexts

A custom detail group definition can be used in more than one business context. For example, you might work in several business contexts. In this case, you could create one custom detail group definition that you can use in any business context that you have access to.

A shared definition is a reference to the initial definition. If you have the appropriate permissions, any changes that you make to the shared definition are saved to the initial definition.

To share a definition that was created in a different business context, click and select **Share custom detail group definition**.

Display 7.161 *Share Definitions*

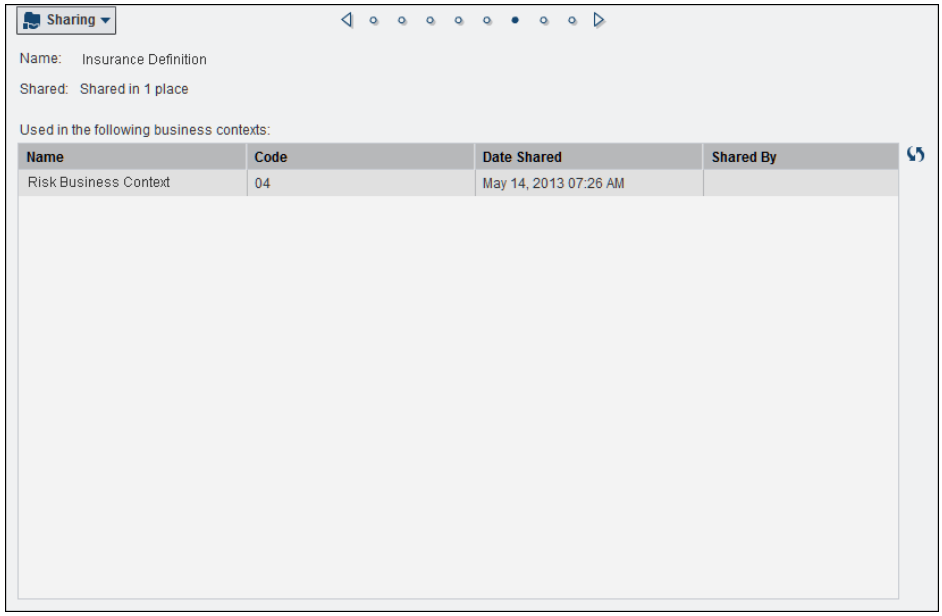


Select the **Source business context** that contains the custom detail group definitions that you want to share. Click to select the storage location for the shared definition within the current business context. Select the definitions from the Available Definitions table and click the arrows to add them to the list of selected definitions.

If you delete a shared definition, it is deleted only from the current business context.

The Sharing page of the custom detail group definition lists other business contexts that share the definition.

Display 7.162 *Sharing Page*



A number in a red badge indicates the business contexts that share this definition but that you do not have permission to view.

Custom Detail Tags

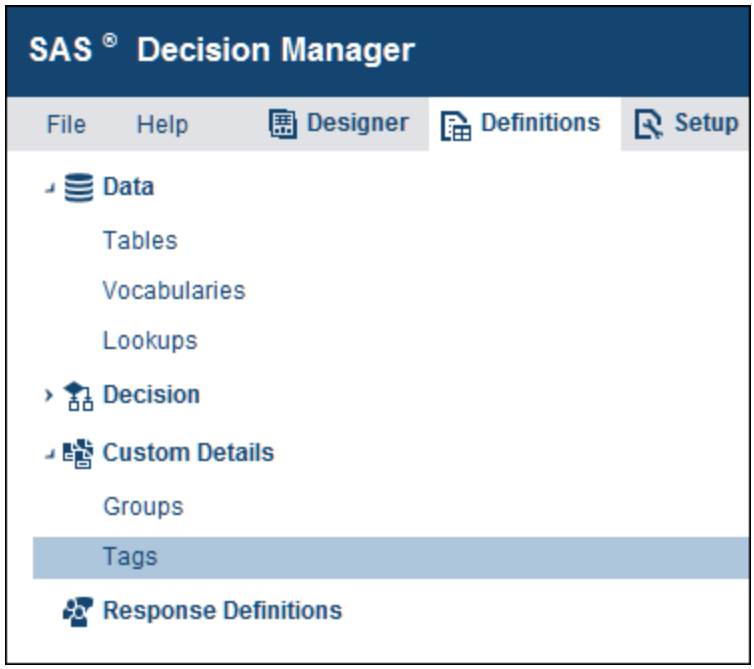
Overview of Custom Detail Tags

A custom detail tag is a placeholder for a custom detail. You create a tag and then you assign the tag to a custom detail. You can assign the tag to any variable. For example, you can assign tags to reply variables in order to return the underlying custom detail, or you can assign tags to custom details of dynamic treatments.

Create a Custom Detail Tag

To create a custom detail tag, select **Tags** in the Definitionsworkspace.

Display 7.163 *Tags*

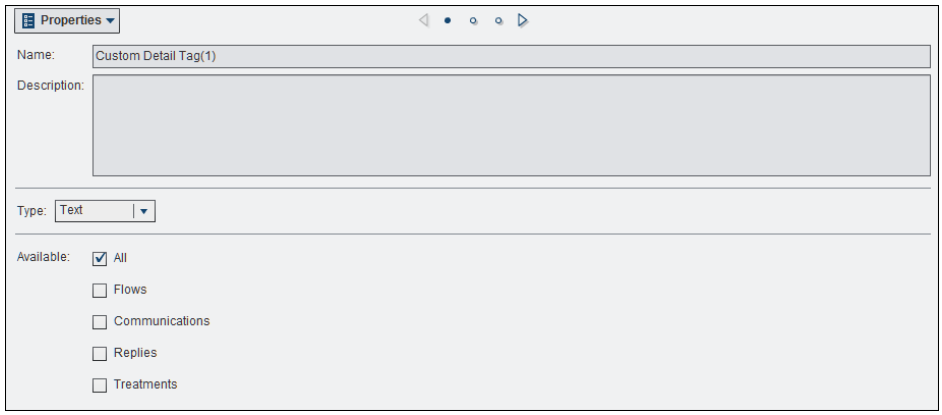


Click to create the tag.

Specify Custom Detail Tag Properties

The Properties page displays the name and other information about the custom detail tag.

Display 7.164 *Custom Detail Tag Properties*



Select the type of tag from the **Type** list. You can select one of the following types:

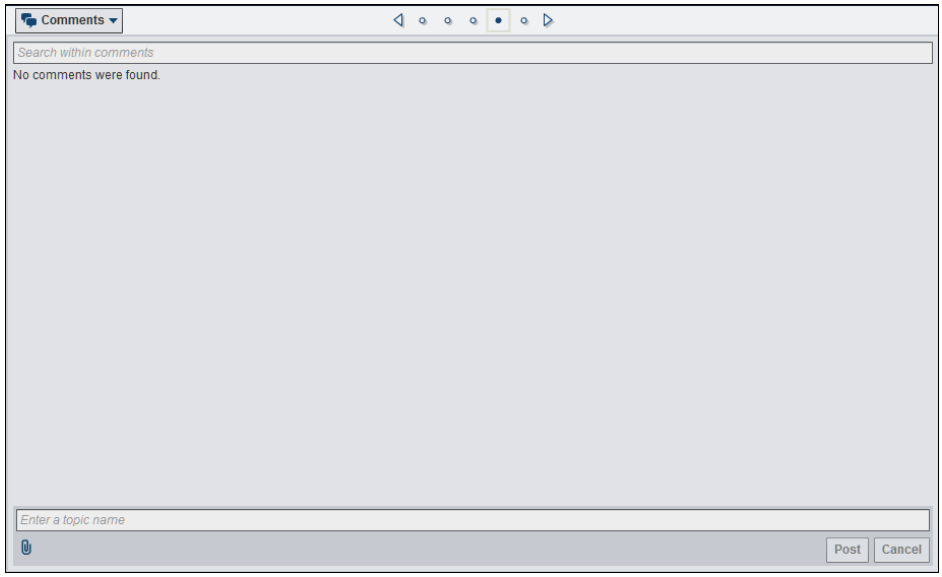
- Text
- Numeric
- Date
- Boolean
- Hyperlink.

In the Available section, select the check boxes to make the tag available to flows, replies, or treatments. You must select at least one check box.

Add Comments

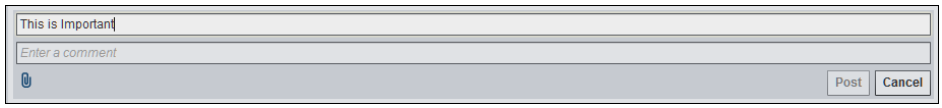
On the Comments page, you view and add comments. You add comments after saving.

Display 7.165 *Comments*



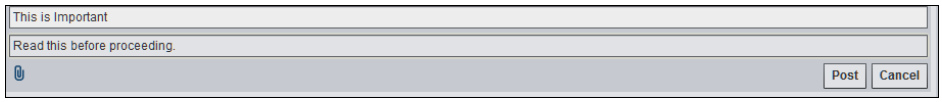
Enter a topic name to add a new comment.

Display 7.166 *New Topic*



Enter the text of the new comment.

Display 7.167 *Comment Text*

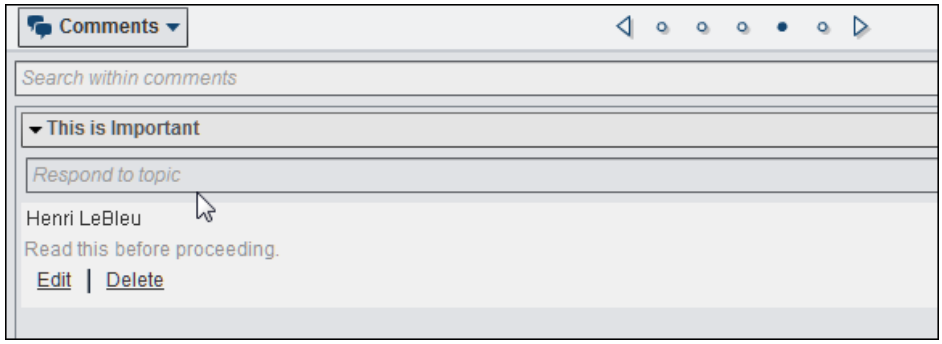


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

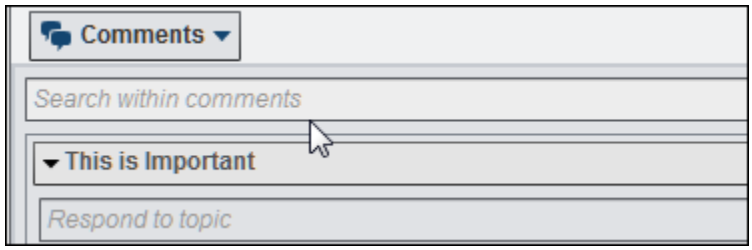
To reply to an existing comment, type text in the field below the comment title.

Display 7.168 *Comments List*



Type in the search field to find text in comments.

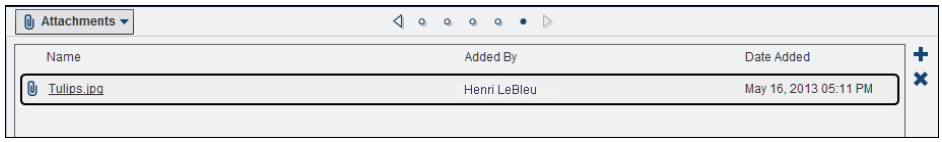
Display 7.169 *Search Comments*



Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.170 *Attachments*



Click ✚ to select a file to attach.

Responses

Overview of Response Definitions

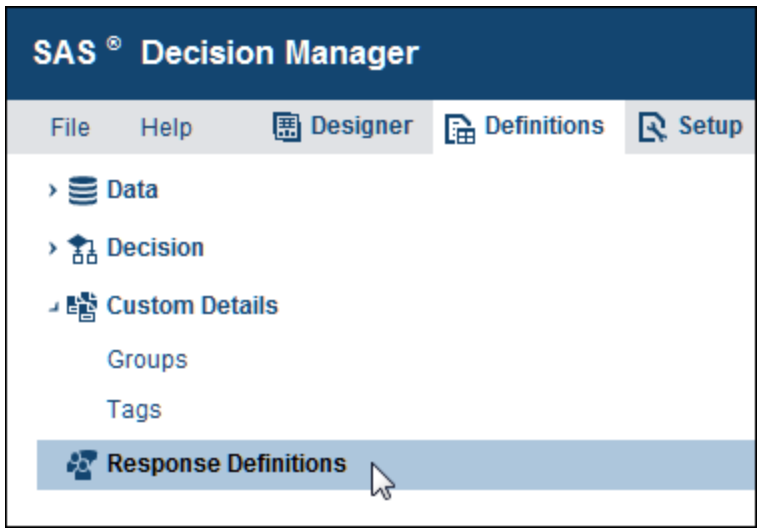
A response is the reaction that an individual or a system has to a decision, such as handling a claim or processing a case.

Responses are tracked by Reply nodes and standard replies. You specify the content of the responses by creating response definitions.

Create a Response Definition

To create a response definition, select the Response Definitions category in the Definitions workspace.

Display 7.171 *Response Definitions*



Click to create a response definition.

Specify Response Definition Properties

The Properties page displays the name and description of the response definition.

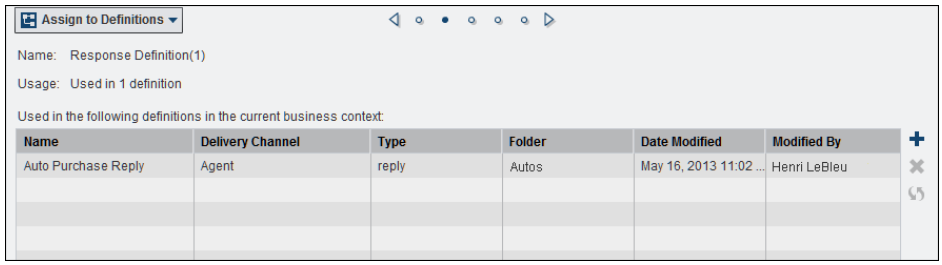
Display 7.172 *Response Definition Properties*

The response code is generated automatically and cannot be edited.

Assign Communication Definitions to a Response

On the Assign to Definitions page, you assign the response to communication definitions. Then you are able to select from the assigned response definitions on the Responses page of the Communication node in a campaign.

Display 7.173 *Assign to Definitions*

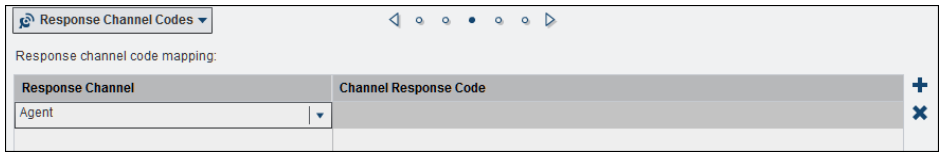


Click ✚ to select one or more definitions to associate with the response.

Assign Channels to a Response

On the Response Channel Codes page, you map channels to channel response codes. Response codes are used in reporting to track responses.

Display 7.174 *Response Channel Codes*



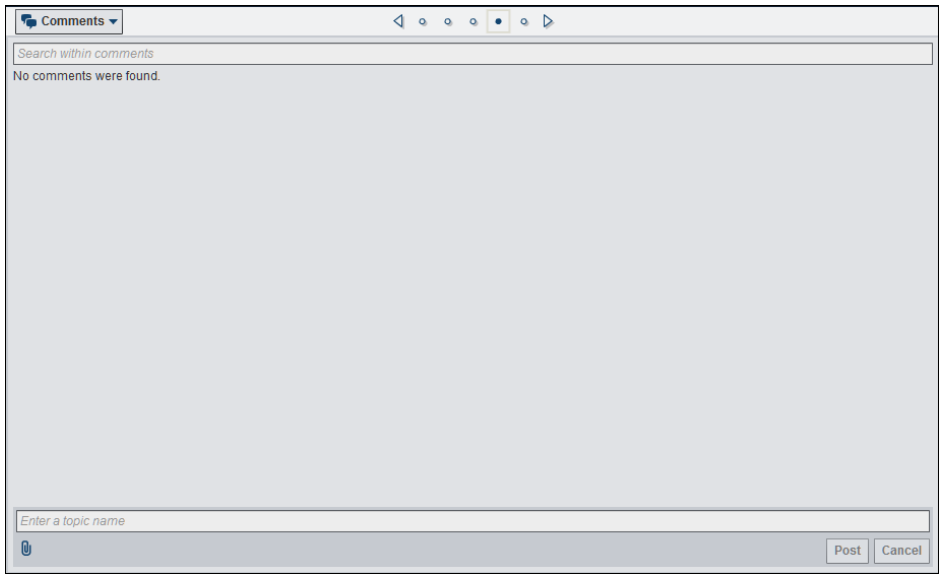
To map a channel to a channel response code:

- Click ✚ to add a row to the table.
- Click the **Response Channel** cell and select a channel from the list.
- Enter a code in the **Channel Response Code** cell. The code should be recognizable by the channel.

Add Comments

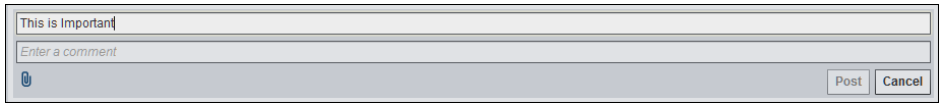
On the Comments page, you view and add comments. You add comments after saving.

Display 7.175 *Comments*



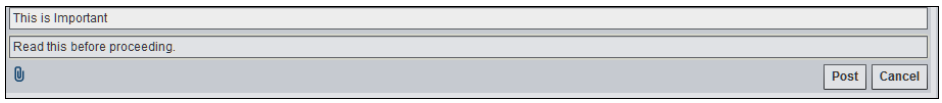
Enter a topic name to add a new comment.

Display 7.176 *New Topic*



Enter the text of the new comment.

Display 7.177 *Comment Text*

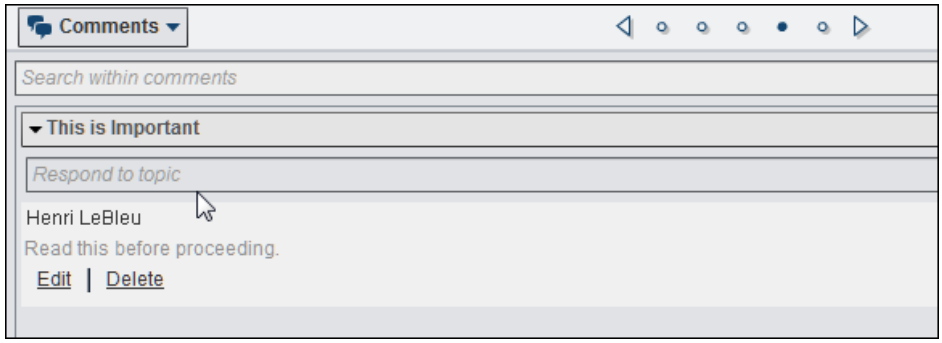


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 7.178 *Comments List*



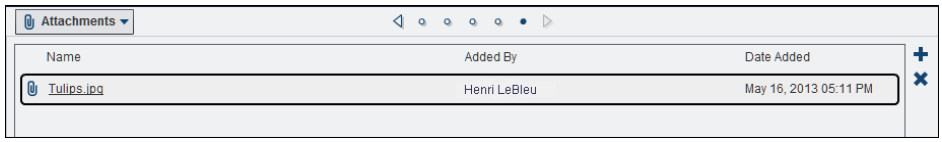
Type in the search field to find text in comments.

Display 7.179 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 7.180 *Attachments*



Click + to select a file to attach.

Chapter 8

Managing Business Rules and Rule Sets

About Rules and Expressions

A rule specifies conditions to be evaluated and actions to be taken if those conditions are satisfied. Most rules correspond to this form:

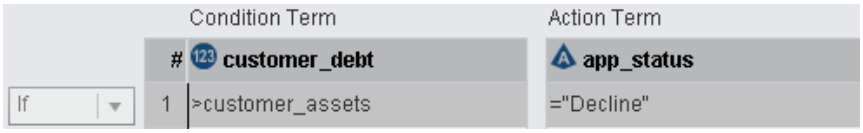
if *condition_expressions* then *action_expressions*

For example, suppose you have the following rule:

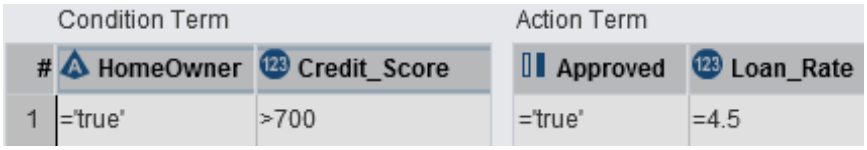
```
if customer_debt > customer_assets then app_status="Decline"
```

In this case, **customer_debt** is a condition term, and **customer_debt > customer_assets** is a condition expression. The term **app_status** is an action term, and **app_status="Decline"** is an action expression. To enter this rule into the decision table, you first need to add the terms **customer_debt** and **app_status** to the decision table, and then enter the expressions under the terms to which the expressions apply.

The following figure shows the decision table with this rule added to it:



A single rule can have multiple terms, conditions, and actions. Multiple condition expressions within the same rule are joined together with the AND operand. For example, suppose you define the following rule in SAS Decision Manager:



SAS Decision Manager generates the following rule condition:

```
(HomeOwner='true') AND (Credit_Score > 700)
```

Action expressions are always assignment statements.

About Rule Sets

Rules are grouped together into rule sets. Rule sets are logical collections of rules that are grouped together because of interactions or dependencies between the rules or because they are processed together when they are published.

By default, the condition expressions for all rules are evaluated regardless of the results of previous rules, and they are executed sequentially. However, you can use the ELSE and OR operators to control when the condition expression for a rule is evaluated. See "Controlling Which Conditions Are Evaluated" on page 157 for more information.

For all rules, if the rule's condition expression evaluates to true, SAS Decision Manager executes the rule's action expression.

Create a New Rule Set

To create a new rule set:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the folder where you want to create the new rule set, and select **New Rule Set**. Alternatively, select the folder where you want to add the new rule set, click in the toolbar, and then select **New Rule Set**.
3. In the New Rule Set dialog box, enter a name for the new rule set. Rule set names are limited to 100 characters and must be unique within a folder.
4. (Optional) Enter a description for the new rule set. Descriptions are limited to 256 characters.
5. Select the vocabulary that is associated with the new rule set.
6. Click **Create**. SAS Decision Manager opens the decision table for the new rule set.

The default view of a rule set is the horizontal view. In the horizontal view, the terms used by the rules in the rule set are displayed across the top of the decision table, and the decision table has one row for each rule in the rule set. To switch to the vertical view, select **Vertical** from the menu in the toolbar above the decision table. In the vertical view, the terms used by the rules are displayed in the left column, and the decision table has one column for each rule in the rule set.

Open an Existing Rule Set

In the Designer workspace, select the **Business Rules** category. You can open a rule set in one of the following ways:

- Double-click on the rule set.
- Select the rule set, and click **Open** in the toolbar.
- Right-click on the rule set, and select **Open**.

Defining New Rules in the Rule Set

Add a New Rule

There are three ways to add a new rule to a rule set:

- Click . You can modify the rule name and description on the **Rule Details** tab.
- Click in the decision table in the same row as . You can modify the rule name and description on the **Rule Details** tab.
- Click in the toolbar that is above the decision table.SAS Decision Manager opens the New Rule dialog box.

1. (Optional) Enter a name for the new rule.
2. (Optional) Enter a description for the new rule.
3. (Optional) Change the order of the new rule. The rule order, in addition to the IF, ELSE, or OR keyword (see "Controlling Which Conditions Are Evaluated"), controls how rules are evaluated within the rule set.

   Note: You can also change the order of the rules later by right-clicking on a rule order number and selecting either **Reorder** or **Swap**. See "Change the Order of Rules in a Rule Set" on page 166 for more information.
4. Click **OK**. SAS Decision Manager adds a row (or column, in the vertical view) for the new rule to the decision table.

Rule names are limited to 100 characters and must be unique within a rule set. Descriptions are limited to 256 characters.

Define Expressions for a Rule

To define the expression for a rule:

1. Add any additional terms to the decision table that are needed by the rule. You can add a single term in one of two ways:
   - Right-click on the term in the Vocabulary pane, and select either **Use as condition term** or **Use as action term**.
   - Drag the term from the Vocabulary pane onto a column in the decision table.

   You can also add multiple terms at the same time.
   - If the terms that you want to add to the table all belong to the same entity, you can add the entire entity to the decision table in the same way that you add a single term. Note that an entity can contain dozens of terms, and there is no way to undo this operation after the terms have been added to the decision table.
   - If the terms do not all belong to the same entity, select the terms and drag them onto the table, or use the right-click menu as you would for a single term. To select a consecutive set of terms, click on the first term, hold down the Shift key, and click on the last term. To select nonconsecutive terms, hold down the Ctrl key, and click on each term that you want to select.

   For example, if your rule is `If balance <100 then risk ="high"`, the condition term is `balance` and the action term is `risk`.

   TIP By default, terms are listed in the decision table in alphabetical order. You can reorder the terms by dragging the terms in the column or row headings.

   TIP You can add new entities and terms by clicking  in the Vocabularies pane. You can also edit existing entities and terms by right-clicking on the entity or term and selecting the appropriate option. SAS Decision Manager opens the same dialog box that you would see if you were working in the Definitions workspace. See "Create New Entities" on page 40 and "Create New Terms" on page 41 for more information.
2. For each term that is used in the new rule, specify the expression that applies to that term in the row or column for the new rule. For example, if the rule is `If balance <100 then risk ="high"`, the expression for `balance` is `<100`, and the expression for `risk` is `="high"`.

   Expressions can be up to 1024 characters long. They can contain numeric constants, character strings, vocabulary terms, operators, and SAS functions. Condition

expressions can also contain the Lookup function. Action expressions can contain the LookupValue function. However, if the expression contains the Lookup or LookupValue function, then the expression cannot contain anything else.

TIP A rule that does not have a condition expression always executes.

You can enter expressions directly into the decision table, or you can use the Expression Editor to create and edit expressions. To open the Expression Editor, click in the table cell, and select .

As you enter expressions into each cell, SAS Decision Manager displays the rule conditions and actions, including the operators and term names that are added by SAS Decision Manager, on the **Rule Details** tab.(See "Terms and Operators Added by SAS Decision Manager" on page 164.) For example, suppose you enter the following rule in the decision table:

	Condition Term		Action Term
#	Credit_score	DownPmt	Risk_Category
1	>=720 AND <750	>=.20	="Medium"

SAS Decision Manager displays the following expressions on the **Rule Details** tab.

```
Condition: (Credit_score >= 720 and Credit_score < 750) AND (DownPmt >= .20)
Action: Risk_Category = "Medium"
```

For more information about entering expressions, see the following topics:

- "Using the Expression Editor" on page 159
- "Punctuation for Data Values" on page 162
- "Operators for Use in Expressions" on page 163
- "Verify Lookup Keys (Lookup Function)" on page 47
- "Get Lookup Values (LookupValue Function)" on page 48
- "Using Functions in Expressions" on page 163
- "Working with Missing Values" on page 164
- "Terms and Operators Added by SAS Decision Manager" on page 164
- "Examples of Expressions" on page 164

3. (Optional) Select the operator for the rule. The default operator is IF. See "Controlling Which Conditions Are Evaluated" on page 157 for more information.
4. Click to save the rule set. SAS Decision Manager validates the syntax of the expressions. If it does not detect any problems, it saves the rule set. See "Validate the Expressions in a Rule Set" on page 166 for more information.

Controlling Which Conditions Are Evaluated

You add conditional processing within a rule set by using the IF, ELSE, and OR operators. By default, rules are assigned the keyword IF, which means that the rule's condition is evaluated regardless of the results of previous rules. You can change this outcome by changing the operator for a rule to ELSE or OR.

If you set a rule's operator to ELSE, then the rule's condition is evaluated only if the previous rule's condition evaluated to false. For example, given the rule set shown the following display, if Order_Quanitity is 12, the condition for rule 1 evaluates to false,

the condition for rule 2 evaluates to true. Therefore, the action for rule 2 is executed. The conditions for rules 3 and 4 are not evaluated.

		Condition Term	Action Term
	#	Order_Quantity	Offer_Percent
If	1	<=5	=5
Else	2	>=10 AND <=15	=10
Else	3	>=20 AND <=25	=15
Else	4	>=30	=20

Use the OR operator to break up very long condition expressions into multiple condition expressions and to assign the same action to each of the conditions. If any of the conditions evaluate to true, SAS Decision Manager executes the action of the last rule that was assigned the IF or ELSE operator. When you have several consecutive rules that are all assigned the OR operator, only the action for the first rule whose condition evaluates to true is executed. The conditions for the remaining consecutive OR rules are not evaluated.

For example, suppose you have a very long condition expression such as the one shown in the following display.

		Condition Term
	#	Order_Quantity
If	1	<=5 OR (Order_Quantity >= 10 AND Order_Quantity <=15) OR (Order_Quantity >= 20 AND Order_Quantity <=25) OR Order_Quantity >=30

As shown in the next display, you can break this expression into four different rules and use the OR operator, which makes the rule much easier to read and edit.

		Condition Term
	#	Order_Quantity
If	1	<=5
Or	2	>=10 AND <=15
Or	3	>=20 AND <=25
Or	4	>=30

If you assign the OR operator to a rule, then you cannot enter an action expression for the rule. SAS Decision Manager uses the action expression of the last rule that was assigned the IF or ELSE operator.

For example, for the following rule set, rules 1 though 4 use the action expression that is defined for rule 1. Rules 5 through 7 use the action expression that is defined for rule 5.

Display 8.1 *Rule Set That Defines Seven Rules in Two IF Blocks*

		Condition Term	Action Term	
	#	Order_Quantity	Direct_mail_offer	Offer_Percent
If	1	<=5	=False	=5
Or	2	>=10 AND <=15		
Or	3	>=20 AND <=25		
Or	4	>=30		
If	5	>=6 AND <=9	=True	=10
Or	6	>=16 AND <=19		
Or	7	>=26 AND <=29		

An IF block is a series of rules that begins with an IF operator and extends up to but does not include the next IF operator. In the rule set shown in Display 8.1 on page 159, rules 1 to 4 are an IF block and rules 5 to 7 are a second IF block.

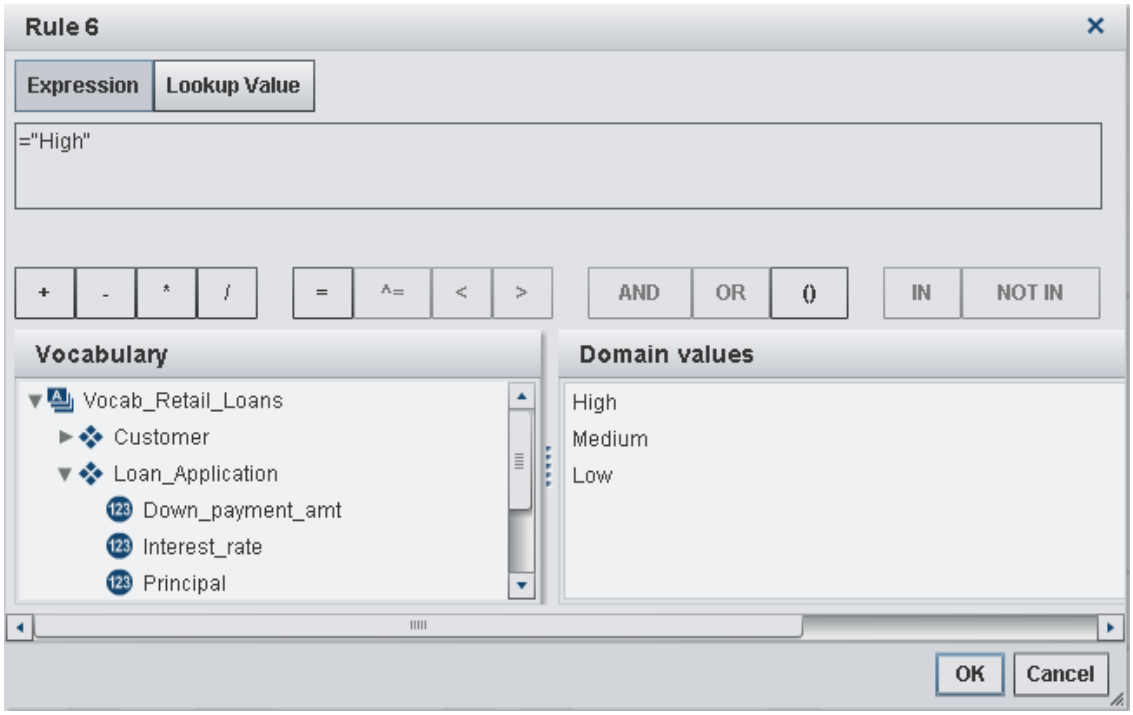
Note: A rule that does not have a condition expression must be the last rule in an IF block.

Using the Expression Editor

Open the Expression Editor

To open the Expression Editor, click in a cell in the decision table, and select  . Alternatively, right-click in the cell, and select **Expression Editor**.

Display 8.2 *Expression Tab for a Condition Term*



If you open the Expression Editor for a condition term, then the Expression Editor contains the **Expression** tab and the **Lookup** tab. If you open the Expression Editor for an action term, it contains the **Expression** tab and the **LookupValue** tab. Also, the comparison operators ^=, <, >, AND, OR, IN, and NOT IN are disabled because action expressions can be assignment expressions only.

Build an Expression in the Expression Editor

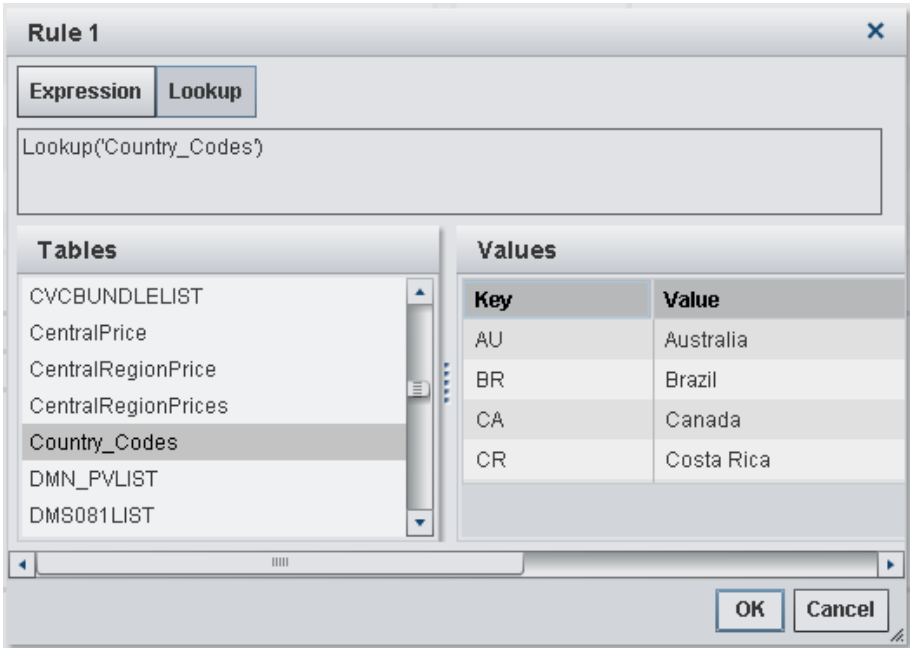
To define expressions that do not use the Lookup or LookupValue functions, enter the expression on the **Expression** tab. Click on the operators, vocabulary terms, and domain values as needed to add them to the expression. The Expression Editor builds the expression in the top field. To add numeric constants, character strings, or functions to the expression, enter them directly into the top field. (Remember to use the correct punctuation. See "Punctuation for Data Values" on page 162.) When you are finished, click **OK**. The Expression Editor adds the expression to the cell in the decision table where you opened the editor.

To build an expression that uses the Lookup or LookupValue functions, switch to the **Lookup** or **LookupValue** tabs. You can enter the Lookup function in condition expressions only, and you can enter the LookupValue function in action expressions only. See "Specify the Lookup Function" and "Specify LookupValue Function" for more information.

Specify the Lookup Function

To use the Expression Editor to enter the Lookup function, click the **Lookup** tab, double-click on the lookup table name that you want to specify in the function call, and click **OK**.

Display 8.3 *Lookup Tab in the Expression Editor*



For more information, see "Verify Lookup Keys (Lookup Function)" on page 47.

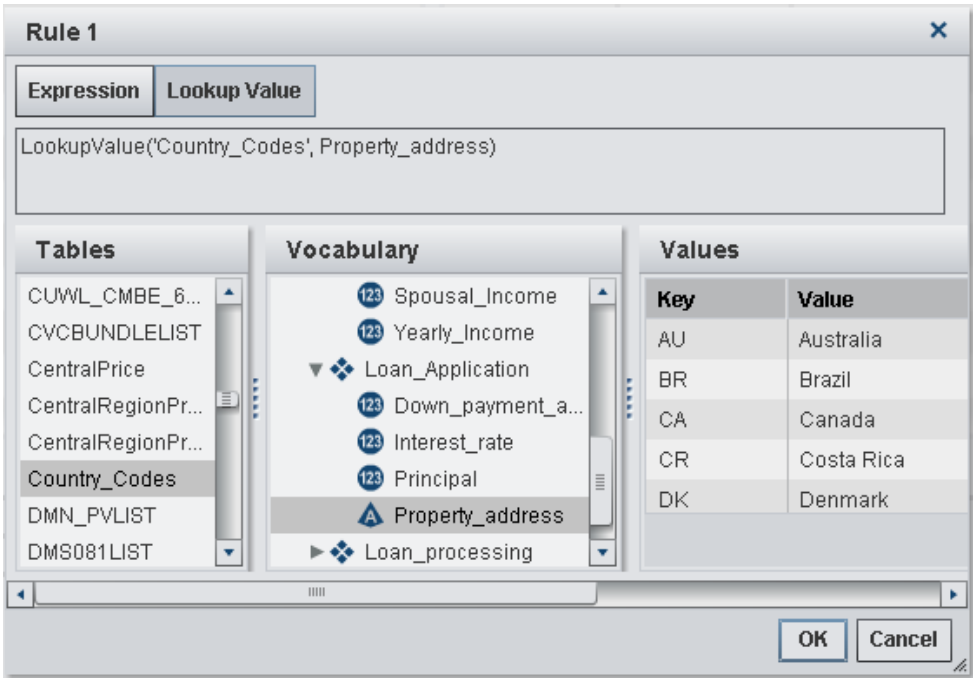
Specify LookupValue Function

To use the Expression Editor to enter the LookupValue function:

1. Click the **LookupValue** tab.
2. Double-click on the lookup table name.
3. Specify the term name or the character string that contains the lookup key value. To specify a term, double-click on the term name. To specify a character string as the lookup key value, enter the character string in the field at the top of the **LookupValue** tab. Enclose the string in quotation marks.
4. Click **OK**.

For more information, see "Get Lookup Values (LookupValue Function)" on page 48.

Display 8.4 *LookupValue Tab in the Expression Editor*



Punctuation for Data Values

Values for some data types might need to be enclosed in quotation marks, as shown in the following table. Date and datetime values must be followed with **`d`** and **`dt`**, respectively.

Table 8.1 *Punctuation Needed for Data Values*

Data Type	Punctuation Needed	Example

String	Enclose strings in either single or double quotation marks.	`='Gold Account'`
		`="Ineligible"`
		`="d'oscail"`

Date	Enter date values by using the format DDMMMYYYY. Enclose each value in quotation marks followed by **`d`**.	`='01SEP2012'd` `>='31SEP2012'd`
Datetime	Enter datetime values by using the format DDMMMYYYY:HH:MM:SS. Use 24-hour clock notation. Enclose each value in quotation marks followed by **`dt`**.	`='01SEP2012:15:00:00'dt` `<='31SEP2012:15:00:00'dt`
Boolean	Boolean values do not need to be enclosed in quotation marks. Enter only **`True`** or **`False`**.	`=True` `=False`

Operators for Use in Expressions

The following table lists the operators that you can use in an expression. Do not enter a space between the elements of the operators <=, >=, or ^=. See "SAS Operators in Expressions" in Chapter 6 of *SAS Language Reference: Concepts* for more information about the operators shown in the table.

Table 8.2 *Operators*

Operator	Definition	Example
*	Multiply	`.085 * sales`
/	Divide	`amount / 5`
+	Add	`num + 3`
–	Subtract	`sale - discount`
=	Equal to	`numTries = maxTriesAllowed`
^=	Not equal to	`insufficientFunds ^= True`
>	Greater than	`daysLate > 5`
<	Less than	`num < 8`
>=	Greater than or equal to	`balance >= 1000`
<=	Less than or equal to	`balance <= 250`
IN (*value-list*)	Equal to an item in *value-list*	`in ("high","medium","low")`
NOT IN (*value-list*)	Not equal to an item in *value-list*	`not in (10,20,30)`
expression AND *expression*	If both expressions are true, the result is true.	`dateExpired >= '01AUG2012'd AND dateExpired <= '31AUG2012'd`
expression OR *expression*	If either expression is true, the result is true.	`dateEnrolled >= '01JAN2012' OR member = True`

Using Functions in Expressions

SAS Decision Manager supports the following functions in rule expressions:

- Lookup and LookupValue functions. See "Verify Lookup Keys (Lookup Function)" on page 47 and "Get Lookup Values (LookupValue Function)" on page 48 for more information.

- DS2 functions that are listed in Table A2.1 on page 285. For information about these DS2 functions, see *SAS DS2 Language Reference* at **http://support.sas.com/documentation/onlinedoc/base/index.html**.
- Base SAS functions INPUTC and PRXMATCH. For information about these functions, see *SAS Functions and CALL Routines: Reference* at **http://support.sas.com/documentation/onlinedoc/base/index.html**.

Working with Missing Values

You can enter a missing value for a character string as a null string (**=""**), and you can use a period (**=.**) to designate missing numeric values.

Missing values have a value of **false** when you use them with logical operators such as AND or OR. For more information, see Chapter 5, "Missing Values," in *SAS Language Reference: Concepts*.

You can also use the MISSING function to check for missing values. This function returns a 0 (false) or 1 (true). For more information, see *SAS Functions and CALL Routines: Reference*.

Terms and Operators Added by SAS Decision Manager

Remember these rules when you are entering expressions:

- If you do not specify an operator at the beginning of an expression, SAS Decision Manager adds an equal sign to the beginning of the expression. For example, if you enter **5+x** for an expression, SAS Decision Manager uses **=5+x**.
- In condition expressions, when an AND or OR operator is followed immediately by another operator, SAS Decision Manager inserts the column term between the AND or OR operator and the operator that follows it. For example, if you enter **>5 and <10** for **myterm**, SAS Decision Manager uses **myterm>5 and myterm<10**. SAS Decision Manager inserts the term for top-level AND or OR operators in condition expressions only. It does not insert the term with nested AND or OR operators or in action expressions.

Examples of Expressions

The following table shows examples of expressions that you can specify. Unless otherwise specified, all of these expressions are valid as condition expression.

Table 8.3 *Examples of Expressions*

Expression As Entered Into the Decision Table For Term X	Resulting Expression	Valid as a Condition Expression	Valid as an Action Expression
`5`	`x=5`	Yes	Yes
`=5`	`x=5`	Yes	Yes
`"mystring"`	`x="mystring"`	Yes	Yes
`=term1`	`x=term1`	Yes	Yes

Expression As Entered Into the Decision Table For Term X	Resulting Expression	Valid as a Condition Expression	Valid as an Action Expression
`5 or >100`	`x=5 or x>100`	Yes	No See Note 1.
`^=5 and x<10`	`x^=5 and x<10`	Yes	No See Note 1.
`^=5 or >=(100/4)`	`x^=5 or x>=(100/4)`	Yes	No See Note 1.
`in (10,20,30)`	`x IN (10,20,30)`	Yes	No See Note 1.
`not in ('med','high')`	`x NOT IN ('MED','HIGH')`	Yes	No See Note 1.
`<'10JUN2012'd`	`x<'10JUN2012'd`	Yes	No See Note 1.
`>'10JUN2012:17:00:00'dt`	`x>'10JUN2012:17:00:00'dt`	Yes	No See Note 1.
`=ABS(-10)`	`x=ABS(-10)`	Yes	Yes
`=True`	`x=True`	Yes	Yes
`False`	`x=False`	Yes	Yes
`&myMacroVar`	`x=&myMacroVar`	Yes See Note 2.	Yes See Note 2.
`%EVAL(&myMacroVar)`	`x=%EVAL(&myMacroVar)`	Yes See Note 2.	Yes See Note 2.
`term1=5`	`x=term1=5`	Yes See Note 3.	Yes See Note 4.
`term1=3 or term2=5`	`x=term1=3 or term2=5`	Yes See Note 5.	Yes See Note 6.
`5 or (x>10 and <20)`	This expression is invalid as both a condition expression and as an action expression. SAS Decision Manager does not add column names after nested AND or OR operators.		

Expression As Entered Into the Decision Table For Term X	Resulting Expression	Valid as a Condition Expression	Valid as an Action Expression
`>"mystring"`	This expression is invalid as both a condition expression and as an action expression. SAS Decision Manager checks whether literal types are compatible with the specified operators. Character strings are not compatible with numeric operators.		
`+10`	This expression is invalid as both a condition expression and as an action expression. SAS Decision Manager adds column names to the expression only after AND and OR operators. It does not add column names after other operators such as the plus sign.		

Notes:

1. Action expressions must be assignment expressions only.
2. SAS Decision Manager validates macro functions and variables based only on whether the syntax is correct. It does not check to determine whether a macro function or variable will be accessible when the rule set is executed.
3. This expression is valid. However, it should be avoided. As a condition statement, this expression checks to determine whether both **x** and **term1** are equal to 5. The recommended way to enter this expression is **=5 and term1=5**.
4. As an action expression, this expression becomes a Boolean assignment statement. This expression determines whether **term1** is equal to 5, and if so, assigns a value of 1 (true) to **x**. If not, it assigns a value of 0 (false) to **x**.
5. This expression is valid. However, it should be avoided. As a condition statement, this expression checks to determine whether both **x** and **term1** are equal to 3 or whether **term2** is equal to 5. The recommended way to enter this expression is **(=5 or term1=3) or term2=5**.
6. As an action expression, this expression becomes a Boolean assignment statement. This expression determines whether either **term1** is equal to 3 or **term2** is equal to 5, and if so, assigns a value of 1 (true) to **x**. If not, it assigns a value of 0 (false) to **x**.

Validate the Expressions in a Rule Set

To validate the syntax in rule expressions, click  .

SAS Decision Manager does not check whether the results produced by the expressions are of the correct data type for the terms to which the expressions apply. Also, when domain values are defined for a term, SAS Decision Manager does not check whether the values that are assigned to the term are included in the list of domain values.

Change the Order of Rules in a Rule Set

There are two ways to change the order of the rules in a rule set. You can move a single rule to a new position, and SAS Decision Manager adjusts the position of the remaining

rules in the rule set. Alternatively, you can swap the position of two rules, and SAS Decision Manager leaves the remaining rules in their original positions.

Move a Rule to a New Position in a Rule Set

There are two ways to move a rule to a new position:

- Drag the rule to the new position.
- Use the **Reorder** menu selection.

To drag a rule to a new position in the rule set, move the mouse pointer over the rule order number, and drag the rule number to the new position.

To use the **Reorder** menu selection to move a rule:

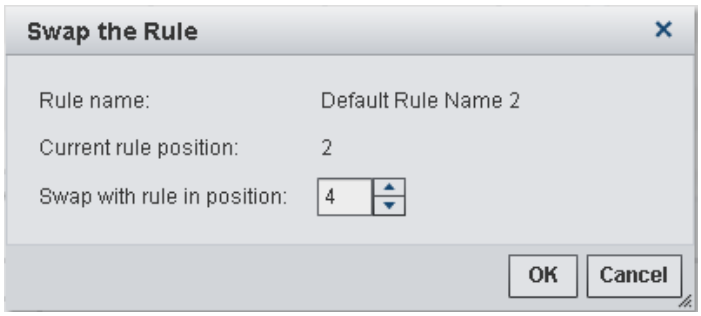
1. Right-click on the order number of the rule that you want to move, and select **Reorder**.

2. Select the new position number for the rule.
3. Click **OK**. SAS Decision Manager moves the rule to the new position and repositions the remaining rules up or down as needed.

Swap Two Rules

To swap the position of two rules:

1. Right-click on the order number of one of the rules that you want to move, and select **Swap**.



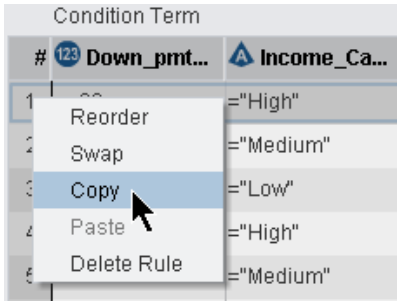
2. Select the position number for the second rule that you want to move.
3. Click **OK**. SAS Decision Manager swaps the positions of the two rules and leaves all other rules in their original positions.

Copy Rules and Expressions

Copy an Entire Rule

To copy and paste an entire rule:

1. Right-click on the order number of the rule that you want to copy, and select **Copy**.

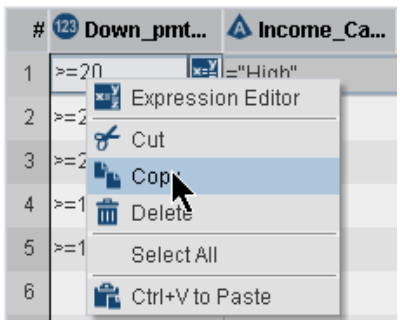


2. Right-click in the decision table, and select **Paste**. SAS Decision Manager adds the copied rule to the bottom of the decision table. You can then edit or reorder the new rule as needed.

Copy Text within a Rule

To copy and paste an expression or part of an expression:

1. Click in the table cell that contains the text that you want to copy.
2. Select the text that you want to copy. To select all of the text in a cell, right-click and select **Select All**.
3. Right-click on the text and select **Copy**.



4. Click in the cell where you want to paste the text and press Ctrl+V.

Delete Rules and Expressions

Delete a Rule

You can delete a rule in one of two ways:

- Click on the order number of the rule that you want to delete, and click  .
- Right-click on the order number of the rule, and select **Delete Rule**.

Delete or Cut and Paste Text within a Rule

To cut and paste an expression or part of an expression:

1. Select the cell in the decision table containing the text that you want to copy.
2. Select the text that you want to cut. To select all of the text in a cell, right-click and select **Select All**.
3. Right-click in the cell and select **Delete** or **Cut**.
4. To paste the text, click in the cell where you want to paste the text, and press Ctrl+V.

Edit the Name and Description of a Rule Set

To change the name or description of an existing rule set:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the rule set that you want to edit, and select **Edit Rule Set**.
3. Change the name and description as needed, and click **OK** to save the changes.

Edit the Name and Description of a Rule

To edit the name or description of an individual rule, you must open the rule set that contains the rule. You can edit the name and description of any of the rules in the rule set by clicking on the rule, and editing the name and description on the **Rules Details** tab. Click  to save your changes.

Copy a Rule Set

You can create a copy of a rule set within the same folder.

To copy a rule set:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the rule set, and select **Copy Rule Set** from the menu. SAS Decision Manager opens the Copy Rule Set dialog box.
3. Enter the name for the new copy of the rule set.
4. (Optional) Enter a description for the rule set.
5. Click **OK**.

Move a Rule Set to a Different Folder

To move a rule set to a different folder:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the rule set, and select **Move Rule Set** from the menu. SAS Decision Manager opens the Choose a Location dialog box.
3. Select the folder where you want to move the rule set to.
4. Click **Move**.

Delete a Rule Set

Note: You cannot delete a rule set if it is used in a rule flow.

To delete a rule set:

1. In the Designer workspace, select the **Business Rules** category.
2. Select the rule set and click  . Alternatively, you can right-click on the rule set, and select **Delete** from the menu.

Save a Rule Set

To save changes to a rule set, click  . SAS Decision Manager validates the syntax of the expressions and displays an error message if it finds any problems. If SAS Decision Manager does not detect any problems with any of the expressions, it saves the rule set. See "Validate the Expressions in a Rule Set" on page 166 for more information.

Chapter 9

Creating and Publishing Rule Flows

Introduction to Rule Flows

A business rule flow is a logical collection of multiple rule sets that define multiple conditions and actions. In general, the rule sets in a rule flow are executed in the order in which they are defined in the rule flow. However, with complex rule flows, certain sections of rule sets are usually executed more times than others. See "Simple Rule Flows, Complex Rule Flows, and BY Groups" on page 172 for more information.

After you publish a rule flow to the SAS Metadata Server, other applications can deploy the published rule flows as SAS programs and services. These programs and services process input data, which contains conditions, in order to create output data, which contains actions. The terms used in the rule flows are mapped to table columns by the applications that use the published rule flows within metadata.

Simple Rule Flows, Complex Rule Flows, and BY Groups

There are two general types of rule flows, simple and complex. A simple rule flow has a single group of rule sets. All of the rule sets are run and output is generated for each input record.

A complex rule flow has at least three sections: Initial, Main, and Final. Rule sets in the Initial section are run only when the first input record is processed. Rule sets in the Main section are run for each input record. Rule sets in the Final section are run after the last input record has been processed by the rule sets in the Main section.

For complex rule flows, you can specify *BY-group terms*. If you specify BY-group terms, then SAS Decision Manager sorts the input data by those terms, and results are calculated for each group of input records that have the same value for all of the terms. Output is generated for each BY group instead of for each input record.

Also, if you specify BY-group terms, SAS Decision Manager adds two new sections to the rule flow, Group Start and Group End. The rules sets in these sections are run with the first and last input record in each BY group.

Create a Rule Flow

To create a rule flow:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the folder where you want to create the new rule flow, and select **New Rule Flow**. Alternatively, select the folder where you want to add the new rule flow, click in the toolbar, and then select **New Rule Flow**.
3. In the New Rule Flow dialog box, enter a name for the new rule flow. Rule flow names are limited to 32 characters and can contain any character except forward slash (/), backslash (\), left brace ({), right brace (}), colon (:), and question mark (?).
4. (Optional) Enter a description for the new rule flow. Descriptions are limited to 256 characters.
5. Click **Create**. SAS Decision Manager opens the rule flow editor.
6. (Optional) Select **Complex Rule Flow** from the menu in the toolbar. SAS Decision Manager adds Initial and Final sections to the rule flow table. The rules in these sections are run at the start and end of the rule flow.
7. Drag the rule sets that you want to add to the rule flow from the Resources pane onto the rule flow table.

   Note: A rule flow can use only rule sets that are defined for the same vocabulary. After the first rule set is added to the rule flow, the vocabulary for the rule flow is

established. Only the rule sets that use the same vocabulary are displayed in the Resources pane.

Note: A rule set can be added to the same rule flow only once.

8. (Optional) If you selected **Complex Rule Flow**, specify BY-group processing. When you specify BY-group processing, all of the input records that have the same values for the BY-group terms are processed before output is generated. One output record is written for each group.
   a. Select the terms that serve as BY-group terms. SAS Decision Manager adds Group Start and Group End sections to the table.
   b. (Optional) Drag the rule sets that you want to add to the new sections into the Group Start and Group End sections of the table. The rules in these groups are run at the start and end of each BY group.
9. (Optional) Reorder the rule sets. To move a rule set, select the rule set, and click or to move it to a different row in the table. To move a rule set to a different section (Initial, Main, and so on), you must delete the rule set, and then add it to the other section.
10. Click to save the rule flow.

Open an Existing Rule Flow

To open an existing rule flow:

1. In the Designer workspace, select the **Business Rules** category.
2. Do one of the following:
   - Double-click on the rule flow.
   - Select the rule flow, and click **Open** on the toolbar.
   - Right-click on the rule flow, and select **Open**.

Open Rule Sets from the Rule Flow Editor

You can open a rule flow and some or all of its rule sets in the same layout. In the rule flow editor, either double-click on the rule sets that you want to open, or select the rule sets and click .

Add Attachments to a Rule Flow

To add an attachment such as a document or an image file:

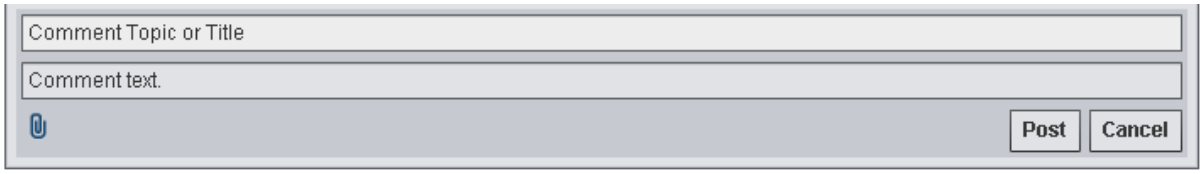
1. Use the Page Manager to select the Attachments page.
2. Click , and select the attachment file.

3. Click .

Add Comments to a Rule Flow

To add a comment:

1. Use the Page Manager to select the Comments page.
2. Enter a topic title and enter the comment. The topic title is required, and the field for comments does not appear until you enter the topic title.



3. (Optional) Click to add an attachment such as an image or a document.
4. Click **Post**.

To reply to an existing comment, enter your reply in the field immediately below the topic title for the existing comment, and click **Post**.

Click to see comments that have been posted by others.

To search for text in the comments, enter text in the search field at the top of the Comment page.

Change the Order of the Rule Sets

You can reorder the rule sets in a rule flow in one of two ways:

- Select the rule set, and click or to move a rule set up or down within the rule flow.
- Drag the order number of the rule set to a new position.

View the Terms Used in a Rule Flow

To view all of the terms that are used in single rule set in a rule flow, open the rule flow, select the rule set, and click .

To view only the input terms that are used in all of the rule sets in the rule flow, open the rule flow, and click .

To view only the output terms that are used in all of the rule sets in the rule flow, open the rule flow, and click .

Note: These icons are unavailable if you have made editing changes to the rule flow. You must save the changes to the rule flow before you click on these icons.

Edit Name and Description for a Rule Flow

To change the name or description of an existing rule flow:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the rule flow that you want to edit, and select **Edit Rule Flow**.
3. Change the name and description as needed, and click **OK** to save the changes.

Copy a Rule Flow

You can create a copy of a rule flow within the same folder.

To copy a rule flow:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the rule flow, and select **Copy Rule Flow** from the menu. SAS Decision Manager opens the Copy Rule Flow dialog box.
3. Enter a name for the new copy of the rule flow.
4. (Optional) Enter a description for the rule flow.
5. Click **OK**.

Move a Rule Flow to a Different Folder

To move a rule flow to a different folder:

1. In the Designer workspace, select the **Business Rules** category.
2. Right-click on the rule flow, and select **Move Rule Flow** from the menu. SAS Decision Manager opens the Choose a Location dialog box.
3. Select the folder where you want to move the rule flow to.
4. Click **Move**.

Delete a Rule Set from a Rule Flow

To remove a rule set from a rule flow, open the rule flow, select the rule set, and then click . Alternatively, you can right-click on the rule set, and select **Remove**.

Delete a Rule Flow

Note: You cannot delete a rule flow if it has been published.

To delete a rule flow:

1. In the Designer workspace, select the **Business Rules** category.
2. Select the rule flow and click . Alternatively, you can right-click on the rule flow and select **Delete**.

Testing a Rule Flow

You can test a rule flow before you publish it. If necessary, you can specify initialization or setup code that you want to run before the rule flow is run. SAS Decision Manager reports rule flow results and test data such as rule-fired data.

Input Data for Rule Flow Tests

SAS Decision Manager expects the input data for the rule flow test to already exist and to be defined as a data table. See "Managing Data Tables" on page 32 for information on defining data tables. Your user ID must have permission to access the data.

Test Setup

To specify code that you want to run before the rule flow is executed, enter the code on the **Test Setup** tab.

You can use the &BRMPrimaryEntityKey and &BRMPrimaryTransactionDTTM macro variables to specify terms whose values are recorded in the ENTITY_PRIMARY_KEY and TRANSACTION_DTTM fields in the rule-fired data. Assigning term values to these macro variables helps you determine the exact input record that caused a rule to execute.

To assign a term of type string to the &BRMPrimaryEntityKey macro variable, specify the variable as follows:

```
%let brmPrimaryEntityKey=termName;
```

If the term contains an integer, specify the variable as follows:

```
%let brmPrimaryEntityKey=put(termName,8.0);
```

The term that you specify for the &BRMPrimaryTransactionDTTM macro should be a term of type datetime. Specify this macro variable as follows:

```
%let brmPrimaryTransactionDttm=termName;
```

Test a Rule Flow

To test a rule flow:

1. Open the rule flow that you want to test.

2. (Optional) On the **Test Setup** tab, enter any SAS code, such as initialization or setup code, that you want to run before the rule flow is run. See "Test Setup" on page 176 for more information.
3. Select the data source that contains the input data for the test, and click **Run**. When the rule flow has completed, the status changes to from **Not Run** to **Successful**.

   SAS Decision Manager displays the results of the rule flow, the rule-fired data, the SAS code that was generated and run by SAS Decision Manager, the SAS log, and test reports. See "View Rule Flow Results and Test Output" on page 177 for more information.
4. (Optional) Click **Save Results** to save the results of the test in SAS data sets. The output of the rule flow is saved in a SAS data set whose name begins with OUTPUT. The rule-fired data is saved in a SAS data set whose name begins with RULEFIRE. The test data, such as the number of records processed, is saved in a data set whose name begins with DEPEXEC. The rule flow identifier and your user ID are appended to the data set name. For example, if the rule flow identifier is 10052 and your user ID is BRMUSER1, then the test results are saved in SAS data sets named OUTPUT10052BRMUSER1, RULEFIRE10052BRMUSER1, and DEPEXEC10052BRMUSER1.

View Rule Flow Results and Test Output

After you have tested a rule flow, SAS Decision Manager executes the rule flow and displays the output that the rule flow produced on the **Results** tab.

SAS Decision Manager also displays the code that was generated and data about the test itself. The SAS code that was generated and run by SAS Decision Manager is displayed on the **Code** tab. The SAS log that was generated when that code was run is displayed on the **SAS Log** tab. The **Test Reports** tab displays a graph that shows the number of times that each rule set was executed. The **Rule Fired Data** tab displays the rule-fired data for the rule flow. A new rule-fired record is created every time a rule is executed. Each record in the table contains the following fields:

RULE_ACTION_FIRE_ID
: the unique identification string that is generated for the rule each time it is executed.

RULE_SET_SK
: the identification number of the rule set.

RULE_SET_NM
: the name of the rule set.

RULE_SK
: the identification number of the rule.

RULE_NM
: the name of the rule.

RULE_FLOW_SK
: the identification number of the rule flow.

RULE_FLOW_NM
: the name of the rule flow.

RULE_FIRE_DTTM
: the date and time that the rule was run.

DEPLMT_EXECUTION_ID
the identification string of the specific instance of the rule flow that was executed.

ENTITY_PRIMARY_KEY
the value of the term that was specified with the &BRMPrimaryEntityKey macro variable in the test preprocessing code.

TRANSACTION_DTTM
the value of the term that was specified with the &BRMPrimaryTransactionDTTM macro variable in the test preprocessing code. The TRANSACTION_DTTM is the value of the datetime term for the record that was being processed when the rule was executed.

See "Test Setup" on page 176 for information about the &BRMPrimaryEntityKey and &BRMPrimaryTransactionDTTM variables.

Publish a Rule Flow

Publishing is the process of writing a business rule flow to the content server. After you publish a rule flow to the content server, other applications can use it.

1. Open the rule flow.
2. If the rule flow contains changes that have not been saved, click  . You cannot publish a rule flow if it contains changes that have not been saved.
3. Click .
4. In the Choose a Location dialog box, select the location where you want to publish the rule flow.

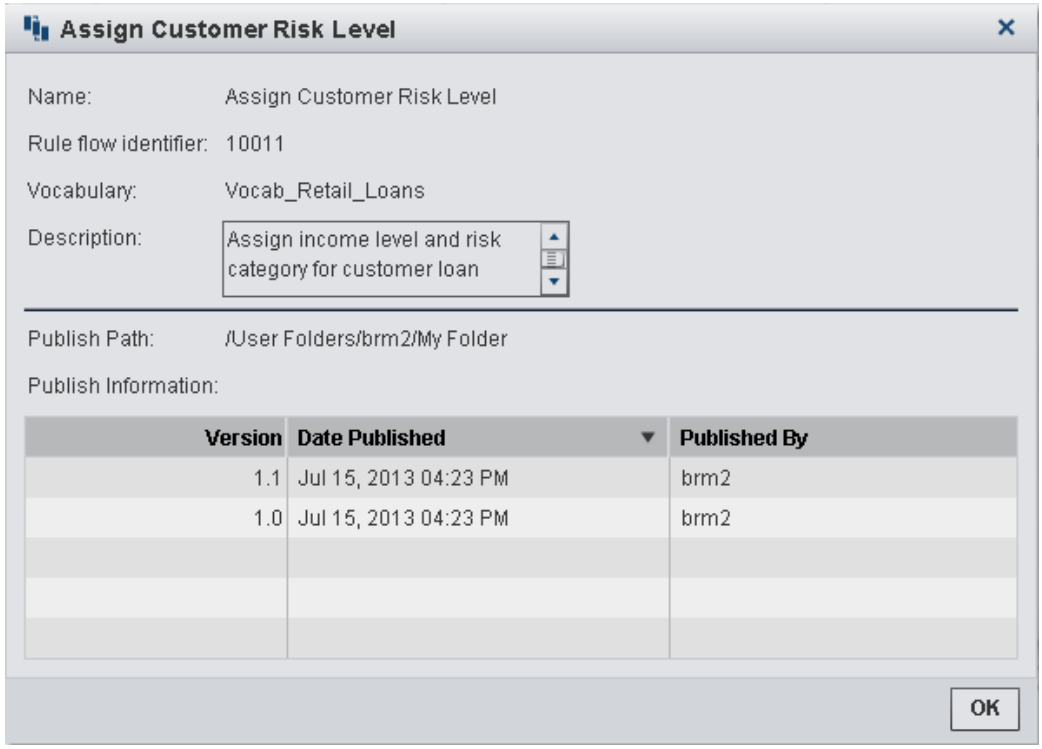
   Note: This dialog box lists all of the objects that are defined in the SAS metadata folders. To limit the list to folders only, select the **Show folders only** check box.

   Note: In the Choose a Location dialog box, to create a new subfolder, click . To delete an existing folder, select the folder, and click  .
5. Click **OK**.

Display Publish Information for Rule Flows

To display publish information for a rule flow, open the rule flow, and click  . SAS Decision Manager opens the rule flow information dialog box. This dialog box displays the name, rule flow identifier, vocabulary, and description for the rule flow. It also displays the folder path to which the rule flow as published and the list of versions that have been published. For each version, it shows the date on which the version was published and the display name or user ID of the user that published the rule flow.

You can control whether the list is displayed in ascending or descending order according to date by clicking the **Date Published** column heading. If the column is sorted in ascending order, a appears beside the column heading. When the column is sorted in descending order, a appears.


Assign Customer Risk Level
Name: Assign Customer Risk Level
Rule flow identifier: 10011
Vocabulary: Vocab_Retail_Loans
Description: Assign income level and risk category for customer loan
Publish Path: /User Folders/brm2/My Folder
Publish Information:
Version
Date Published
Published By
1.1
Jul 15, 2013 04:23 PM
brm2
1.0
Jul 15, 2013 04:23 PM
brm2
OK

Chapter 10

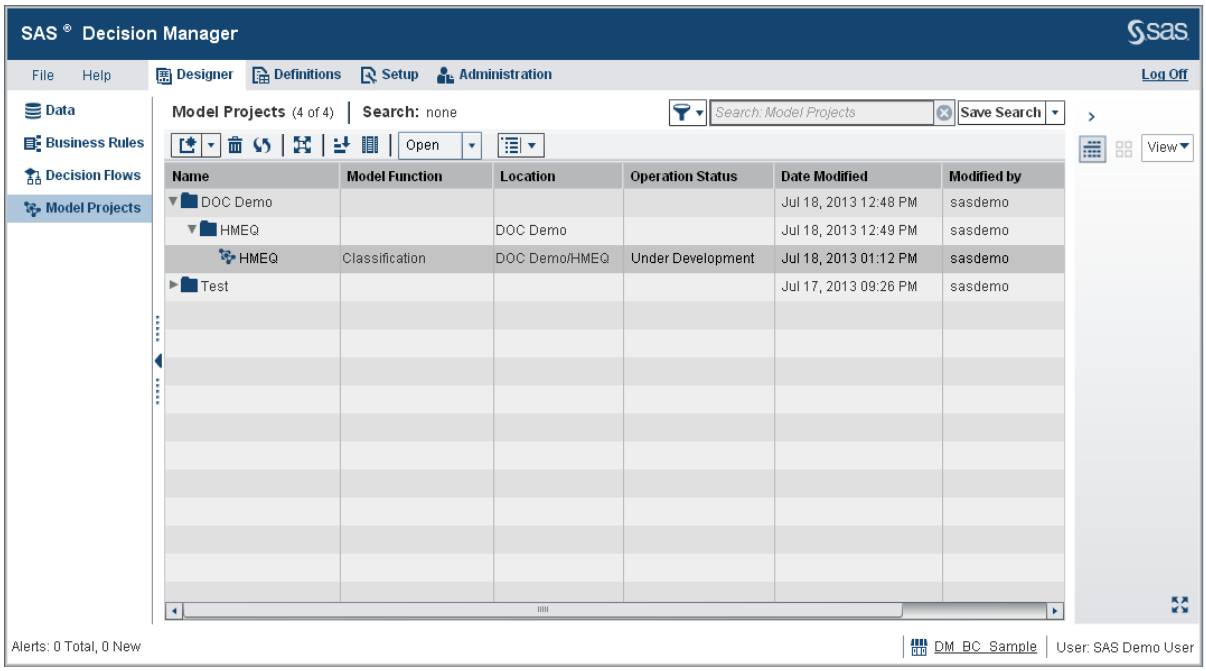
Managing Model Projects

Overview of Managing Model Projects

A model project consists of the models, variables, reports, performance results, and other resources that you use to determine a champion model. For example, a banking project might include models, data, and reports that are used to determine the champion model for a home equity scoring application. The home equity scoring application predicts whether a bank customer is an acceptable risk for granting a home equity loan.

You create projects within folders. The models within a project are associated with a version. A version is a time-based interval that is used to organize the project and model information.

Display 10.1 *Model Projects Category*



Managing Folders

Overview

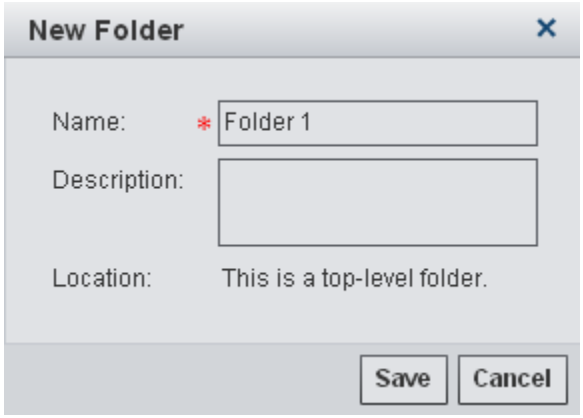
The Model Projects category enables you to create folders to manage your projects and models. The folders are created in the model repository.

Create New Top-Level Folders

To create a new top-level folder:

1. Click and select **New Top-Level Folder**. The New Folder window appears.

Note: Alternatively, you can right-click an item and select the menu option for the action that you want to perform.



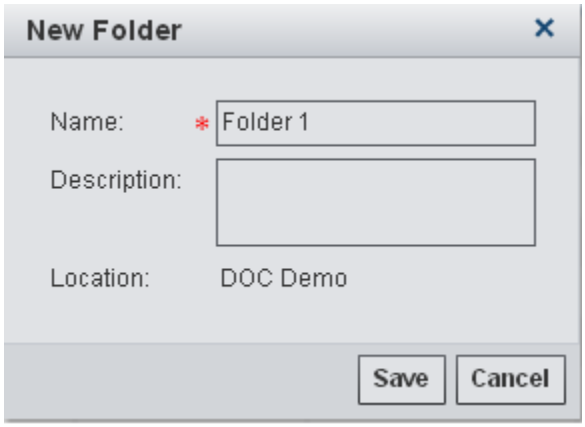
2. Enter a name for the folder. The name can contain letters, spaces, the underscore (_), the hyphen (-), and the period (.). The name cannot begin with a space.
3. (Optional) Enter a description for the folder.
4. Click **Save**.

Create New Subfolders

To create a new folder within another folder:

1. Select the folder in which you want to create a new subfolder. Click and select **New Folder**. The New Folder window appears.

   Note: Alternatively, you can right-click an item and select the menu option for the action that you want to perform.



2. Enter a name for the folder. The name can contain letters, spaces, the underscore (_), the hyphen (-), and the period (.). The name cannot begin with a space.
3. (Optional) Enter a description for the folder.
4. Click **Save**.

Delete a Folder

To delete a folder, right-click the folder, and select **Delete**. Alternatively, you can select a folder and then click .

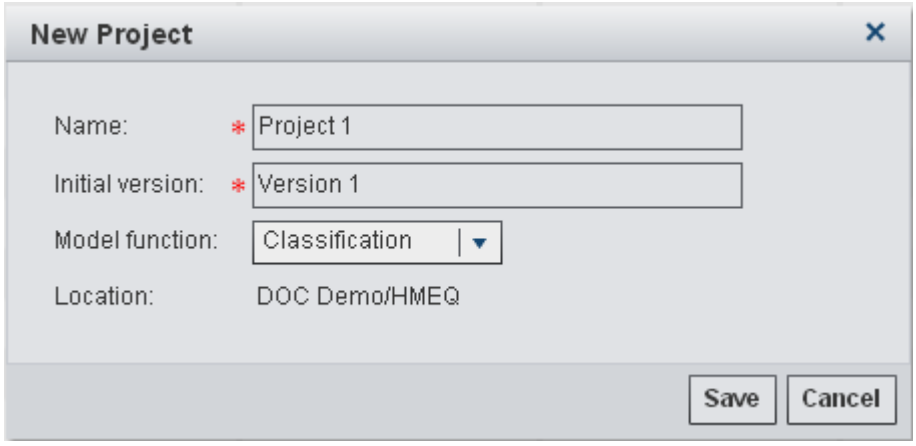
Creating and Modifying Projects

Create Projects

To create a new project:

1. Click and select **New Project**. The New Project window appears.

   Note: Alternatively, you can right-click an item and select the menu option for the action that you want to perform.

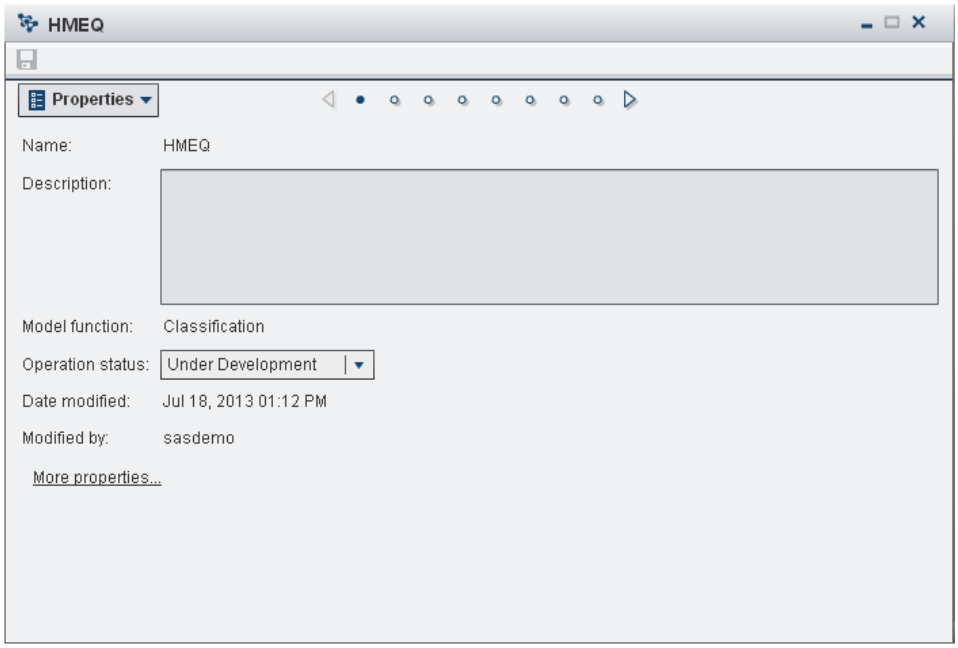


2. Enter a name for the project.
3. Enter a name for the initial version that will be created within the new project.
4. Select a model function to indicate the type of models that can be imported into this project.
5. Click **Save**.

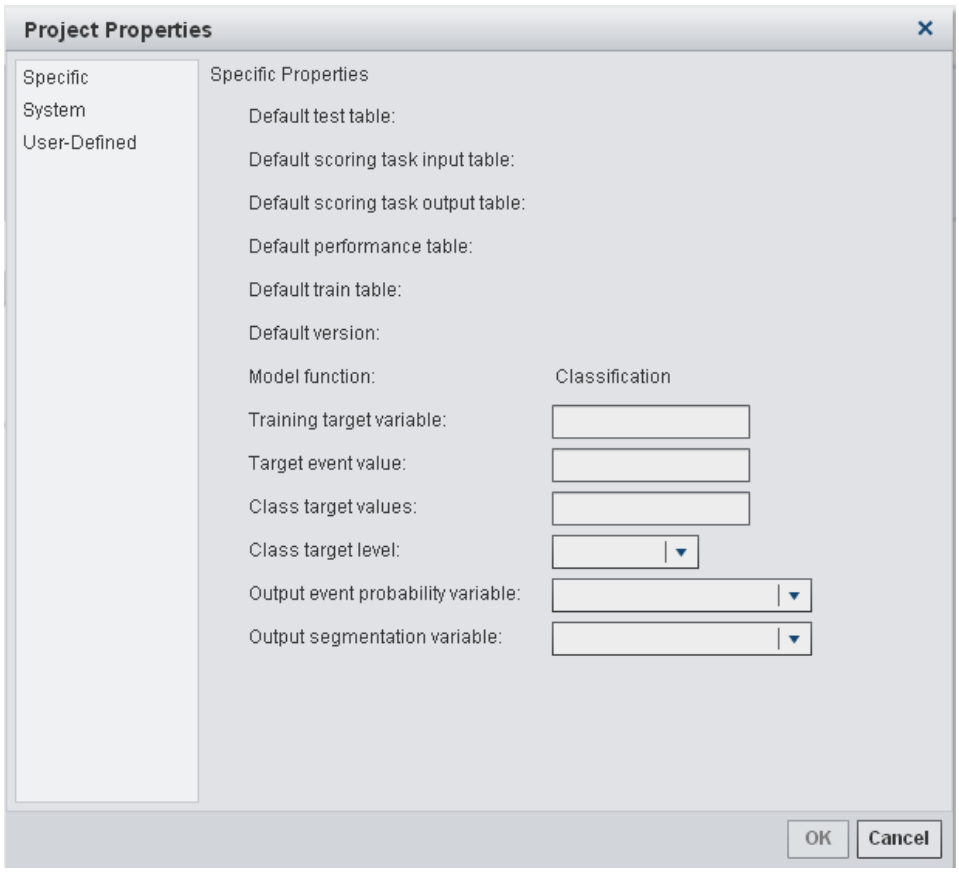
Modify Projects

Modify Project Properties

Open a project. On the Properties page, you can view properties that are associated with the project, and modify the project-specific properties and user-defined properties.



1. (Optional) Enter a description.
2. Click **More properties**. The Project Properties window appears.

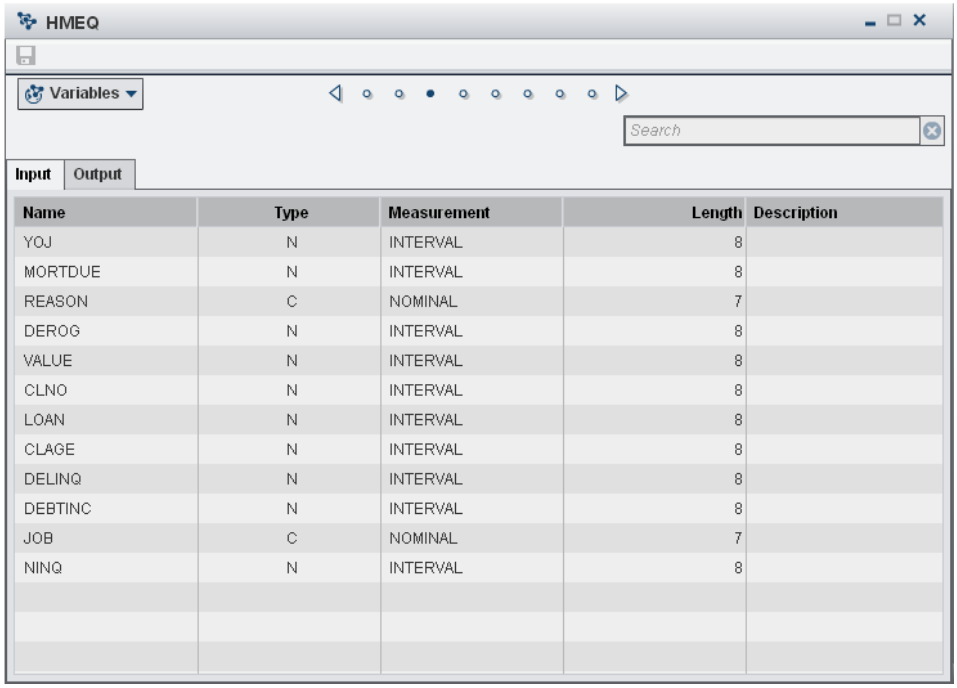


3. Specify the specific and user-defined properties for the project. You can also view the system properties for the project. Click **OK**.
4. To save changes to the project, click .

For more information about project properties, see “Specific Properties for a Project” in Chapter 7 of *SAS Model Manager: User's Guide*.

View Project Input and Output Variables

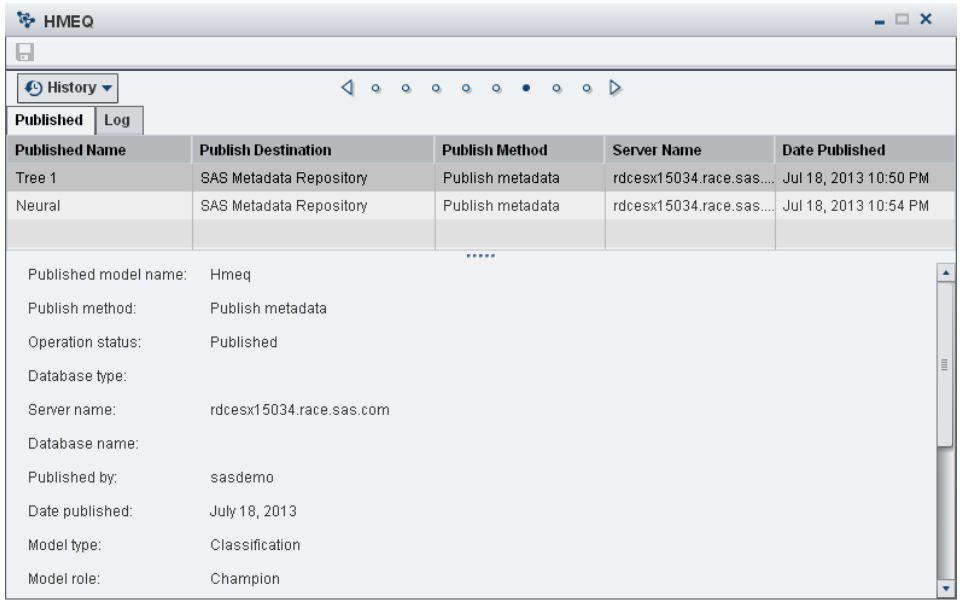
On the Variables page, you can view the project input and output variables. The variables can be added when you set a champion model or flag a challenger model. You can also update them manually by using the SAS Model Manager client application. For more information, see “About Defining Project Input and Output Variables” in Chapter 5 of *SAS Model Manager: User's Guide*.



Name	Type	Measurement	Length	Description
YOJ	N	INTERVAL	8	
MORTDUE	N	INTERVAL	8	
REASON	C	NOMINAL	7	
DEROG	N	INTERVAL	8	
VALUE	N	INTERVAL	8	
CLNO	N	INTERVAL	8	
LOAN	N	INTERVAL	8	
CLAGE	N	INTERVAL	8	
DELINQ	N	INTERVAL	8	
DEBTINC	N	INTERVAL	8	
JOB	C	NOMINAL	7	
NINQ	N	INTERVAL	8	

View Project History

On the History page, you can also view the history log for changes to the project, as well as the history of models that were published at the project level and model level.



Add Attachments

On the Attachments page, you can view and add attachments such as images or documents.

1. Click + to select a file to attach.
2. Click .

Note: You can also click ✖ to remove the attachment.

Add Comments

On the Comments page, you can add new topics or respond to an existing topic. You can also search the comments.

1. Enter a topic name and a comment.
2. (Optional) Click to attach a file to the new topic. Repeat this step to attach multiple files.

   Note: You can also click **Remove** to remove an attachment.
3. Click **Post**.

Note: If the edit comments and delete comments capabilities are assigned to a role that the user is associated with, the user can also edit or delete a comment. For more information, see "Capabilities and Comments" in Chapter 3 of *SAS Decision Manager: Administrator's Guide*.

Delete Projects

To delete a project, right-click the project, and select **Delete**. Alternatively, you can select the project and then click .

Managing Models

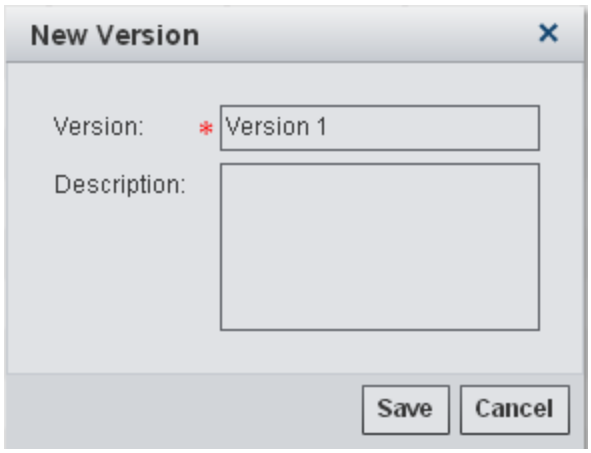
Overview of Managing Models

The Models page lists the models that are associated with the selected project.

Adding or Managing Versions

Add a New Version

1. Select **New Version** from the **Version** drop-down list. The New Version window appears.



2. Enter a name for the version or accept the default name.
3. (Optional) Enter a description for the version.
4. Click **Save**.

Manage Versions

1. Select **Manage Versions** from the **Version** drop-down list.

2. (Optional) Enter a new name for one or more of the versions.
3. (Optional) Enter a description for one or more of the versions.
4. (Optional) Right-click a version name and select **Remove** to delete a version.

5. Click **Save**.

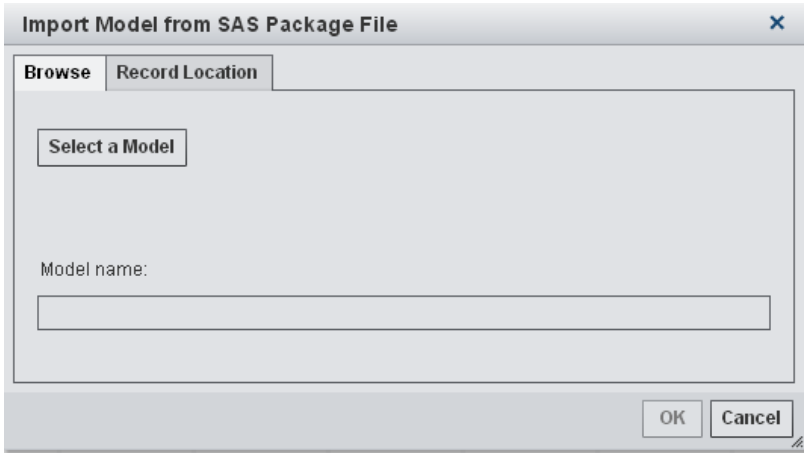
Importing Models

About Importing Models

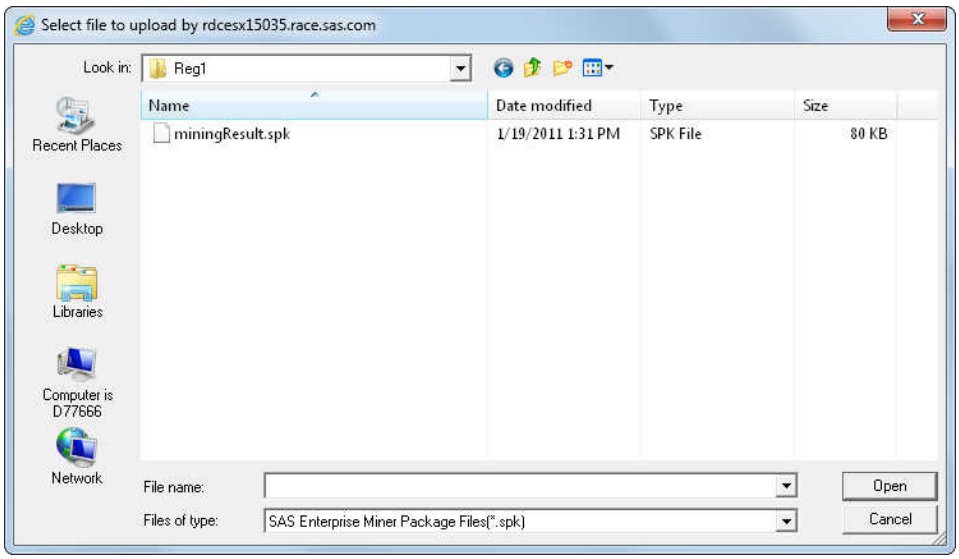
You can import models from the SAS Metadata Repository, a SAS package file (.spk), or a PMML file (.xml) into a version within a project.

Import a Model from an SPK File

1. Select a version from the drop-down list.
2. Select the **SAS Package File** import method from the **Import** drop-down list.



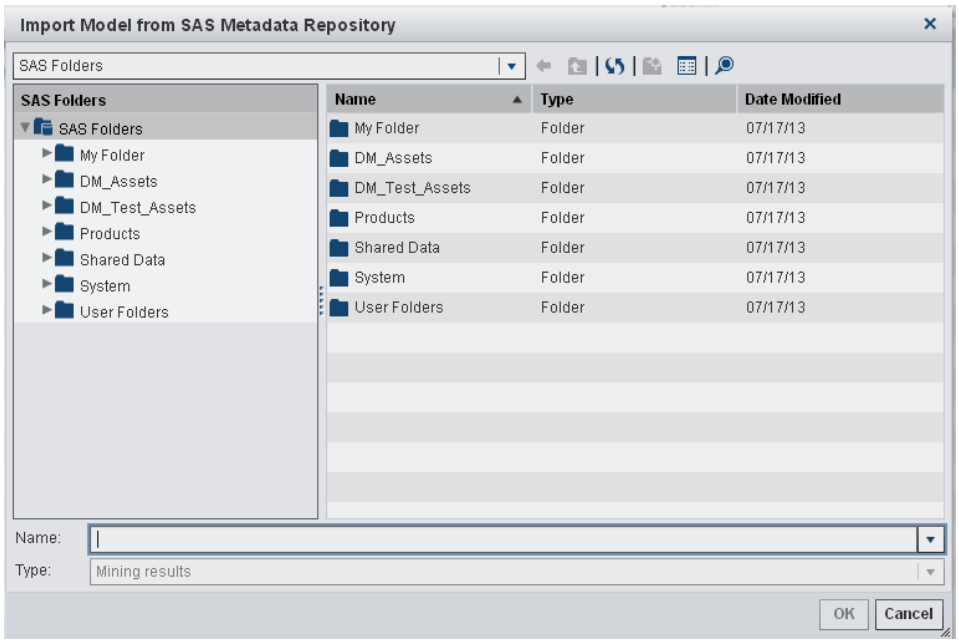
3. Click **Select a Model** and navigate to the location of the file.



4. Select the model file to import and click **Open**.
5. (Optional) Select the**Record Location** tab to enter the location of the SAS package file in order to record the location in the model's history log.
6. Enter a name for the model and click **OK**.

Import a Model from the SAS Metadata Repository

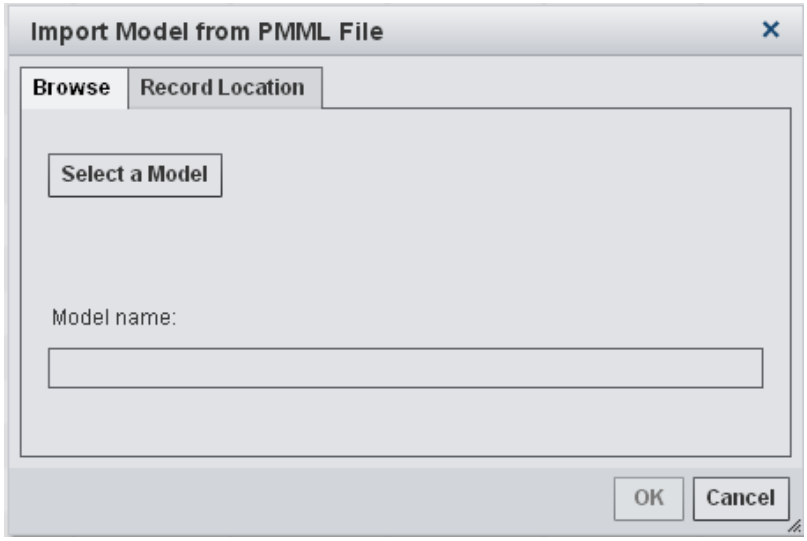
1. Select a version from the drop-down list.
2. Select the **SAS Metadata Repository** import method from the **Import** drop-down list.



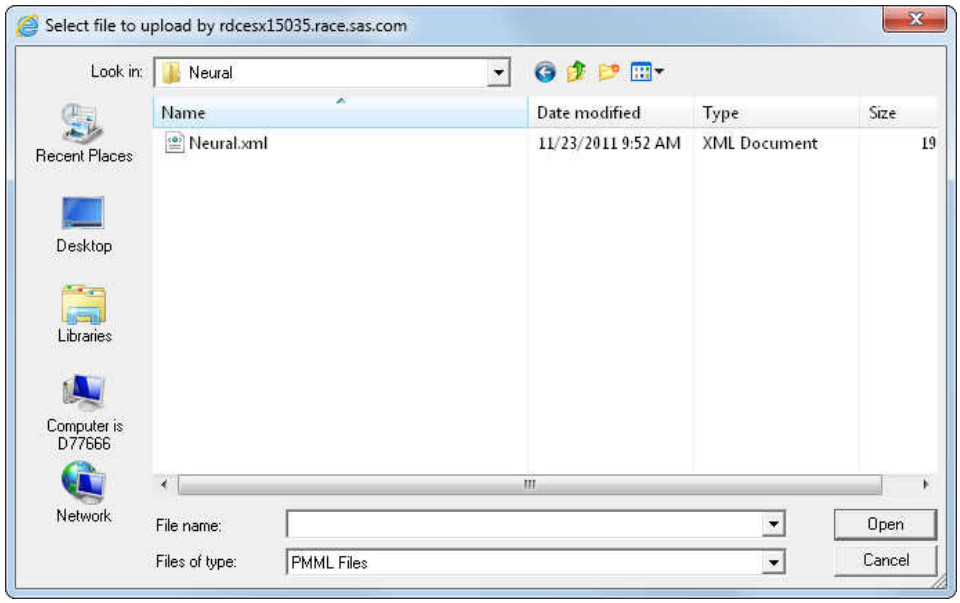
3. Navigate to the location of the file and select the model file to import.
4. Enter a name for the model and click **OK**.

Import a Model from a PMML File

1. Select a version from the drop-down list.
2. Select the **PMML File** import method from the **Import** drop-down list.



3. Click **Select a Model** and navigate to the location of the file.



4. Select the model file to import and click **Open**.
5. (Optional) Select the**Record Location** tab to enter the location of the PMML file in order to record the location in the model's history log.
6. Enter a name for the model and click **OK**.

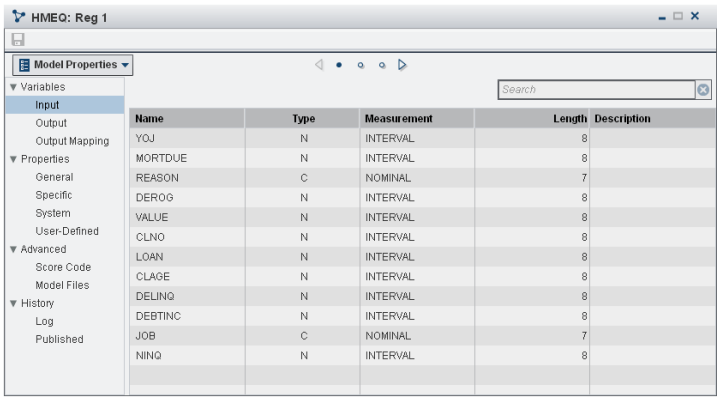
Delete Models

To delete a model, right-click the model, and select **Delete**. Alternatively, you can select the model and then click .

Viewing Models

You can view model information such as properties, model variables, score code, model files, and history. You can also add attachments and comments to a model.

To view the information for a model, select a model from the list, and either click or double-click the model.



Modifying Model Properties

On the Model Properties page, you can view the input and output variables, map model output variables to project output variables, view or modify model specific properties, view or modify score code, view model files, and view the history log for changes to the model, as well as the history of published models.

To save changes to the model properties, click .

Add Attachments

On the Attachments page, you can view and add attachments such as images or documents.

1. Click to select a file to attach.
2. Click .

Note: You can also click to remove the attachment.

Add Comments

On the Comments page, you can add new topics or respond to an existing topic. You can also search the comments.

1. Enter a topic name and a comment.
2. (Optional) Click to attach a file to the new topic. Repeat this step to attach multiple files.

   Note: You can also click **Remove** to remove an attachment.
3. Click **Post**.

Note: If the edit comments and delete comments capabilities are assigned to a role that the user is associated with, the user can also edit or delete a comment. For more information, see "Capabilities and Comments" in Chapter 3 of *SAS Decision Manager: Administrator's Guide*.

Set Champion and Challenger Models

You can set champion and challenger models on the Models page. Perform one or more of the following actions:

- Select a model from the list, and click to set the model as the project champion model.

  Note: The Set Model Output Mapping window appears if you have not mapped the model output variables to the project output variables. If there are model input variables that are not defined as project input variables, you are prompted to add the input variables. Click **Yes** to confirm. The model input variables are copied to the project input variables. If project output variables are not defined, the **Select Project Output Variables** window appears and you are prompted to select the output variables. After you select the output variables, click **OK**.

- Select a model from the list, and click to flag a model as a challenger to the project champion model.

  Note: The Set Model Output Mapping window appears if you have not mapped the model output variables to the project output variables. If there are model input variables that are not defined as project input variables, you are prompted to add the input variables. Click **Yes** to confirm. The model input variables are copied to the project input variables.

- Click to clear a flagged challenger or champion model.

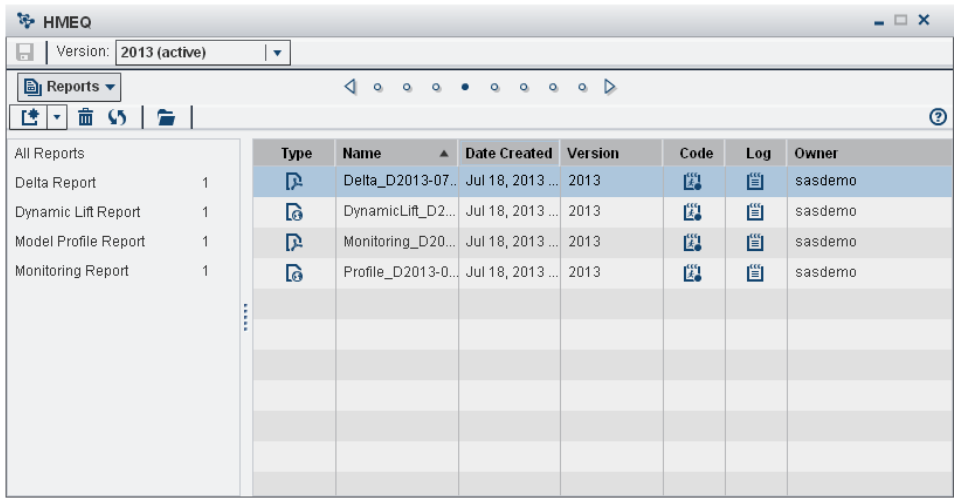
Note: Alternatively, you can right-click a model and select the menu option for the action that you want to perform.

For more information about champion and challenger models, see Chapter 12, "Deploying Models," in *SAS Model Manager: User's Guide*.

Creating and Viewing Reports

Overview of Creating and Viewing Reports

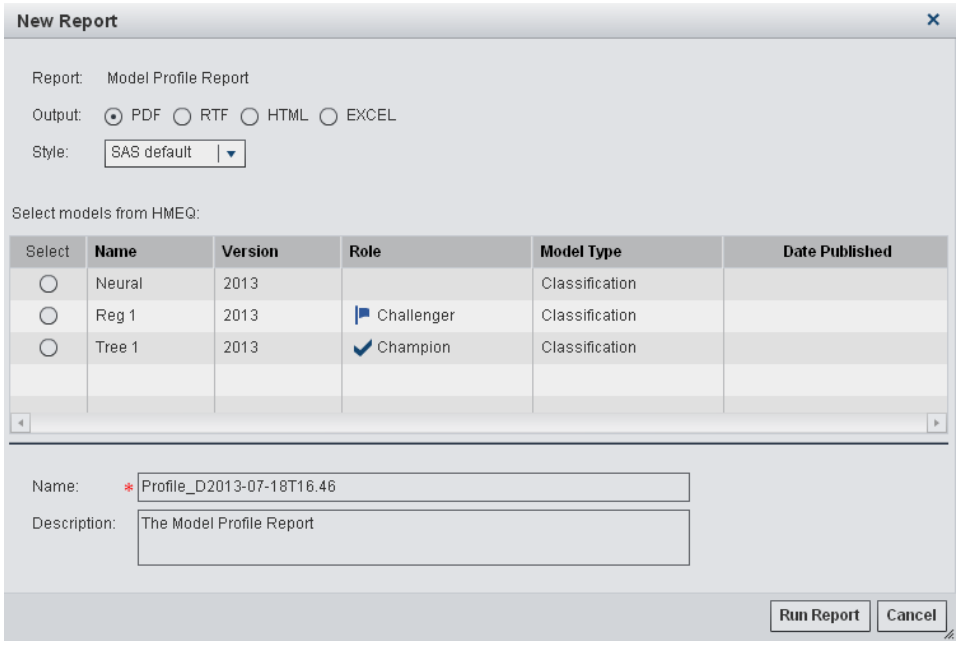
On the Reports page, you can create and view reports. You can also view reports that were created by using the New Report wizard in the SAS Model Manager client application.



For more information about the types of reports that can be created, see "Overview of Model Comparison, Validation, and Summary Reports" in Chapter 10 of *SAS Model Manager: User's Guide*.

Create Reports

1. Select a version from the drop-down list.
2. Click and select a type of report. The New Report window appears.



3. Select an output type. The default is PDF.
4. Select a style for the report. When the SAS default option is selected, the default style and themes are used when generating the report. For example, the SAS default style for the HTML output type is HTMLBLUE.
5. From the list, select the models that you want to include in the report. The models list is not available for some reports.
6. Enter a name and description if you do not want to use the default values.
7. Specify the report options for the selected report type. Click **More options** to view the additional report options that are available for some reports.
8. Click **Run Report**. The new report is generated and appears in the default viewer for the selected output type.

View Reports

1. Select a type of report from the left navigation menu.
2. View the report in one of these ways:
   - Double-click a report in the list.
   - Select a report from the list and click .
   - Right-click a report from the list and select **Open**.

   Note: If the report is not displayed, view the SAS code and SAS log.

Publishing Models

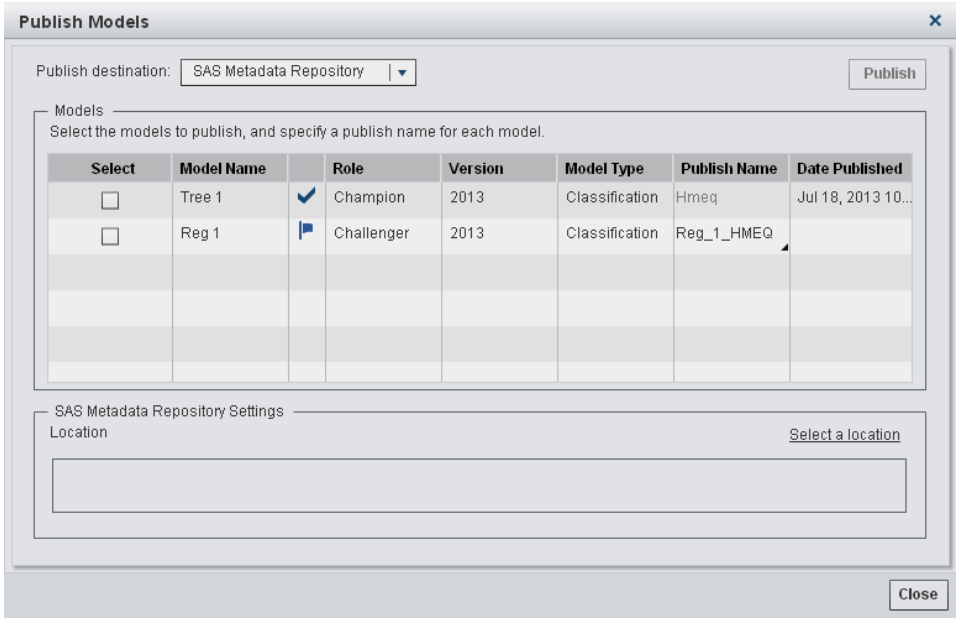
Overview of Publishing Models

You can publish champion and challenger models from a model project to the SAS Metadata Repository. Models can also be published from the **Models** page.

Publish Champion and Challenger Models

1. Select a project and click .

   Note: Alternatively, you can right-click a project and select **Publish**.



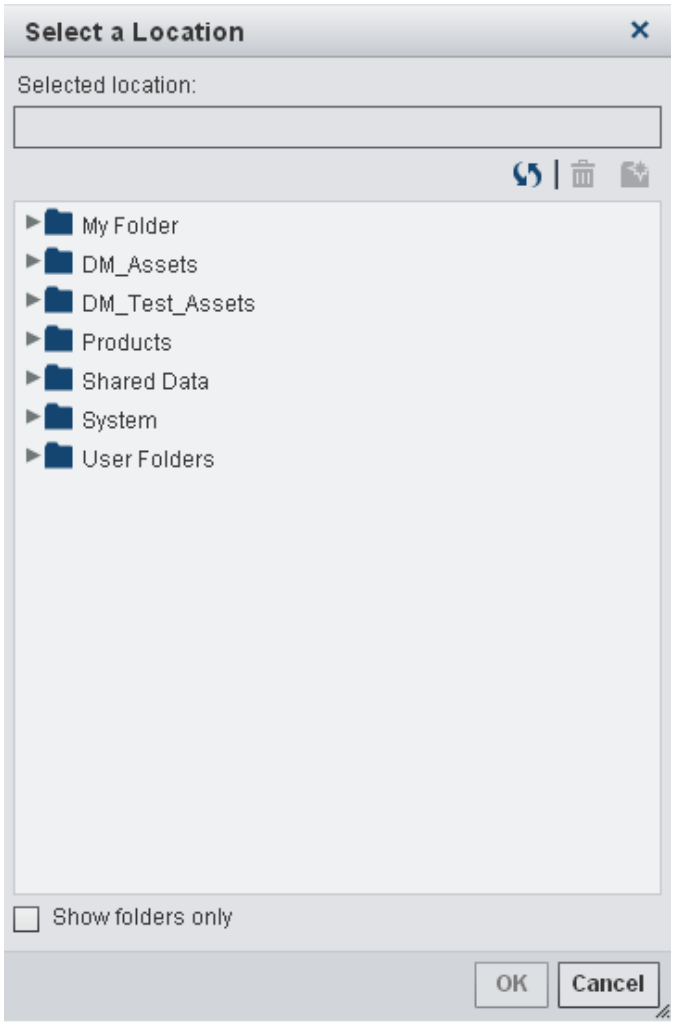
2. Select the models that you want to publish from the **Models** list.
3. Specify a publish name for each model.

   Note: The default format of the publish name is configured by the SAS administrator. You cannot modify the publish name for a champion model.
4. Select the location to publish the models to.
5. Click **Publish**.

Publish a Model

1. Select a model and click .

   Note: Alternatively, you can right-click a model and select **Publish**.



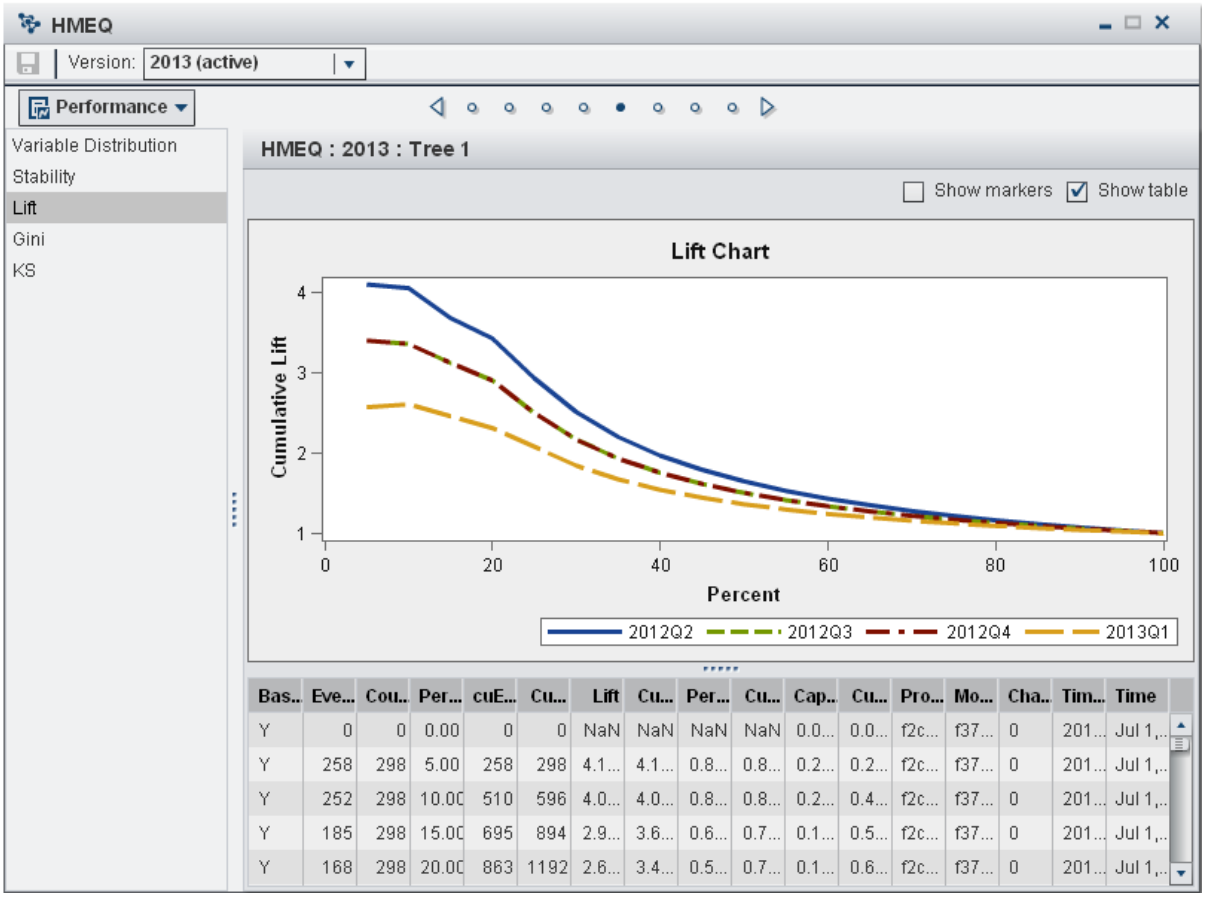
2. Select the location to publish the model to.
3. Click **OK**.

See Also

"Overview of Publishing Models" in Chapter 13 of *SAS Model Manager: User's Guide*

Viewing Performance Results

On the **Performance** page, you can view the performance of the project champion model through a series of charts. The performance data sets are generated using performance tasks in the SAS Model Manager client application. The performance data sets are then used as input for the performance charts. To view the performance charts, select a type of report from the left navigation menu.



Bas..	Eve...	Cou..	Per...	cuE...	Cu...	Lift	Cu...	Per...	Cu...	Cap..	Cu...	Pro...	Mo...	Cha..	Tim...	Time
Y	0	0	0.00	0	0	NaN	NaN	NaN	NaN	0.0...	0.0...	f2c...	f37...	0	201...	Jul 1,..
Y	258	298	5.00	258	298	4.1...	4.1...	0.8...	0.8...	0.2...	0.2...	f2c...	f37...	0	201...	Jul 1,..
Y	252	298	10.00	510	596	4.0...	4.0...	0.8...	0.8...	0.2...	0.4...	f2c...	f37...	0	201...	Jul 1,..
Y	185	298	15.00	695	894	2.9...	3.6...	0.6...	0.7...	0.1...	0.5...	f2c...	f37...	0	201...	Jul 1,..
Y	168	298	20.00	863	1192	2.6...	3.4...	0.5...	0.7...	0.1...	0.6...	f2c...	f37...	0	201...	Jul 1,..

For more information, see “Run the Define Performance Task Wizard” in Chapter 16 of *SAS Model Manager: User's Guide*.

Chapter 11

Designing Decision Flows

Creating Flows

Overview of Creating Flows

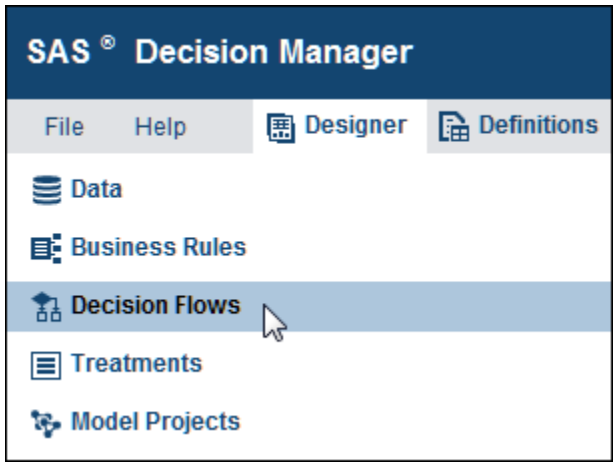
You use SAS Decision Management Studio to create flows.

After you create a flow, you use the diagram and nodes to determine which reply will be sent to the customer.

Create a Flow

To create a flow, select **Decision Flows** in the Designer workspace.

Display 11.1 *Decision Flows*

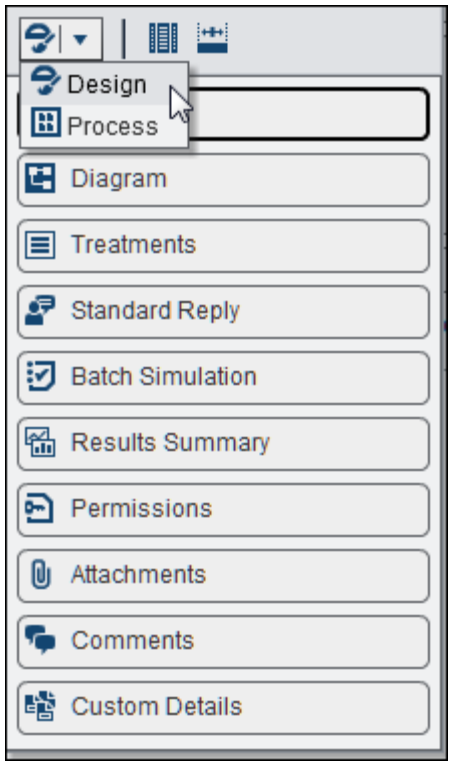


Click and select a flow definition.

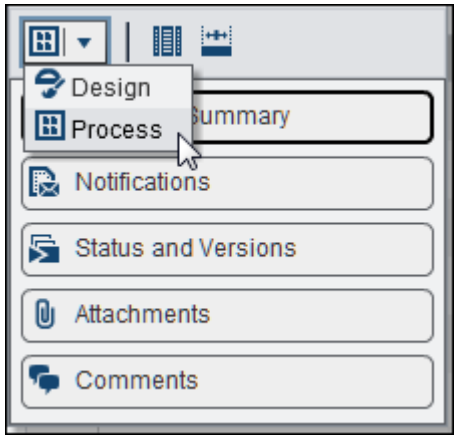
Flow Galleries

Depending on the flow definition, a flow might have a Design gallery and a Process gallery. The flow definition settings determine the pages that are displayed with each gallery.

Display 11.2 *Example of Design Gallery Pages*



Display 11.3 *Example of Process Gallery Pages*



Click to edit the display order of the pages, and to show or hide pages from view.

If you are an approver of the flow, you can view both the Editor and Approver galleries. Select **Editor** to edit the flow. Select **Approver** to approve the flow.

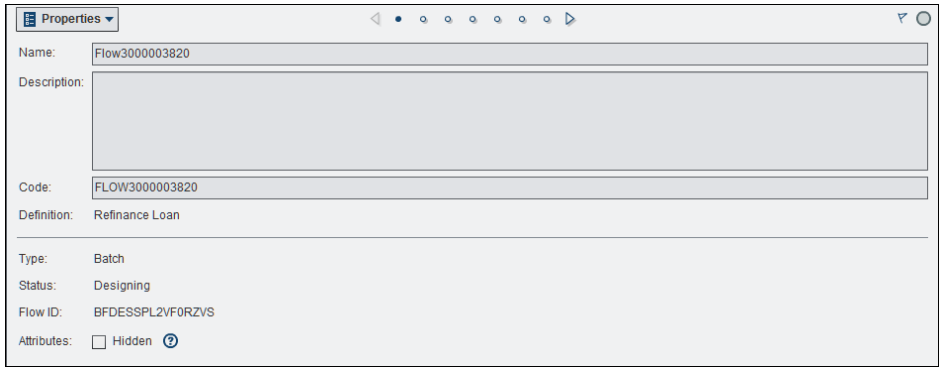
For more information on the Page Manager, see "Selecting Pages" on page 17.

Specify Flow Properties

Overview of Flow Properties

The Properties page displays information about the flow.

Display 11.4 *Properties Page*



Flow Code

The flow code is created either automatically or manually, and the code is editable, depending on the flow definition.

Hide Flow from Display

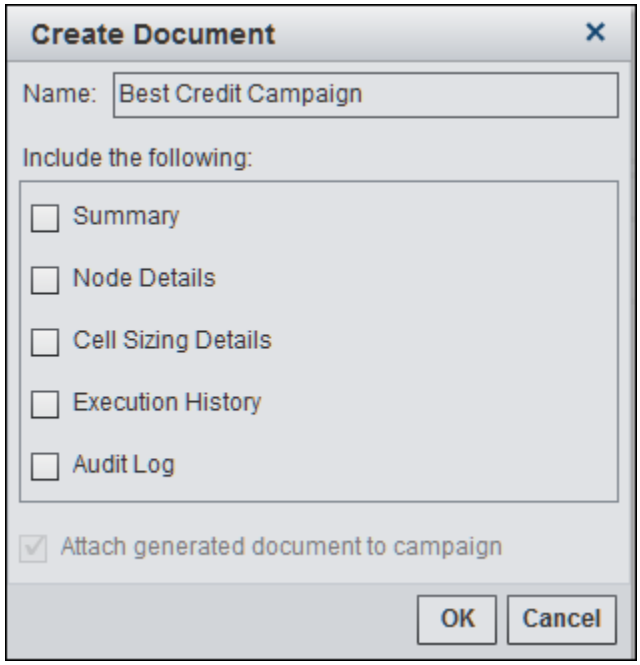
Select **Hidden** to hide the flow from display in the category list. For more information, see "Hide Items from Display" on page 7. If you use **Save as** to save a copy of the flow, the **Hidden** attribute is turned off in the saved copy.

Generate a Diagram Document for Each Execution

You might want to verify the content of a campaign that has executed successfully. You might also want to maintain an audit trail of campaign execution documentation.

You can generate a diagram document every time that the campaign is executed. Select **Attach a diagram document for each execution**. Click **Document setup** to select the items to be included in the diagram document.

Display 11.5 *Create Diagram Document*



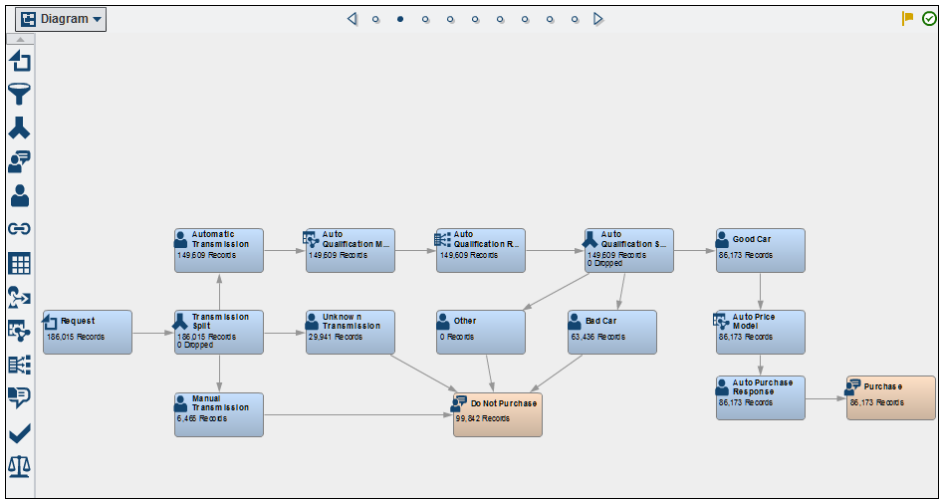
A diagram document is generated only if the campaign executes successfully. The generated

documents are listed on the Attachments page of the campaign.

Create a Diagram

A diagram consists of linked nodes. Select the Diagram page to create a diagram.

Display 11.6 *Diagram*



To add a node to the diagram, double-click the node, or drag the node onto the diagram.

Follow these steps to connect a node to another node or to a node group.

1. Position the pointer over the outer section of the first node. The pointer changes to a pencil.

   Display 11.7 *Connect a Node*

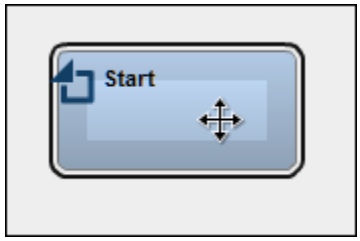
   

2. Select and hold down the left mouse button. Then, drag the pointer to the second node.

To move a node, follow these steps:

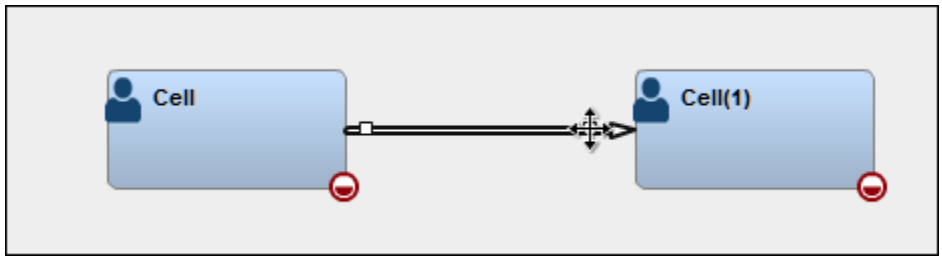
1. Place the pointer over the inner section of a node, wait until the pointer becomes a cross, and hold the left mouse button down to select the node.

Display 11.8 *Move a Node*



2. Drag the node icon to a new location.

Display 11.9 *Move a Link*



Note: You cannot move a link to or from a collapsed node group.

To move a link from one node to another, follow these steps:

1. Select the link to highlight it.
2. Place the pointer over the end of a link and wait until the pointer becomes a cross.
3. Drag the link to the new location.

For information on the nodes, see Chapter 11, "Designing Decision Flows," on page 199.

Standard Replies

Overview of Standard Replies

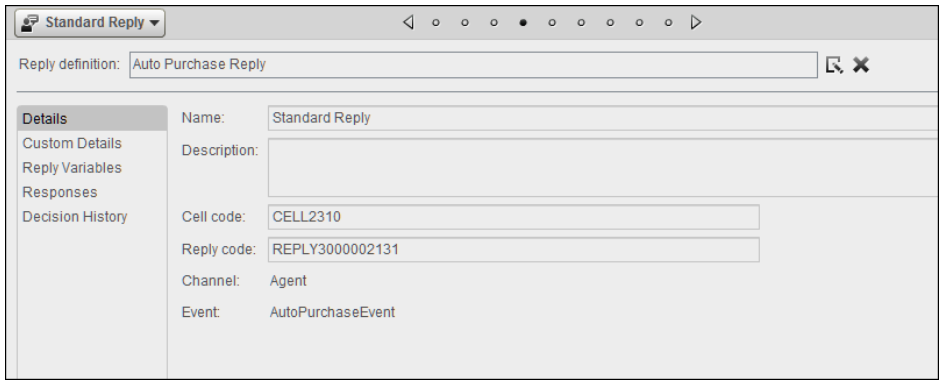
A standard reply sends replies to any customers who do not fit the parameters of the Filter or Branch nodes.

To set a standard reply, select the Standard Reply page.

Specify Standard Reply Details

On the Details page, enter basic information about the standard reply.

Display 11.10 *Standard Reply*



Note: The Decision History page is not displayed if SAS batch functionality is enabled. For more information, see "Flows" on page 63.

Click to select a reply definition. For more information, see "Select a Reply Definition" on page 267.

You can change the reply code and the cell code if the codes are editable. Cell codes contain the standard reply information that is published to the common data model when the flow is published.

The **Event** field displays the event that was selected in the Start node.

For information about the Custom Details page, see "Display Custom Details" on page 268. For information about the Reply Variables page, see"Specify Reply Variables" on page 269. For information about the Responses page, see "Specify Responses" on page 269. For information about the Decision History page, see "Specify Decision History Information" on page 270.

Using Custom Detail Tags to Provide Treatment Values for Standard Replies

When you design a flow, you might want to set up a standard reply before you know which treatments will be used in the flow. You can use custom detail tags to supply treatment values for reply variables in standard replies.

To use a custom detail tag as a placeholder for a treatment, take the following steps:

1. Select the Reply Variables page.
2. In the **Value** cell of the reply variable, click .
3. Select a custom detail tag from the **Custom Detail Tags** folder in the **Package** folder.

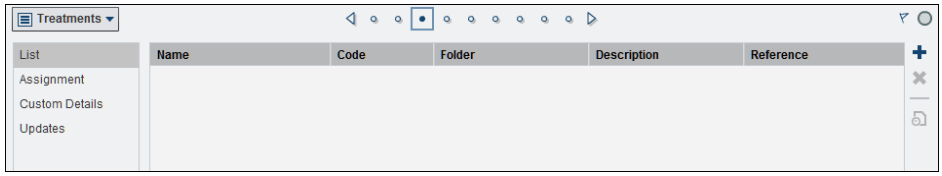
Add Treatments to a Flow

List Treatments

The Treatments page displays the treatments that are associated with the Reply nodes and standard replies in a flow.

Select **List** to add a treatment to the list.

Display 11.11 *List of Treatments*



To select a treatment and make it available to the flow, click .

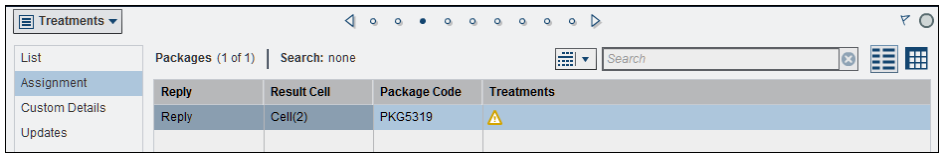
Assign Treatments

Select **Assignment** to assign the treatment to a Reply node or standard reply. In order to assign treatments, the flow must have a standard reply or a Reply node that is linked to a marketing cell.

Select Replies and Treatments

The Assignment page has two views, the Summary table view and the Matrix view. Click to display a table view and the summary of treatments that are assigned to each marketing cell.

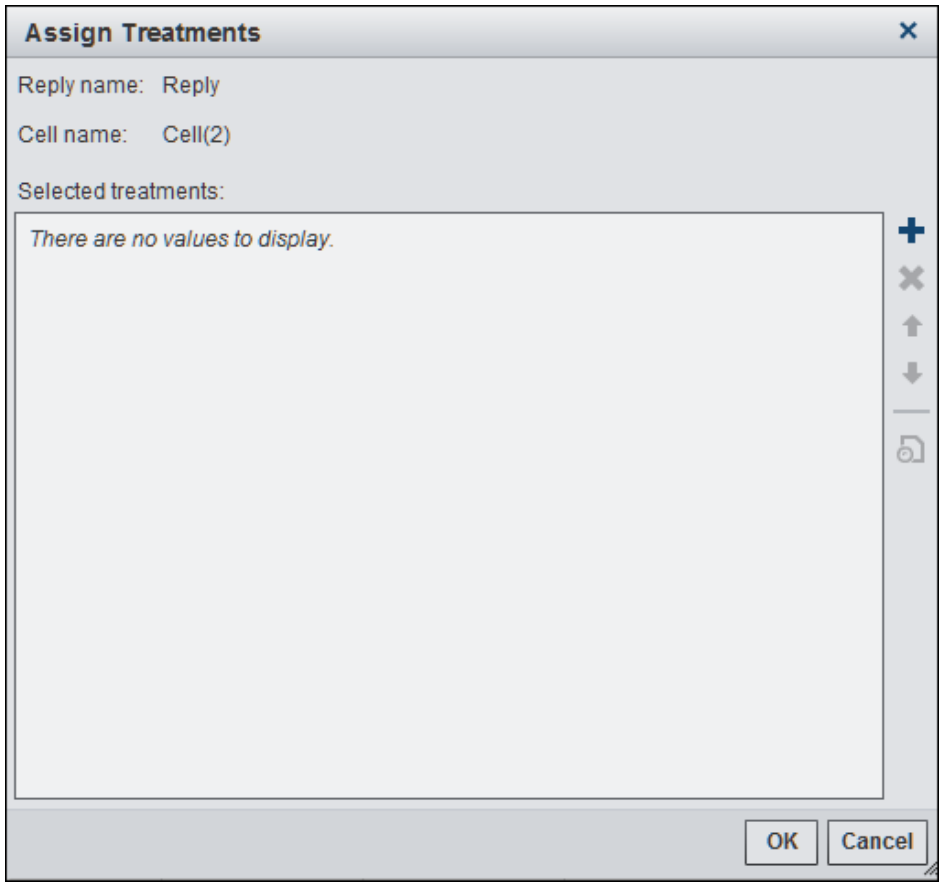
Display 11.12 *Summary Table View*



A indicates that no treatments have been selected for that cell.

Click in the **Treatments** cell to select the treatments to assign to a marketing cell. You cannot select a static treatment more than one. You can select more than one instance of a dynamic treatment. This is useful if you want to provide different values for the custom details in different instances of the same treatment. Each package can contain 0 or more treatments.

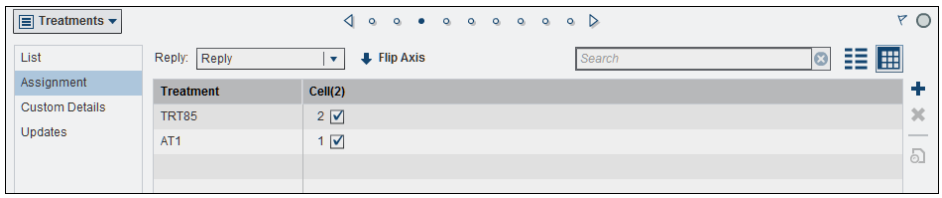
Display 11.13 *Assign Treatments Window*



Use the up and down arrows to change the priority. Click ✚ to select a treatment. Click to view the contents of a treatment.

To display the Matrix view of the Assignment page, click .

Display 11.14 *Matrix View*

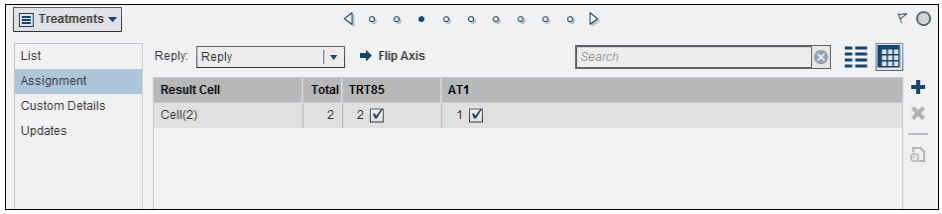


Priorities for treatments are assigned in the order in which they are selected. Treatments are sent in order of priority. Press the Shift key while selecting treatments to select multiple treatments in order.

Click ✚ to select a new treatment to add to the Matrix view.

Click **Flip Axis** to change the orientation of the Matrix view.

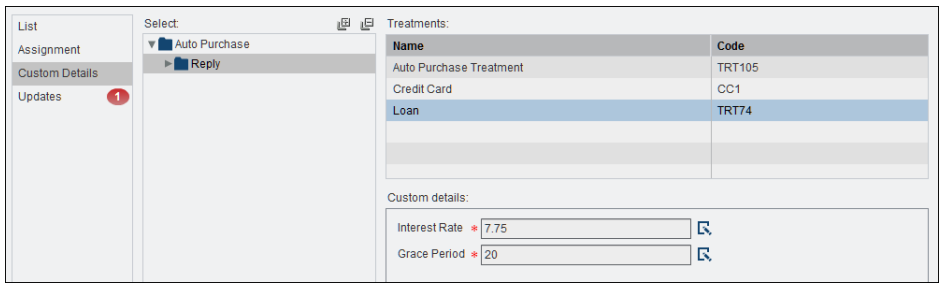
Display 11.15 *Flip Axis*



Specify Custom Details

Select **Custom Details** to display the custom details for each treatment.

Display 11.16 *Custom Details*



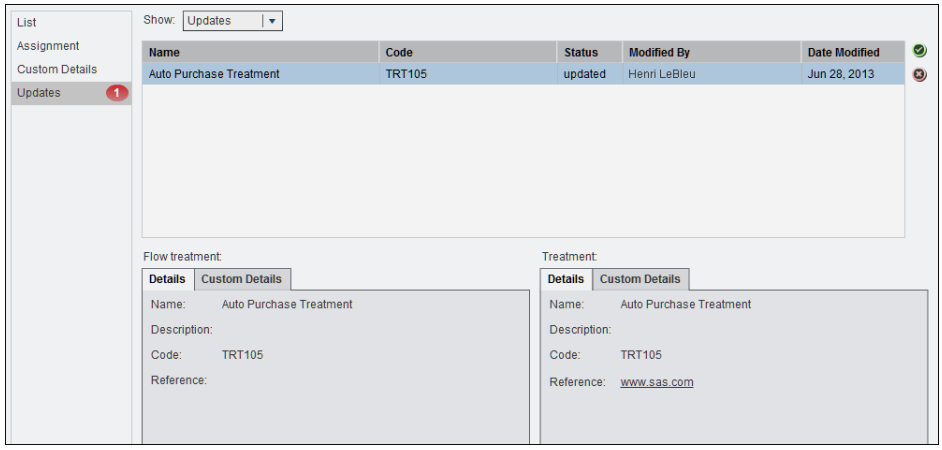
Enter a value for the custom detail or click  to select a variable.

The  next to a custom detail displays information about the associated custom detail tag.

View Updated Treatments

Treatments that have been modified because they were assigned to the flow are displayed on the Updates page.

Display 11.17 *Updates*



The Updates page is not displayed if **Use external treatment list** has been selected for the current business context.

The number in the red disc indicates the number of treatments that have been changed. Select **Updates** or **Rejections** to display changed treatments or treatments whose

changes have been rejected. Click in the toolbar to refresh the contents of the Treatments page.

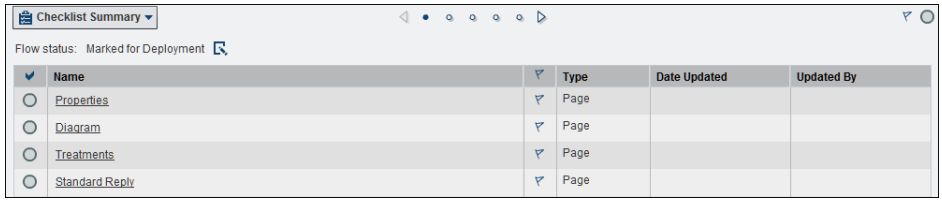
Select a treatment to compare the flow version of the treatment with the changed version, **Flow Treatment** is the version of the treatment that is associated with the flow. **Treatment** is the changed version.

Click to accept the changes. Click to reject the changes.

Monitor Flow Status

The Checklist Summary page displays the status of the flow and of pages on the checklist. You can use the checklist to keep track of your progress while working on a flow.

Display 11.18 *Checklist Summary Page*



Click to select a new status for the flow.

Checkmarks can indicate completion of a portion of a flow. Click next to a page name to change the status. The icon changes to when you click it.

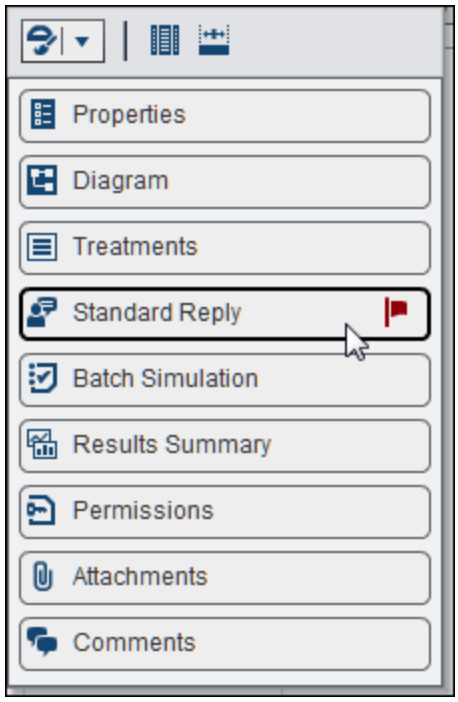
Status flags can indicate levels of completion or areas that need work. Select a status flag next to the page name.

Display 11.19 *Status Flag*

Click a page name to display the page.

The checkmark and status flag are displayed in the Page Manager.

Display 11.20 *Page Status and Follow-up Flag*



Click the icons to change the checkmark and status flag on the page.

Display 11.21 *Change Page Status*

Set Access Permissions for the Flow

The Permissions page displays the names of users and groups who have access.

Display 11.22 *Permissions Page*

To view the users in a group, select the group and click .

In order to edit user or group permissions, you must have Edit access. The owner automatically has Edit permission. The owner's permission cannot be edited. To grant View or Edit permission to a user or user group, click the **Permission** cell and select the permission. By default, all users and groups that you select have Edit permission.

In general, the permission that you set for an individual user overrides the permission that is set for a group that the user is a member of. For more information about the relationship of permissions between users and groups, see *SAS Intelligence Platform: Security Administration Guide* at **SAS Intelligence Platform**.

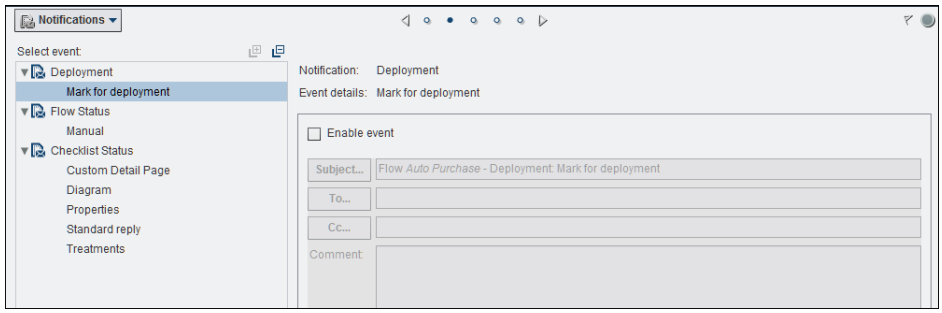
To add a user to the list, click + and select a user. To add a group to the list, click + and select a group.

E-mail Notifications

Set an E-mail Notification

You can use the Notifications page to notify users of an event such as a change in checklist status.

Display 11.23 *Notifications*



Click to expand the list of events. Click to collapse the list.

Select the type of notification and the event for which the e-mail message will be sent.

Select **Enable event** to modify the subject line and to select addressees. In order to receive the notification, the correct e-mail addresses must be assigned to the users in the User Manager plug-in in SAS Management Console. For more information, see *SAS Marketing Automation and SAS Real-Time Decision Manager Administrator's Guide*.

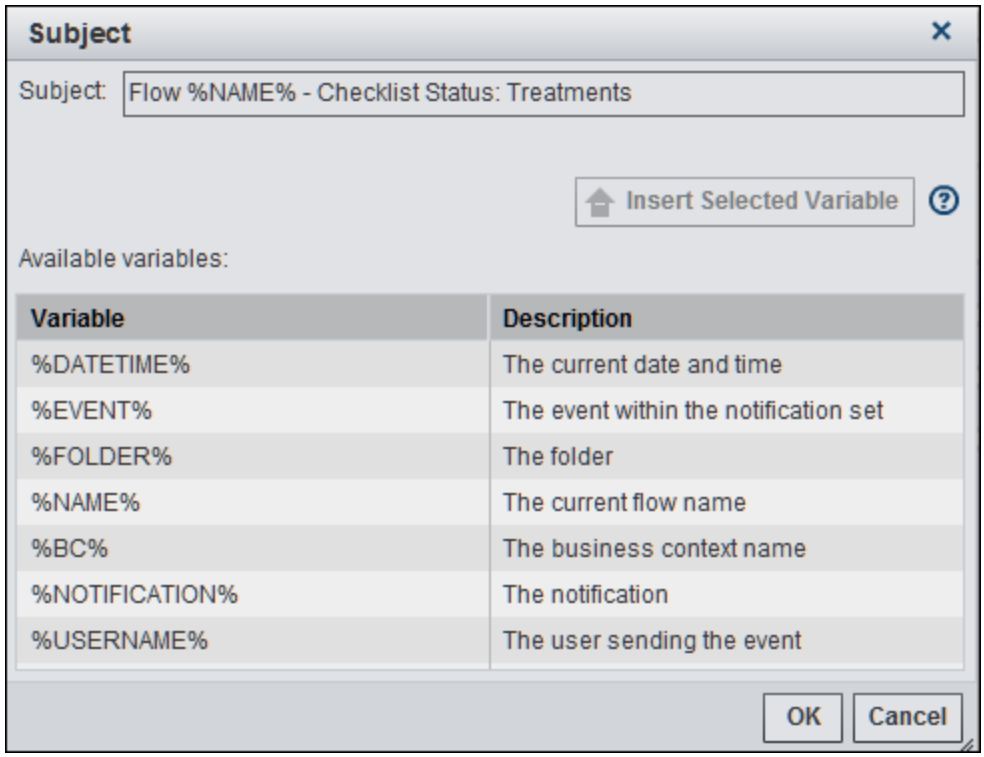
Click **To** and **Cc** to designate the recipients of the message. For more information, see "Select Users and Groups" on page 212.

Enter any additional information in the **Comment** field.

Change the Subject

Click **Subject** to change the subject line of the e-mail message.

Display 11.24 *Subject Window*

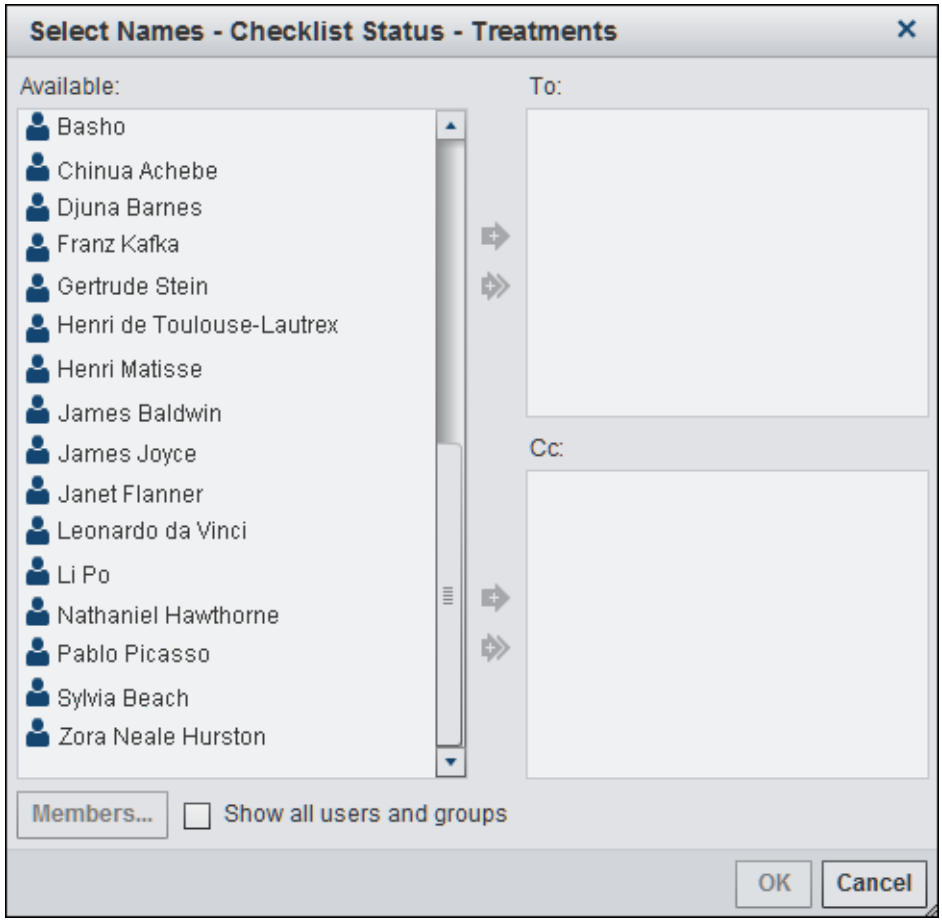


Place the pointer at the location in the **Subject** field where you want to insert the variable. Select a variable and click **Insert Selected Variable**. In the e-mail message, the variable is replaced by the text that is indicated in the **Description** column. For example, in Flow21476, if the **Subject** field contains **`Flow`** *%NAME%* **-** **`Execution: Failed`**, the subject of the e-mail message would be **Flow Flow21476 - Execution: Failed**.

Select Users and Groups

Select names and use the arrows to add users and groups to the **To** and **Cc** lists.

Display 11.25 *Select Names for E-mail Notification*



The **Available** list displays SAS Customer Intelligence users. Select **Show all users and groups** to display all users and groups.

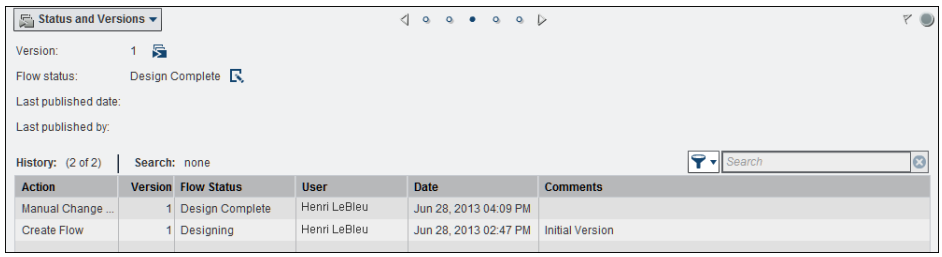
Select a group and click **Members** to display the members of the group.

Status and Versions

Set Status and Version

The Status and Versions page displays a history of changes in the flow status and of the different versions of the flow.

Display 11.26 *Status and Versions*



You might want to record different versions of the flow (for example, if the selection criteria change over time). The first set of selection criteria would be Version 1, and the second set of selection criteria would be Version 2. Click to create a new version. Click to manually change the flow status. Versions and changes in flow status are listed in the History table.

CAUTION:

Creating a new version deletes the approval status for the flow.

The Life Cycle of a Flow

A flow progresses through three phases. Each phase contains one or more statuses.

1. The Design phase contains the following statuses.

   Initiating
   : This status is set when a flow is created. Some information must be supplied before beginning the design of the flow.**Use "initiating" as a flow status** must be enabled in the flow definition.

   Initiation Complete
   : The necessary information has been supplied. The flow is ready for the designer.

   Designing
   : The flow is being designed.

   Design Complete
   : No further work is required on the flow.

2. The Approval phase contains the following statuses.

   Requested
   : Approval has been requested.

   Denied
   : Approval has been denied.

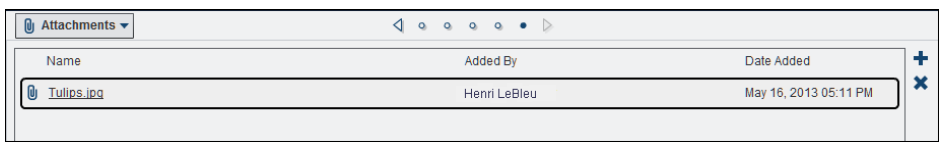
   Approved
   : The flow has been approved.

3. The Execution phase contains the Mark for Deployment status.

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 11.27 *Attachments*

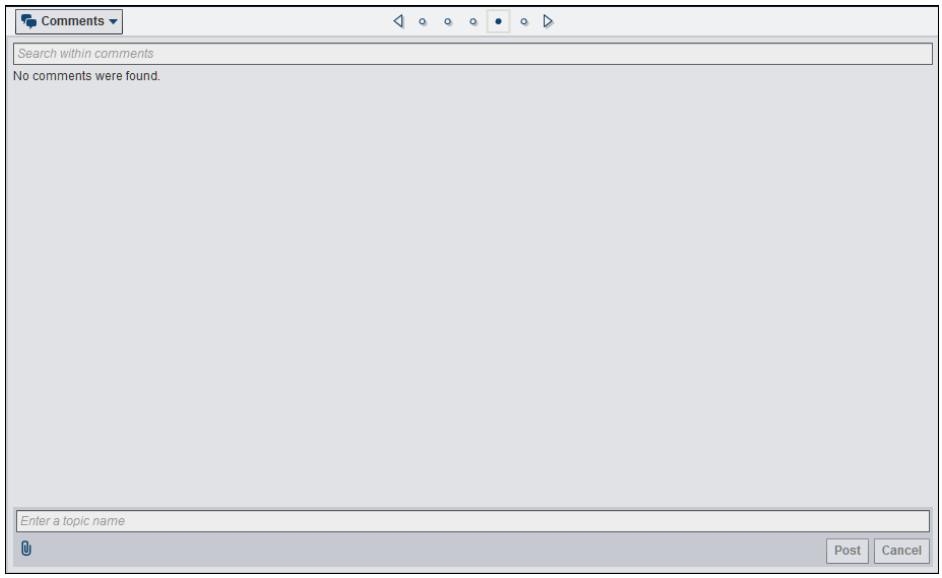


Click to select a file to attach.

Add Comments

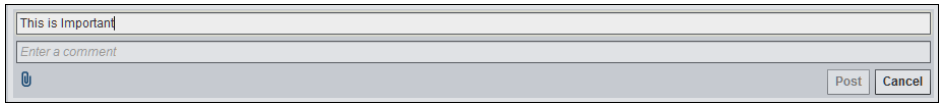
On the Comments page, you view and add comments. You add comments after saving.

Display 11.28 *Comments*



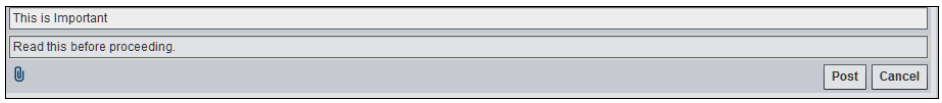
Enter a topic name to add a new comment.

Display 11.29 *New Topic*



Enter the text of the new comment.

Display 11.30 *Comment Text*

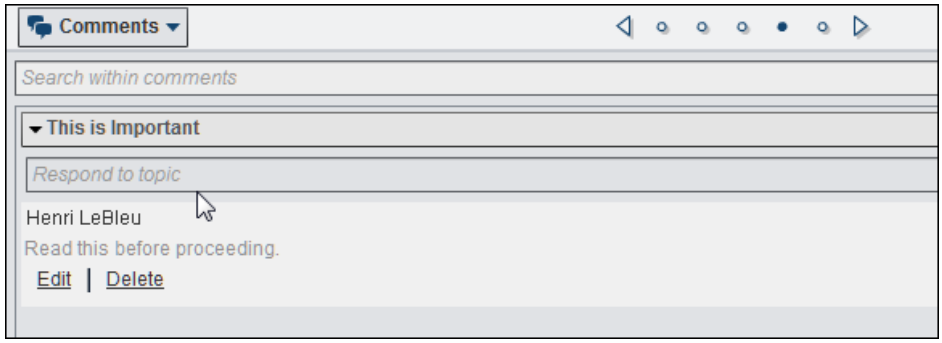


Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 11.31 *Comments List*



Type in the search field to find text in comments.

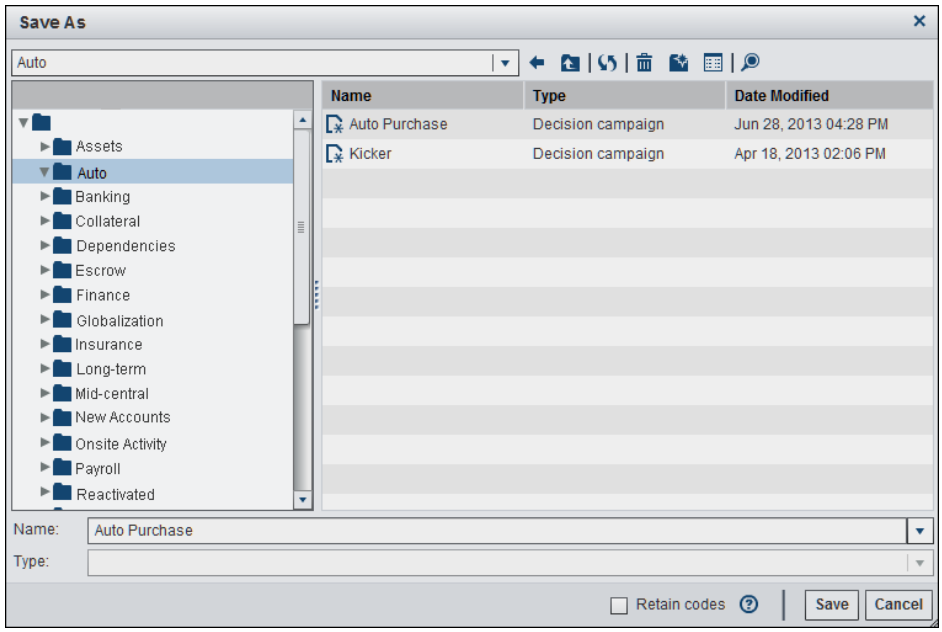
Display 11.32 *Search Comments*

Save a Flow

To save a flow, click in the toolbar. The flow is saved under the name that is specified in the **Name** field.

To save a flow under a different name, click in the toolbar.

Display 11.33 *Save As*



Select a folder and supply a new name for the flow. To save the flow to a new folder, click and open the new folder.

Select **Retain codes** to retain codes that are created manually or generated automatically. Codes are retained according to the setting for the business context. The following codes are retained:

- flow code
- cell code
- package code

Note: You have Edit permission for a flow that you have saved under a different name. The pages that are displayed might be different from the pages that are displayed for View or Approve permission.

Creating Treatments

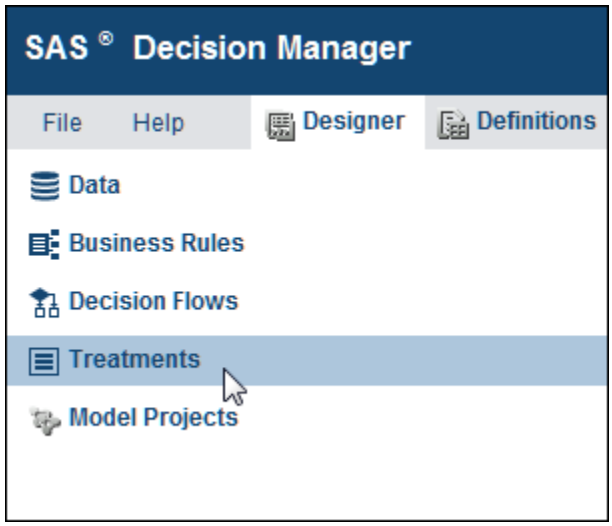
Overview of Treatments

A treatment is a type of marketing communication, such as a coupon for a stay at a hotel. A treatment includes the format, creative content, and offer. Treatments are often used to test the efficacy of a communication. For example, a test of treatment messages might compare an offer of 30% off the price for six months with an offer of two months free in a six-month contract.

Create a Treatment

To create a treatment, select the Treatments category in the Designer workspace.

Display 11.34 *Treatments Category*

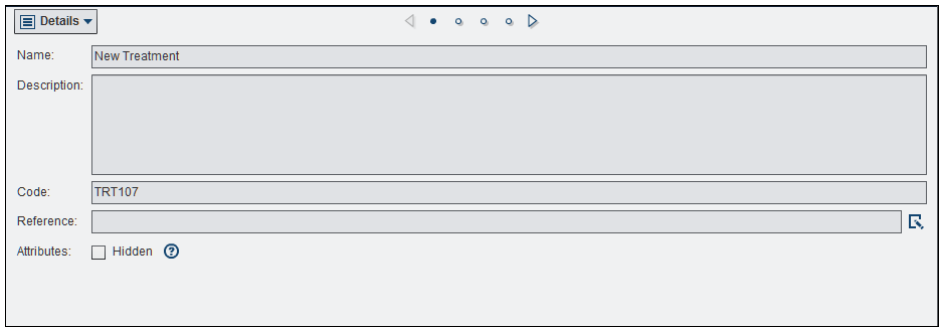


Click .

Specify Treatment Details

The Details page displays information about the treatment.

Display 11.35 *Details Page*



The code depends on the flow definition. The code can be generated automatically or manually, and can be editable.

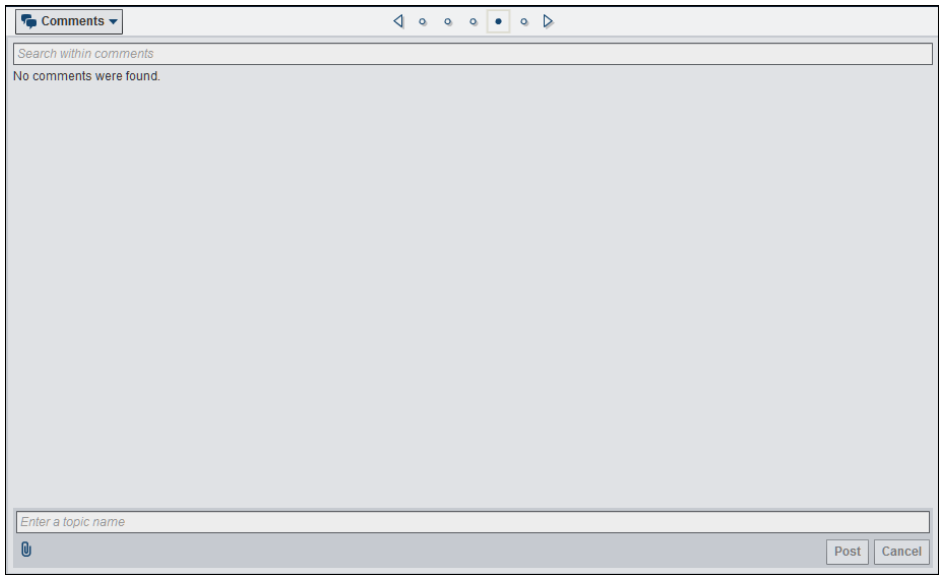
Click next to the **Reference** field to select a reference for the treatment.

Select **Hidden** to hide the treatment from display in the category list. For more information, see "Hide Items from Display" on page 7. If you use **Save as** to save a copy of the treatment, the **Hidden** attribute is turned off in the saved copy.

Add Comments

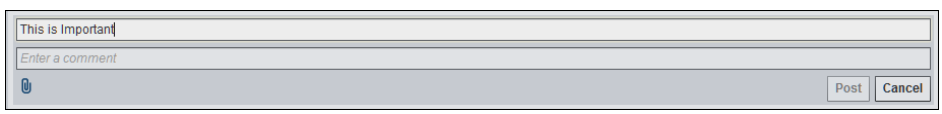
On the Comments page, you view and add comments. You add comments after saving.

Display 11.36 *Comments*



Enter a topic name to add a new comment.

Display 11.37 *New Topic*



Enter the text of the new comment.

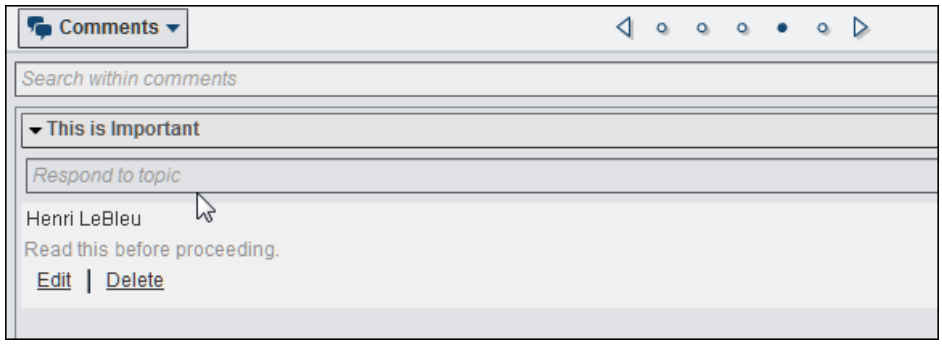
Display 11.38 *Comment Text*

Click **Post** to post the comment. Your new comment is displayed on the Comments page. You can add comments even if you do not have Edit permission.

Click to add an attachment such as an image or a document.

To reply to an existing comment, type text in the field below the comment title.

Display 11.39 *Comments List*



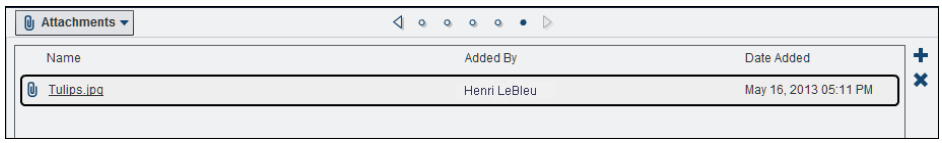
Type in the search field to find text in comments.

Display 11.40 *Search Comments*

Add Attachments

On the Attachments page, you view and add attachments such as images or documents.

Display 11.41 *Attachments*



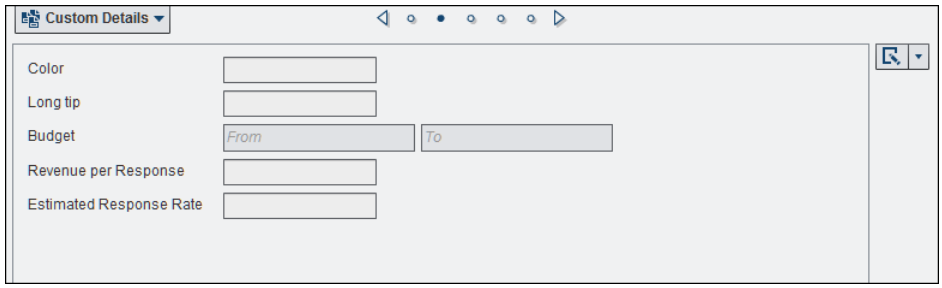
Click to select a file to attach.

Custom Details

Overview of Adding Custom Details

On the Custom Details page, you add user-defined fields.

Display 11.42 *Custom Details Page*



To add a custom detail, click and select **Manage custom details**.

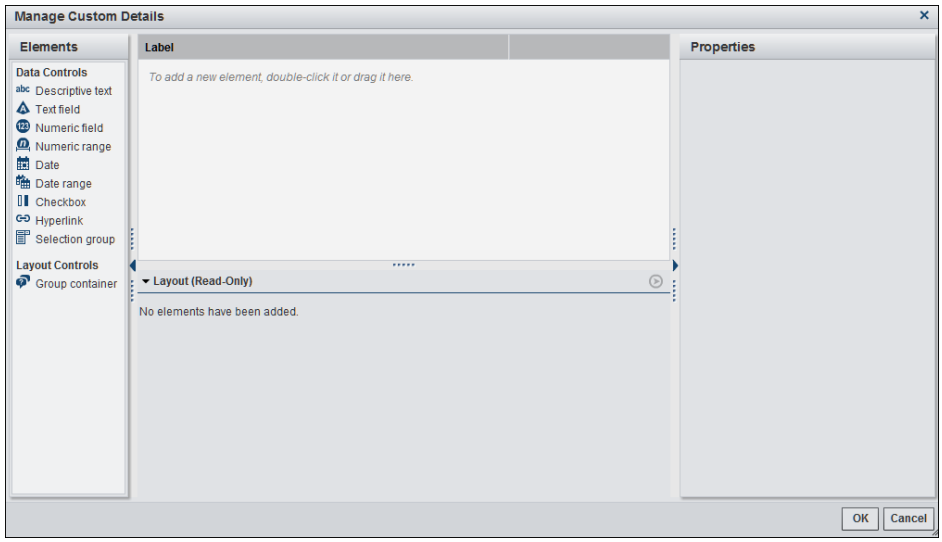
To append a custom detail group to the custom detail, select **Add custom detail groups**..

A next to a custom detail displays information about the associated custom detail tag.

Manage Custom Details

In the Manage Custom Details window, you supply information about the custom details.

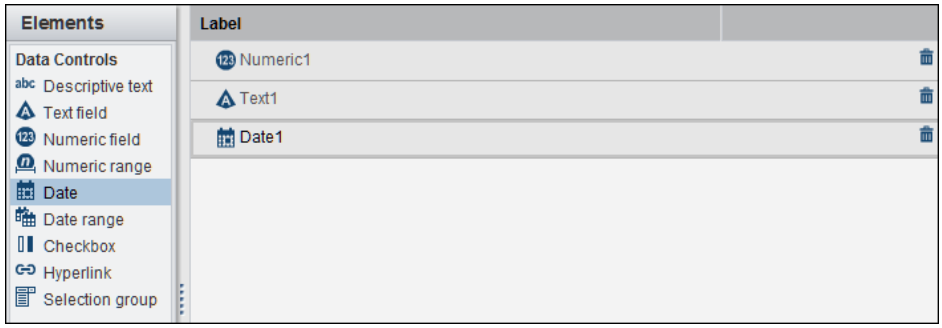
Display 11.43 *Manage Custom Details*



Select an Element

To select the type of custom detail, double-click it or drag an element from the **Elements** pane to the **Label** pane.

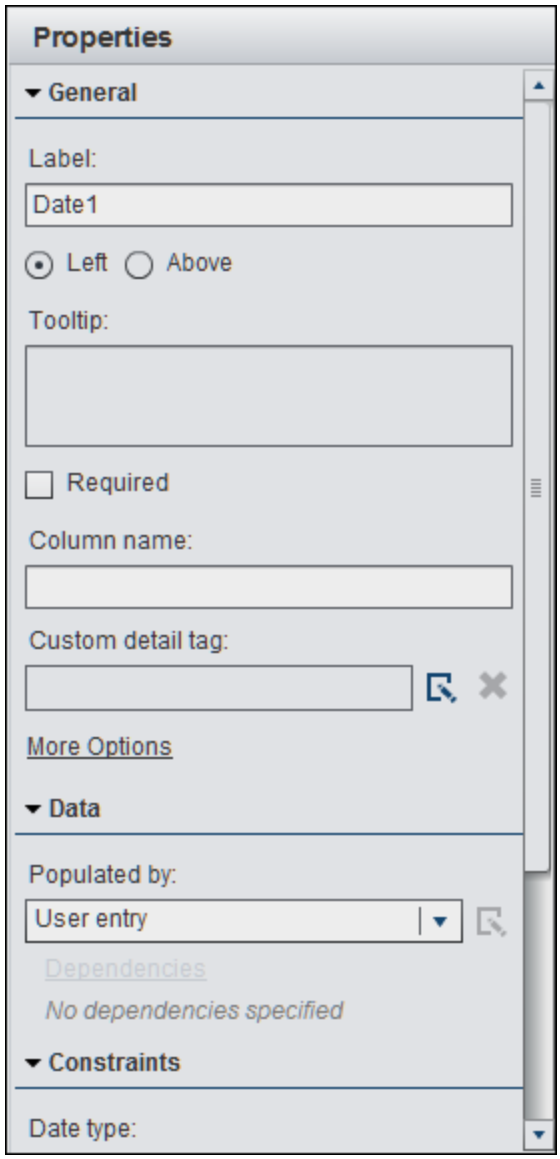
Display 11.44 *Select Element*



Specify Properties

In the **Properties** pane, specify the details for the selected element. The details vary, depending on the element and the software component. As you set the properties, you can review the results in the **Layout** pane.

Display 11.45 *Custom Detail Properties*



Specify General Properties

The following items are the possible properties in the General section. Click **More Options** to display more properties.

Label
is the name that is displayed with the field. Select **Left** or **Above** to set the location of the label in relation to the custom detail.

Note: The names of custom details that are passed to SAS Marketing Optimization must be no longer than 26 characters.

Description
is the description of the field.

Tooltip
is the text that is displayed when you rest the mouse pointer on the field.

Required
indicates that a value is required.

Dynamic
indicates that a value is dynamic. Dynamic custom details can be modified. Values that are not dynamic cannot be changed. This option is available only for treatments.

Column name
is the name of the column that is displayed in a published report.

Minimum column name
is the name of the column that displays the minimum value in a range.

Maximum column name
is the name of the column that displays the maximum value in a range.

Custom detail tag
is the custom detail tag that is associated with the custom detail. Click  to select a custom detail tag.

Minimum custom detail tag
is the custom detail tag that is associated with the minimum value in a range. Click  to select a custom detail tag.

Maximum custom detail tag
is the custom detail tag that is associated with the maximum value in a range. Click  to select a custom detail tag.

Width
is the width of a field.

Hint
is the text that is displayed beneath the field that indicates the value that should be entered.

In-field hint
is the text that is displayed in the field that indicates the value that should be entered.

Specify Data

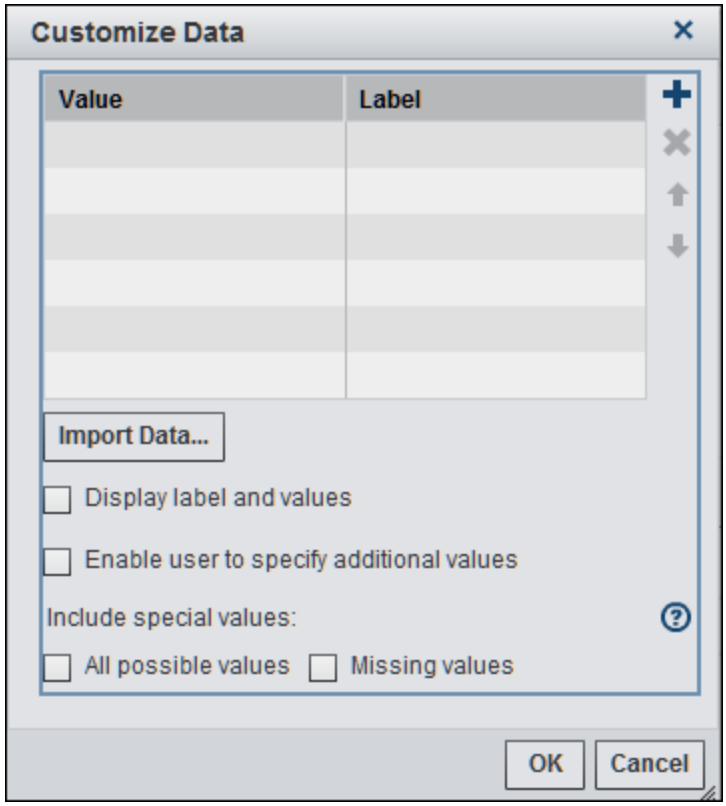
These are the possible properties in the Data section:

Number of values
sets the number of text values that can be entered. If you select **Multiple values**, select **Enable user to reorder values** to enable the user to change the order of the values.

Populated by
specifies the source of the values that are entered.

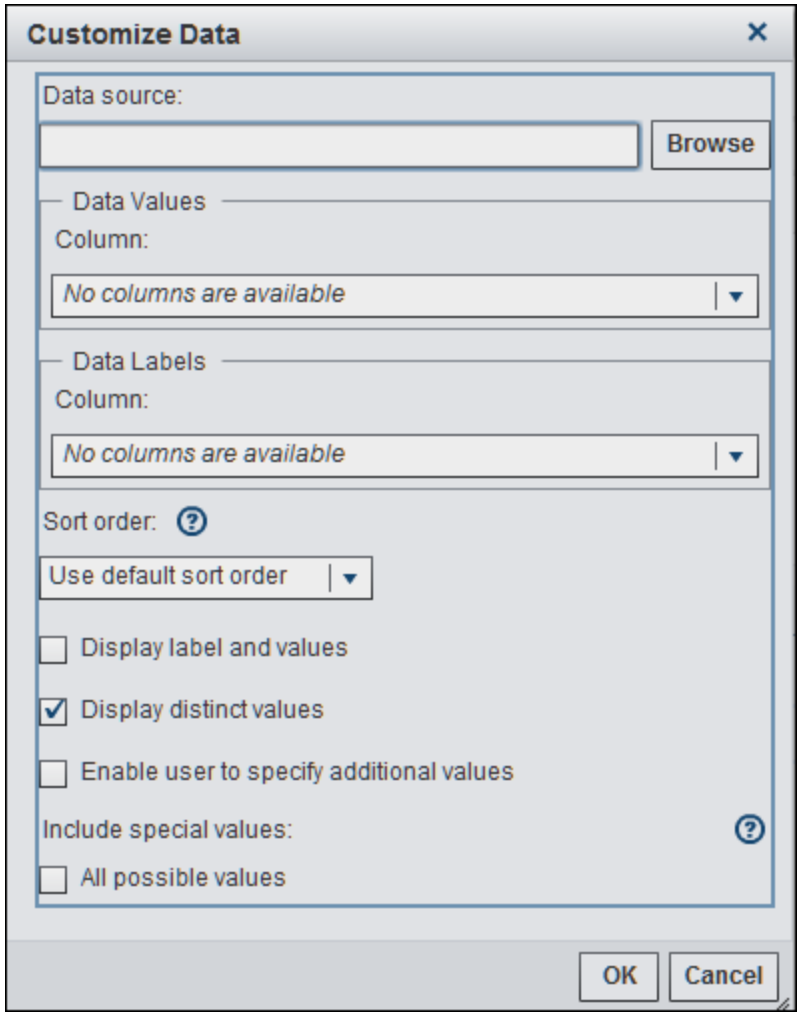
Select **User entry** to indicate that values are entered in by the user.

When you select **A predefined list**, the list does not change unless you add or remove values.



To display text other than the name of the list item, enter a value in the Label column. For example, if the list items are products, the Value could be the product number A12345 and the Label could be Child's Desk. When a predefined list is published to the common data model, the published value contains the concatenated display values. Click **Import Data** to import values from a SAS library. Click **Display label and values** to display the label and values with the list item. To enable the user to select values from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

When you select **A dynamic list**, you can include up to 5,000 items from an external list. The list displays the contents of the SAS Folders hierarchy in the **Folders** tab of SAS Management Console. Changes in this external list are reflected in the list of values that the user can select.



Click **Browse** to select a data source. Select a column in the Data Values and the Data Labels section to display those columns. Select a sort order. To display a value other than the text in the **Value** field, select **Display label and values** and **Display distinct values**. To enable a user to select more than one value from a list, select **Enable user to specify additional values**. Select **All possible values** and **Missing values** to include those values in the list.

Specify Constraints

The following items are the possible properties in the Constraints section.

Allow only integer values
indicates that only integer values can be entered in a numeric or a numeric range custom detail.

Number of lines
specifies whether to display single or multiple lines. . If you select **Multiple lines**, specify the **Maximum line count** and **Number of lines displayed**.

Minimum length
sets the minimum number of characters that are allowed in the field.

Maximum length
sets the maximum number of characters that are allowed in the field.

Maximum line count
is the maximum number of text lines that can be entered in a field.

Number of lines displayed
is the number of text lines that are displayed in the field.

Date type
sets the unit to **Day**, **Week**, **Month**, **Quarter**, or **Year**.

Include relative dates
enables you to select a date that is relative to the current date (for example, **Next week**).

Minimum decimal places
sets the minimum number of decimal places that are allowed in the field.

Maximum decimal places
sets the maximum number of decimal places that are allowed in the field.

Minimum value allowed
is the minimum value for the field.

Maximum value allowed
is the maximum value for the field.

Combined field
is another text field that this field can be combined with.

Maximum combined length
is the combined length of two combined text fields.

Specify Appearance

The Appearance section offers a choice of displays for selection groups and group containers. A selection group can be displayed as a drop-down list or a set of radio buttons. A group container can be displayed as a labeled box, a collapsible section, or an unlabeled group.

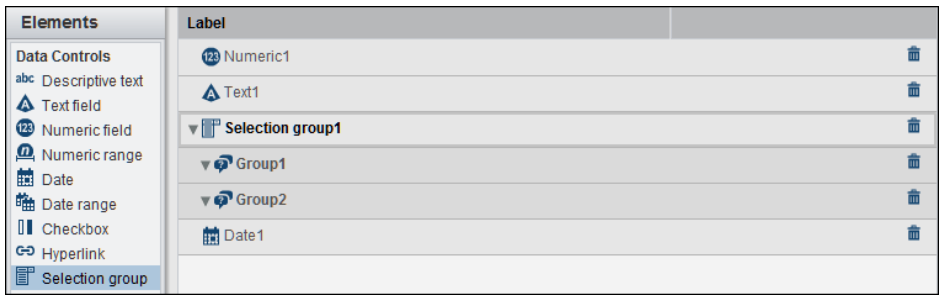
Specify Default Values

In the Default Values section, you specify a default value for a selection group. Click  to specify which group is displayed first by default.

Organize Custom Details

A selection group is a collection of other groups that is displayed as a list or a series of radio buttons. Double-click **Selection group** to add it to the **Label** pane.

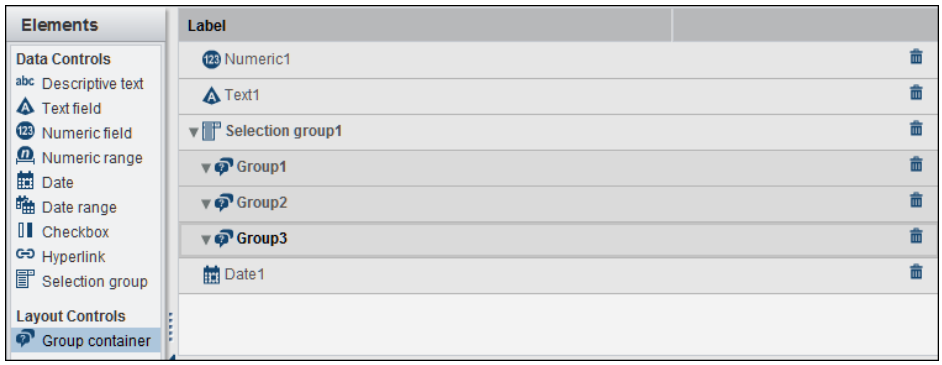
Display 11.46 *Selection Groups*



The selection group is prepopulated with groups that you can modify and add items to. Select items from the **Elements** pane and drag them to a group.

A group container collects custom details into a group. Double-click **Group container** to add it to the **Label** pane.

Display 11.47 *Group Container*

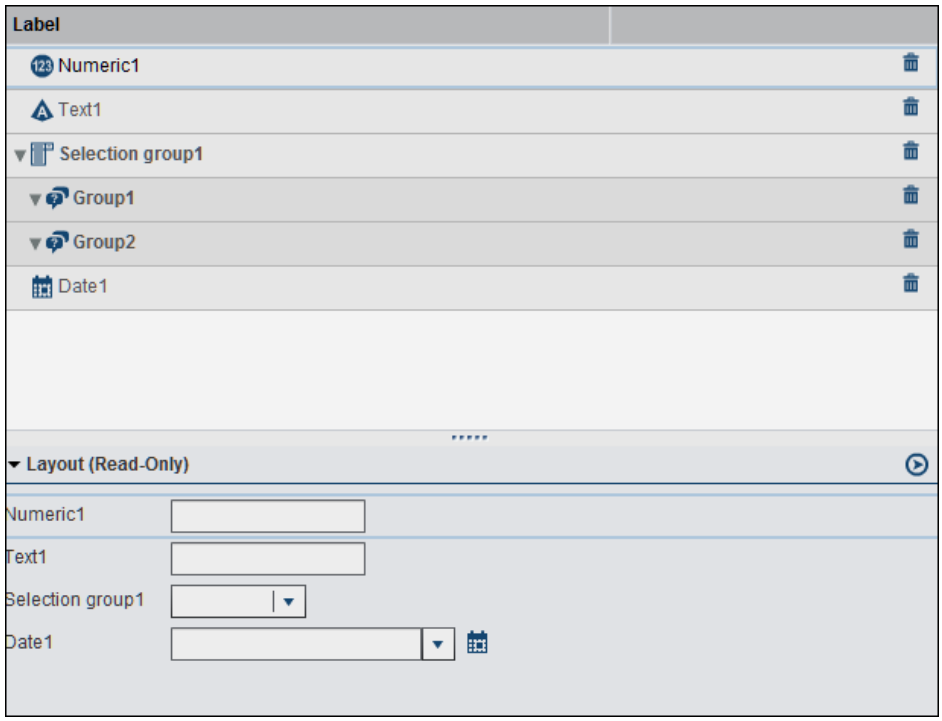


Select items from the **Elements** pane and drag them to a group.

Preview Custom Details

The Layout pane displays the custom details as they appear on the Custom Details page.

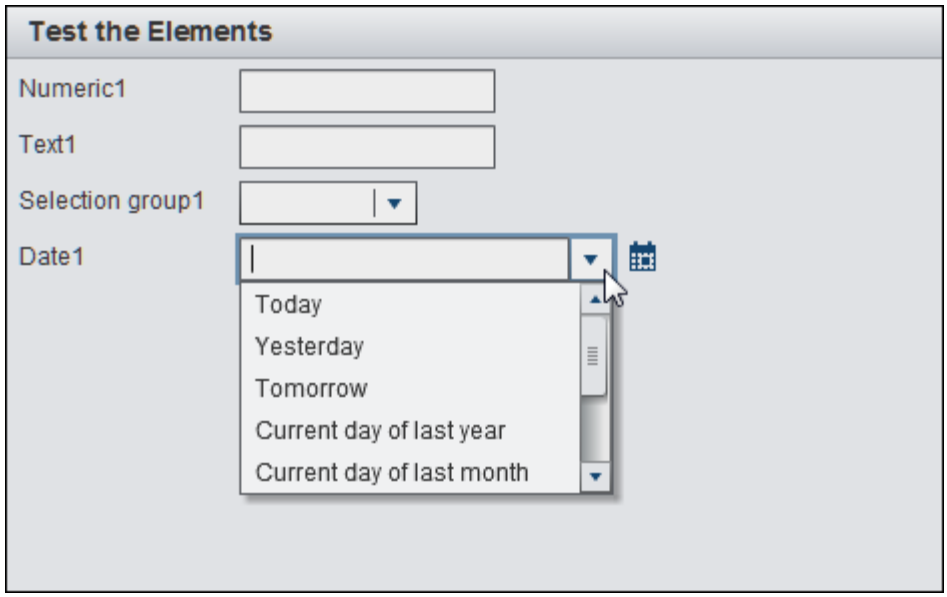
Display 11.48 *Layout*



A red asterisk (*) indicates that a field is required.

Click to open a Test the Elements window where you can test the custom details by interacting with them.

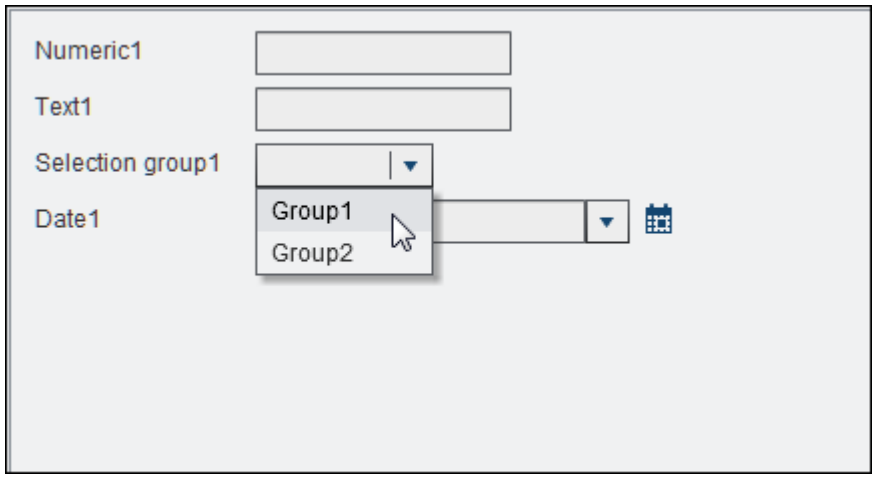
Display 11.49 *Test the Elements*



Set Default Values

On the Custom Details page, you specify default values for the custom details that you have created.

Display 11.50 *Default Values*

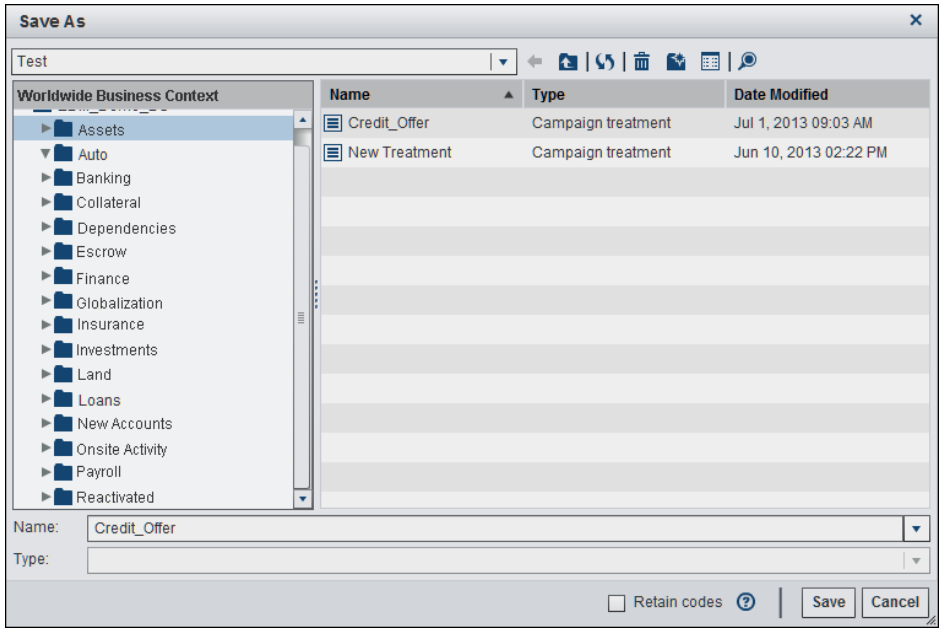


Save a Treatment

To save a treatment, click in the toolbar. The treatment is saved under the name that is specified in the **Name** field.

To save a treatment under a different name, click in the toolbar.

Display 11.51 *Save As*



Select a folder and supply a new name for the treatment. To save the treatment to a new folder, click and open the new folder.

Select **Retain codes** to retain codes that are created manually or generated automatically. Codes are retained according to the setting for the business context. The following codes are retained:

- flow code
- cell code
- package code

Testing Flows

Overview of Testing Flows

You can test flows to ensure that they perform as you expect when they are executed. To conduct a test, select the Diagram page and click in the toolbar.

The results of a test case are reset if any of the following conditions are met:

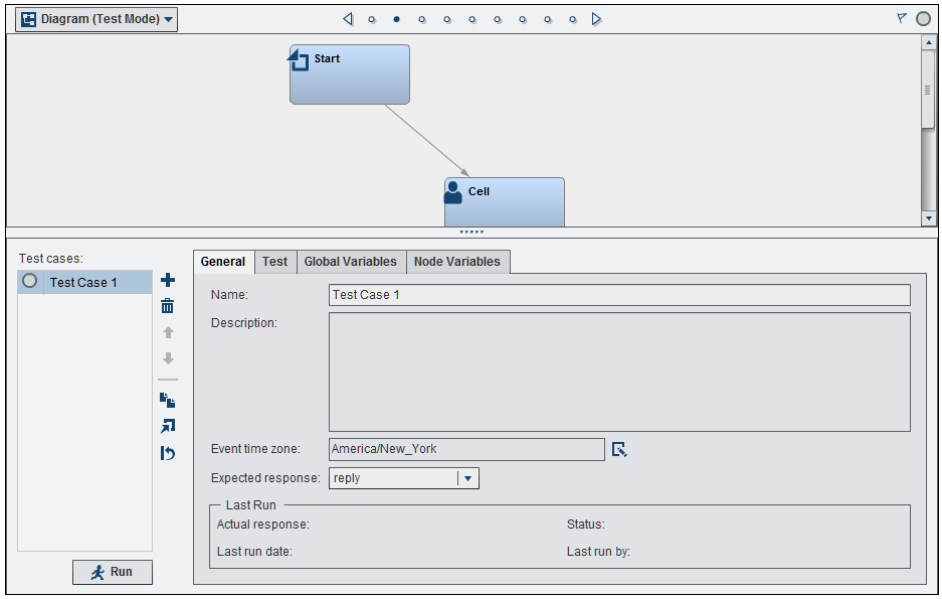
- A link between nodes is added to or removed from the diagram.
- A node is added to or removed from the diagram.
- A node is pasted into the diagram.
- Any node, including a Standard Reply, is updated.
- The diagram is opened after an underlying asset, such as a process, has changed.
- An event has changed.

- Problems were found during the opening of the diagram and the diagram has been repaired.

Add and Run Test Cases

In Test Mode, you specify the testing criteria and run tests on the diagram. The diagram is read-only. Click to toggle between Test Mode and editing the diagram.

Display 11.52 *Test Mode*



Click to add a test case.

Click to duplicate a selected test case.

Click to import test cases from other flows or tables.

Click to reset the node details for all nodes and the actual values for the selected test case.

Click **Run Selected** to run the selected test cases. You can run more than one test case at a time. If a test case succeeds, a check mark is displayed.

The counts from the test case are displayed on the nodes. Click on the toolbar to clear the test counts from all nodes.

Import Test Cases

Overview of Importing Test Cases

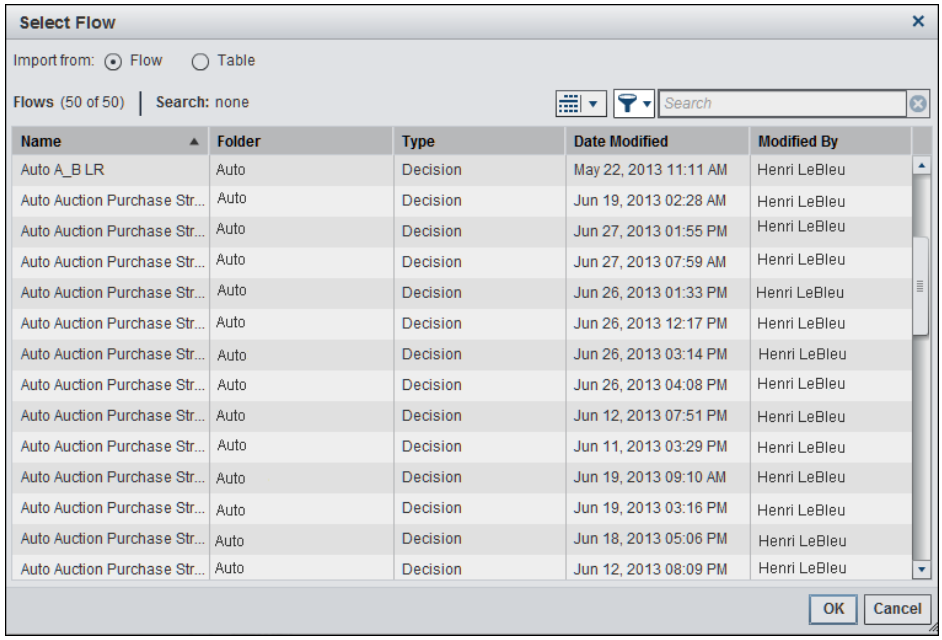
You can make copies of one or more test cases that are associated with another flow of the same type within the same business context by clicking .

If the reply and request variables match the variables in the current flow, the test case can be imported. If the required variables do not match the variables in the current flow, the import operation fails.

Import Test Cases from a Flow

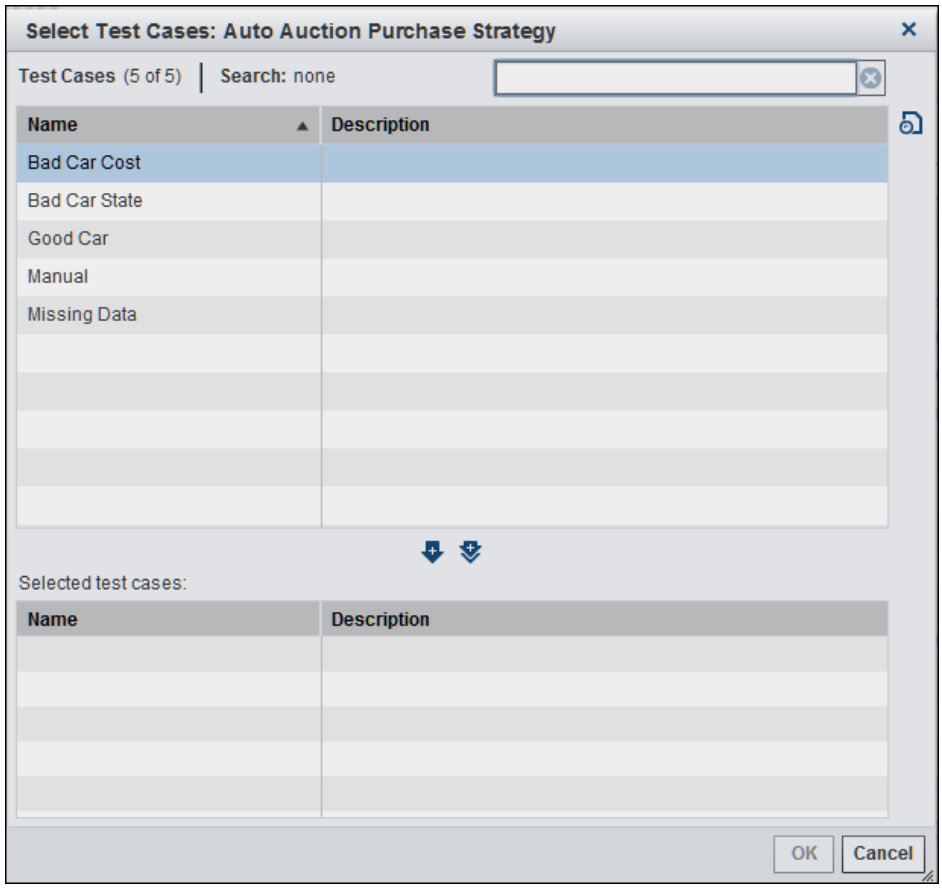
To import test cases from a flow, select **Flow** in the **Import from** field.

Display 11.53 *Import from Flow*



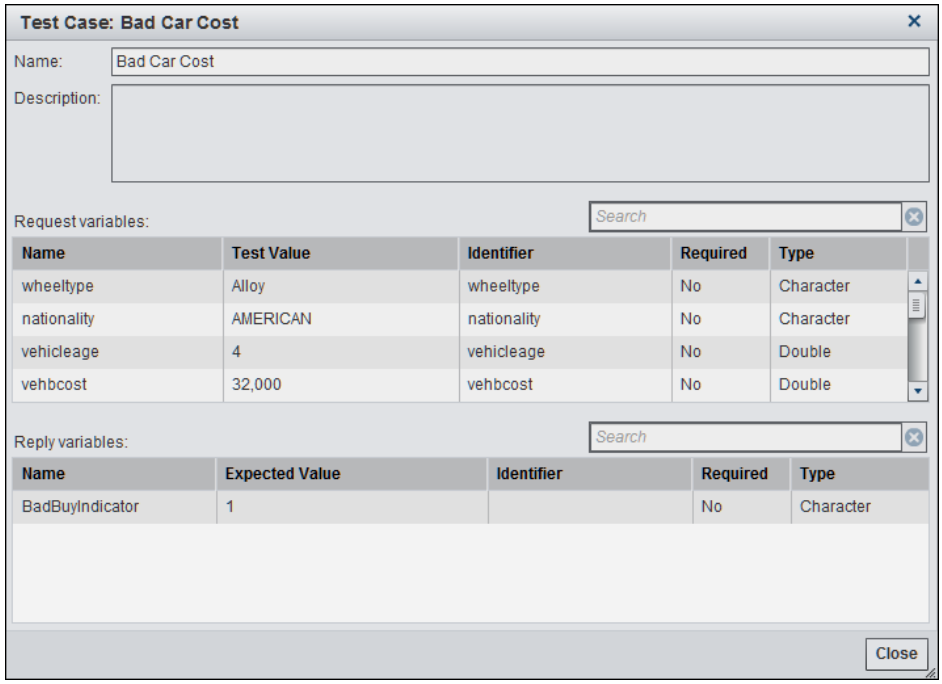
Select a flow.

Display 11.54 *Select Test Cases*



Select a row and click to view the contents of a test case.

Display 11.55 *View Contents of Test Case*



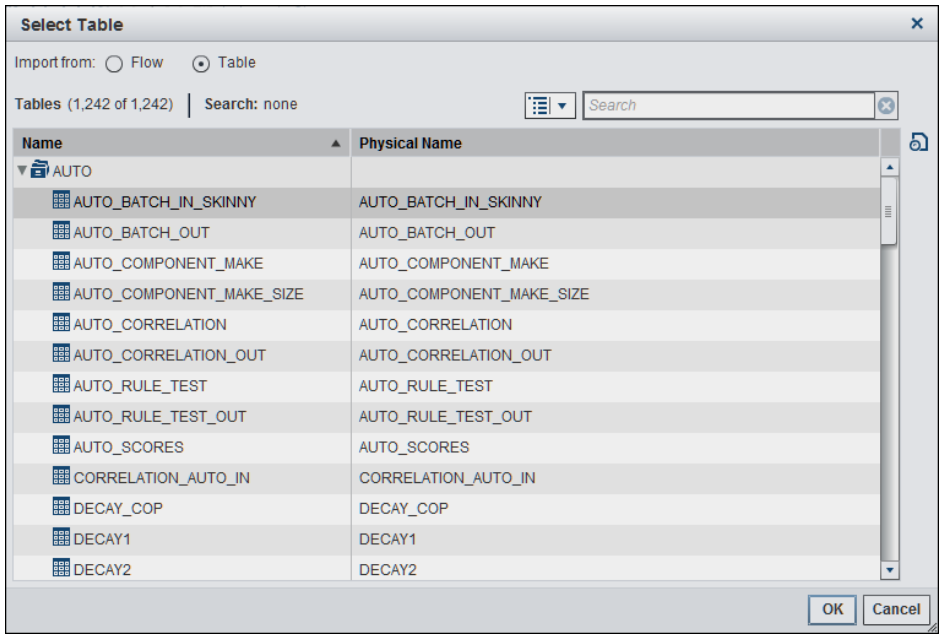
Variables that do not exist in the current flow are not copied. If a variable does not have a value in the current flow, you can assign a value.

Import Test Cases from a Table

You can create a SAS data set from historical data that resides in other systems or files. You can then import the data to use in a test case,

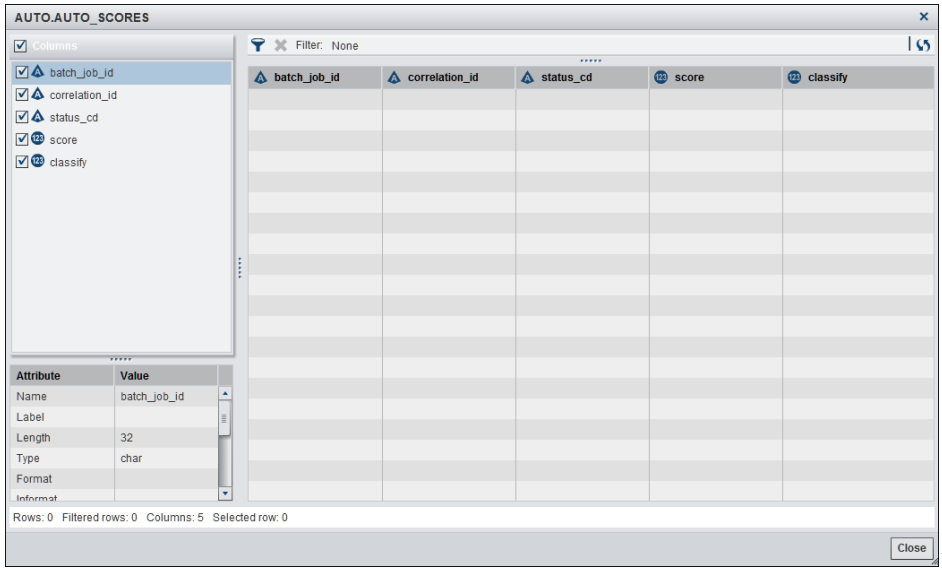
To import test case data from a data set, select **Table** in the **Import from** field.

Display 11.56 *Import from Table*



Select a row and click to view the columns in the table.

Display 11.57 *Test Case Table*

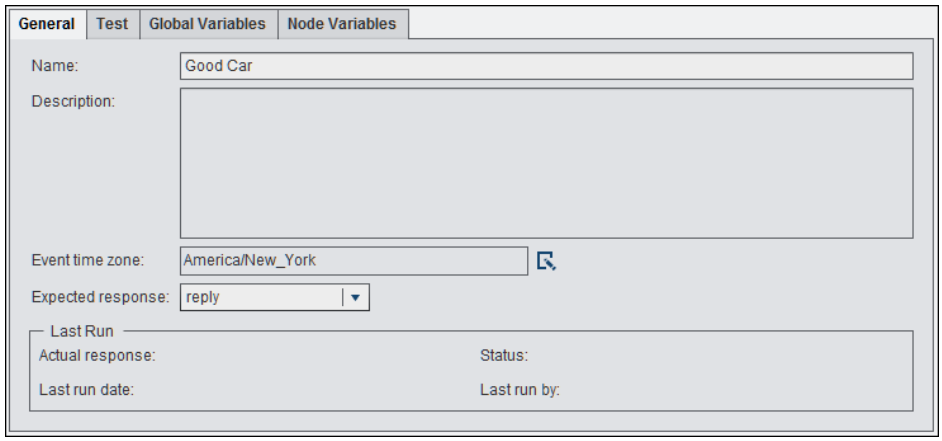


When you import a test case from a data set, a new test case is always created, regardless of whether you have imported the same test case previously.

Supply General Information

The **General** tab of the test interface displays time zones, expected responses, and other information.

Display 11.58 *General Tab*



Click next to the **Event time zone** field to select a time zone for the test case. For more information, see "Time Zones and Test Cases" on page 234.

Select an expected response. There are four types of responses:

reply
verifies that the diagram returns the reply variable values in the Reply node.

standard reply
verifies that the diagram returns the reply values for the standard reply.

error reply
verifies that the diagram returns the error reply values when the diagram is executed with the specified request variables. To display the error reply, the **Provide error values for this diagram** check box in the Start node must be selected. The **Error Value** column in the Start node must contain values if **Required** is set to **Yes**. If the diagram contains errors and **Error Reply** is not selected, the diagram test fails.

error
tests the Error test case. When the test runs and exceptions occur, the status is set to Success.

Time Zones and Test Cases

A number of time zones can be used in calculated variables. The GetDateInTimeZone(*date*,*timezoneid*) function enables you to set a time that is specified by the time zone ID. For example, you can have the following expression: **`GMT_Time = GetDateInTimeZone(date_in, 'Greenwich') where date_in is 1/1/2013 6:00 AM`**. The **`date_in`** request variable is set to the Event Time Zone ID, in this case EST. The value of GMT_Time is 1/1/2013 10:00 AM because the time in London GMT is 11:00 AM when it is 6:00 AM in New York

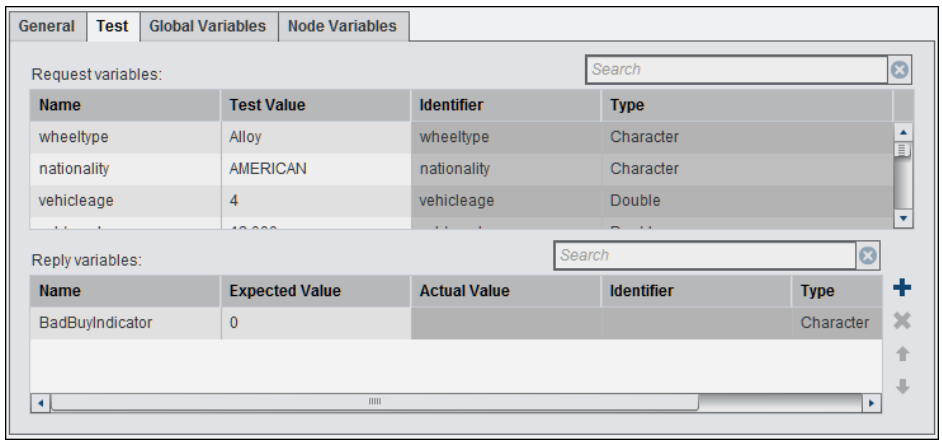
Reply variables are returned in the same time zone as the Event Time Zone ID. In the previous example, 10:00 AM is not returned because it is 10:00 AM GMT, not 10:00 AM EST.

The ToString() function returns a character representation of the calculation, so no conversions have taken place. For example, in the following expression: `ToString(DateTime())`, the return value could be 2013-06-18T10:30:05-04:00. In this expression: `ToString(GetDateInTimeZone(DateTime(), 'Greenwich')`, the return value could be 2013-06-18T14:30:05+00:00.

Supply Test Case Values

The **Test** tab displays the values for the test case variables.

Display 11.59 *Test Tab in Decision Diagram*



Select the **Test Value** and **Expected Value** cells in the Request variables and Reply variables tables and enter the values or click to select values. Select a cell and press Ctrl-C to copy a value in a cell.

Note: To copy and paste list type values from the Actual Value column to the Expected Value column, click in the Expected Value column and paste the list type values into the Define Value window.

In decision flows, any required reply variables are automatically added to the Reply variables table. To add a variable to the Reply variables or Treatment variables table, click

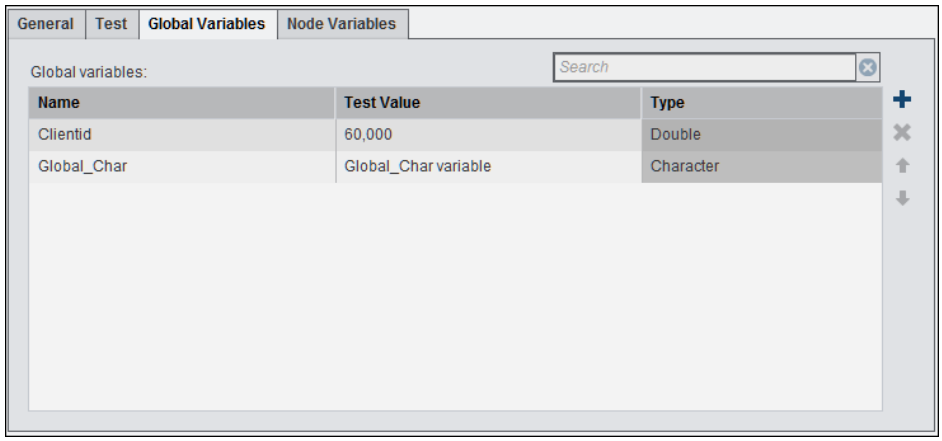
Note: Array types that are returned from calculated variables are not supported. Data Grid type values must be from SAS data sets. Data grids that do not contain columns cause the test to fail.

The **Actual Value** cell displays the actual values that have been returned. Variables that are associated with identifiers return the value of the identifier, even if a value has not been specified in the node.

Change Global Variable Values

On the **Global Variables** tab, you override global variable values for the specified test.

Display 11.60 *Global Variables*

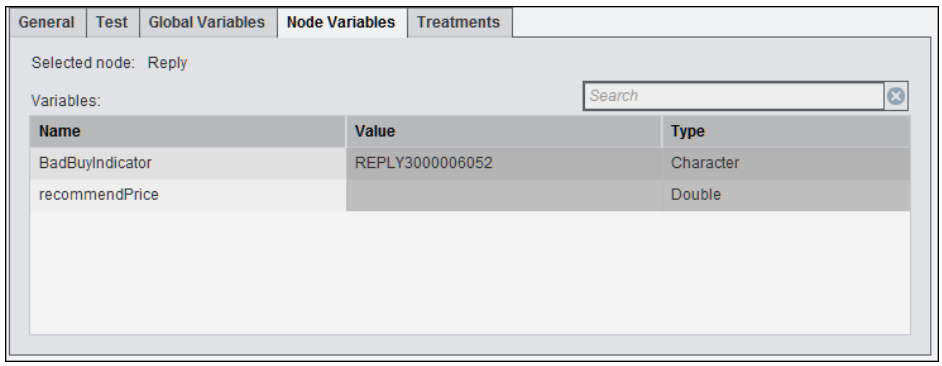


Click ✚ to add a global variable to the table. Click ↖ in the Test Value cell to change the value of the global variable. The changed values are specific to the current test case.

View Node Variables

To view the variables that are associated with the selected node, click the **Node Variables** tab and select the node.

Display 11.61 *Node Variables Tab*

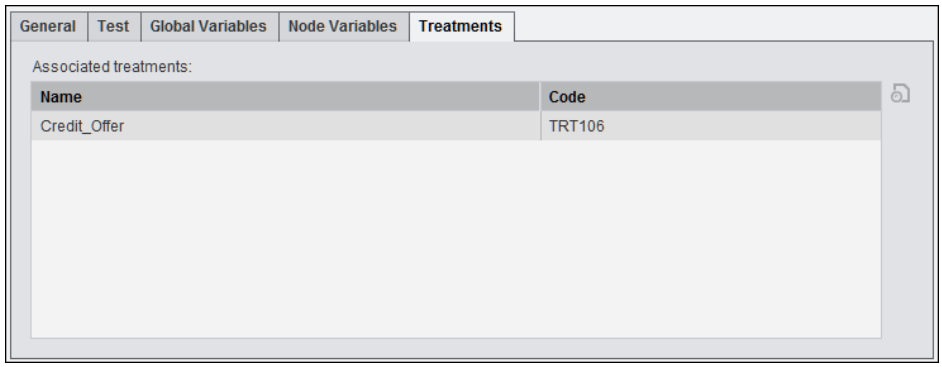


Data grids are not displayed on this tab. Select the **Test** tab to view the contents of a data grid.

View Treatments

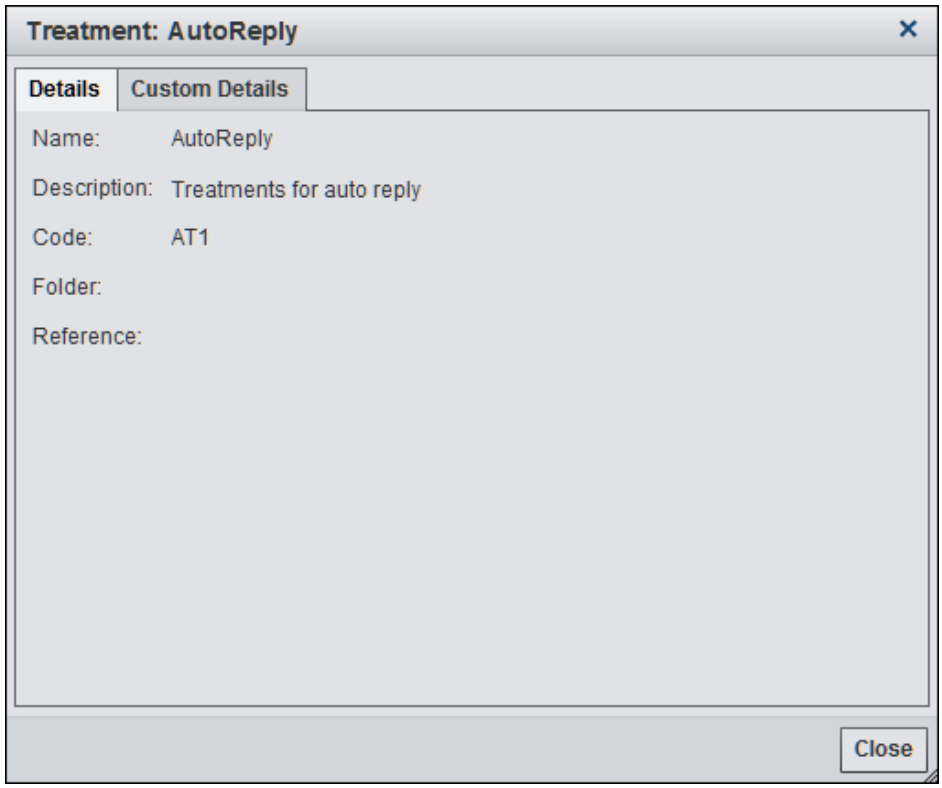
If a Reply node has been selected, the **Treatments** tab displays the list of treatments that are associated with the flow.

Display 11.62 *Treatments Tab*



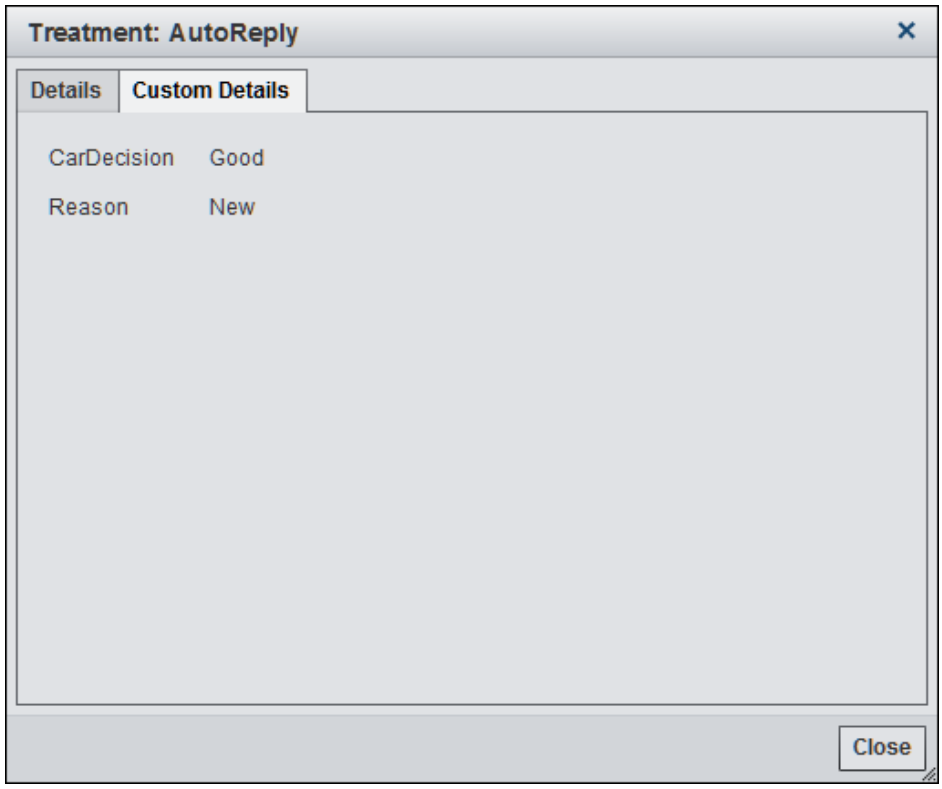
Click to view the contents of the selected treatment.

Display 11.63 *Treatment Details*



The **Custom Details** tab displays any custom details that are associated with the treatment.

Display 11.64 *Treatment Custom Details*



Executing Batch Simulations

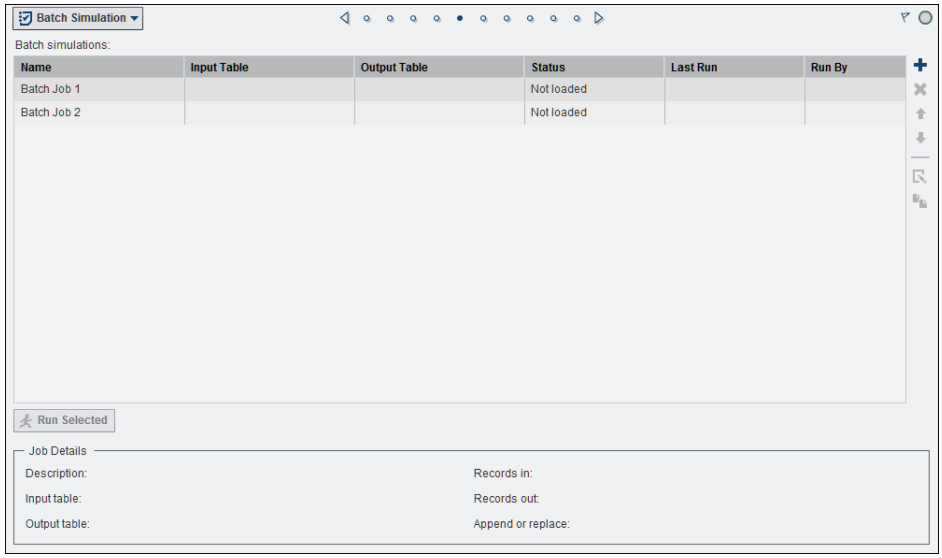
Overview of Batch Simulations

You can run high-speed simulation tests of transactions that are stored in database tables. With these batch simulations, you can produce application and system performance data. Batch simulations can be used to process a representative amount of data so that you can confirm the pattern of expected results. As a best practice, you run a batch simulation after conducting unit tests and before you deploy the flow.

Add a Batch Simulation

You run batch simulations on the Batch Simulation page.

Display 11.65 *Batch Simulation Page*

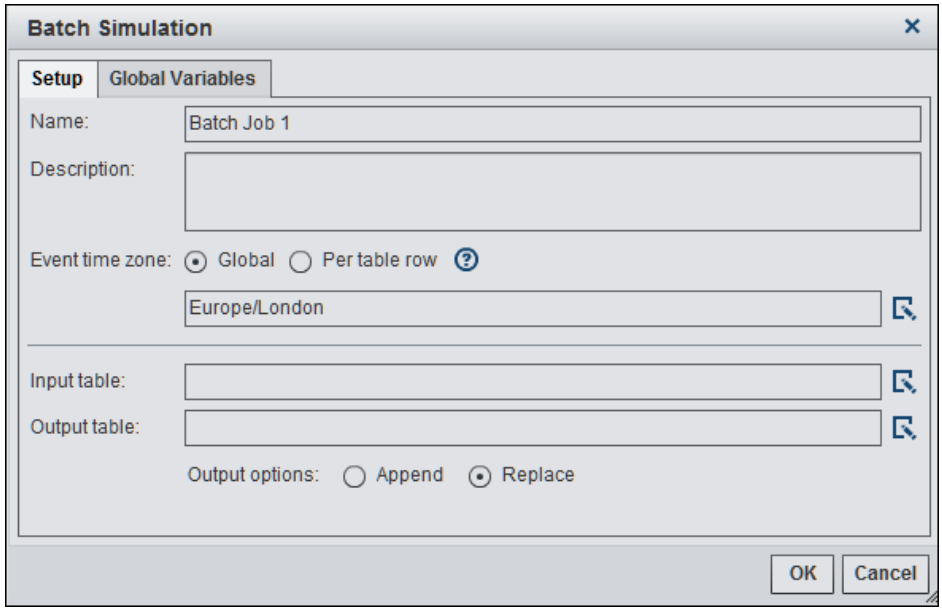


Select ✚ to add a batch simulation.

Specify Tables and Time Zones

On the **Setup** tab of the Batch Simulation window, you specify details such as input and output tables and time zones.

Display 11.66 *Setup Tab*



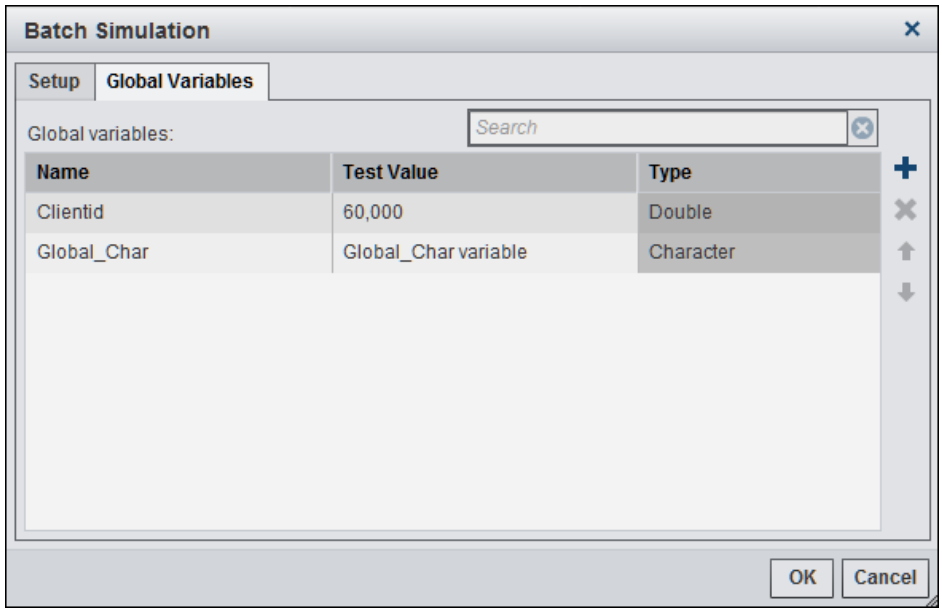
To set the event time zone for the entire input table, select **Global**. Click to select the time zone. To display the time zone for a particular row record, select **Per table row** and specify the column name that contains the time zone.

Click to select the input table and output table for the batch simulation. Select **Append** or **Replace** to append the output to an existing table, or to replace the contents of the existing table with the output.

Select Global Variables

On the **Global Variables** tab, you override existing global variables with variables that are used in the simulation.

Display 11.67 *Global Variables Tab*

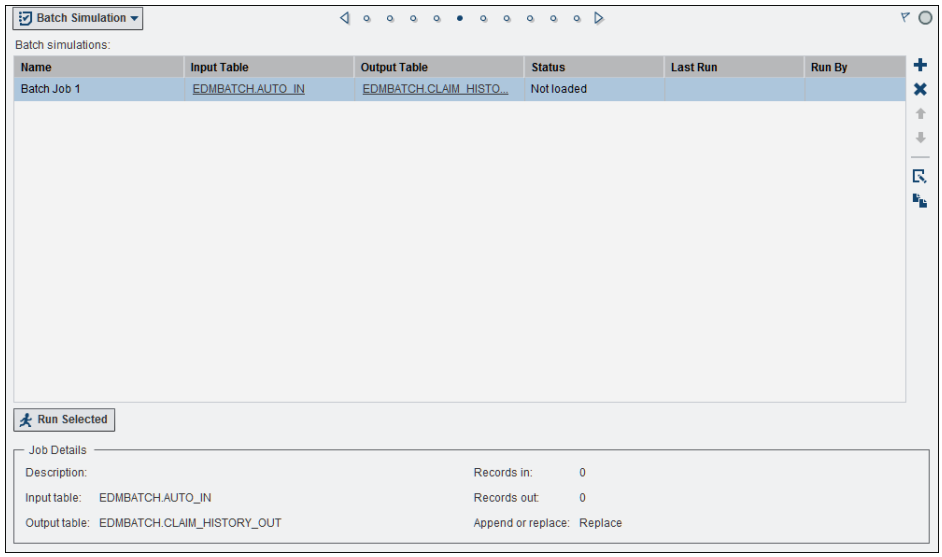


Click to select a global variable.

Run a Batch Simulation

After you have added a batch simulation, the tables are displayed on the Batch Simulation page. Click a table name to view the contents.

Display 11.68 *Selected Batch Simulation*



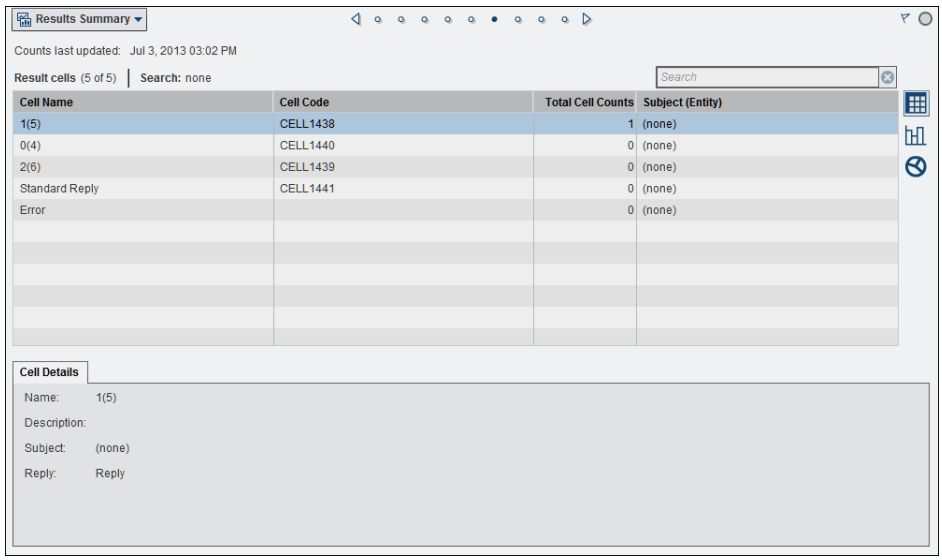
Click to duplicate the selected simulation.

Select a row and click **Run Selected** to run the simulation. You cannot edit or save a flow while a batch simulation is running. When the simulation is complete, the node counts in the diagram are updated to reflect the counts that are generated by the batch simulation.

View Batch Simulation Results

The results of the most recent batch simulation are displayed on the Results Summary page.

Display 11.69 *Results Summary*



The total cell counts for the Batch and Filter nodes are the number of records that are passed to the next node that is downstream. The dropped counts are subtracted from the total cell counts.

Click to display the results in a grid. Click to display the results in a pie chart. Click to display the results in a bar chart.

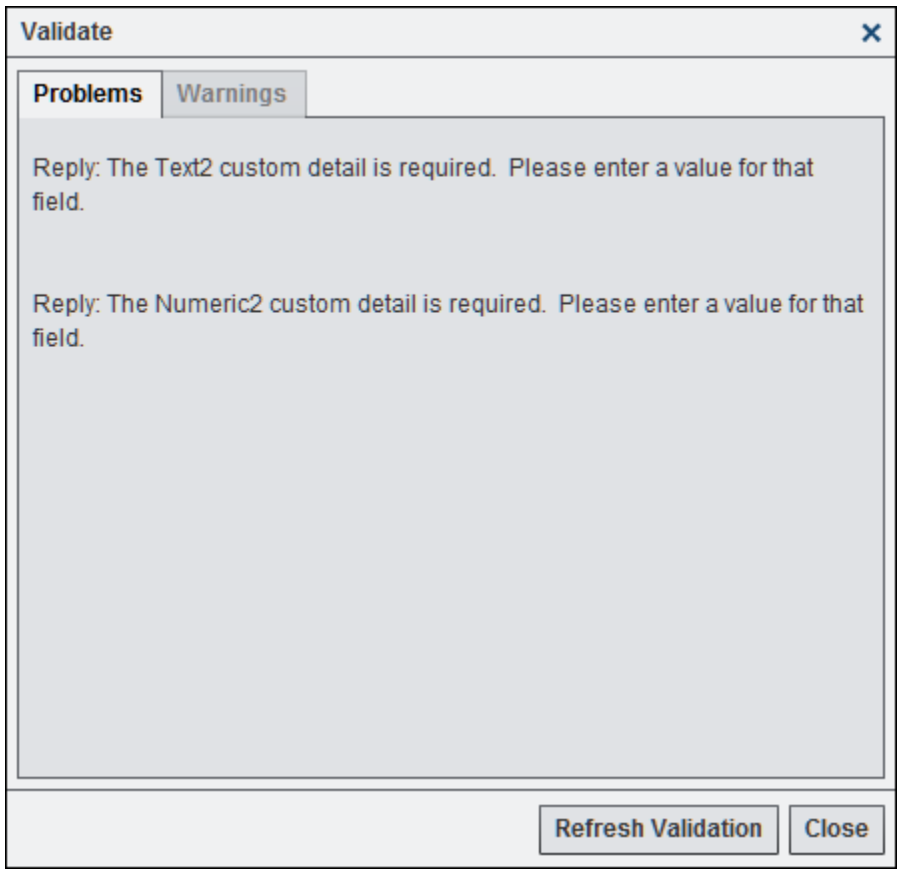
Validate Flows

You can validate flows to determine whether all of the nodes in a diagram are ready to be deployed. If the diagram is ready to be deployed, the validation process generates a temporary diagram on the SAS Decision Services design-time server.

To validate a flow, click in the toolbar.

The Validate window displays the results. If the validation fails, a message that describes the errors is displayed on the **Problems** tab.

Display 11.70 *Problems*



The **Warnings** tab displays warnings about the nodes in the diagram. Press Ctrl-A to copy all of the text in the **Warnings** tab.

If there are errors, address the errors, and click **Refresh Validation** to run the validation again.

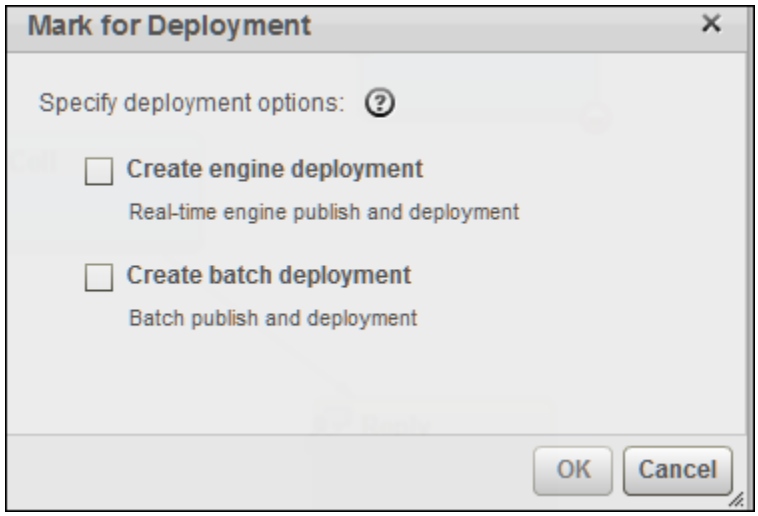
Mark for Deployment

To mark a decision flow for deployment, click on the toolbar.

Real-time decision flows are generated on the SAS Decision Services design-time server and published to the common data model.

Batch decision flows can be marked for deployment to the design-time server, or they can be published to a repository. If the flow is a batch decision flow, the following dialog box is displayed.

Display 11.71 *Batch Flow Deployment Options*



Select **Create engine deployment** to generate the flow on the SAS Decision Services design-time server.

Select **Create batch deployment** to publish the code to a repository. Applications such as SAS Data Integration Studio can include the DS2 code in the repository in a SAS batch process. Before the code is published to a repository, the flow is generated on the SAS Decision Services design-time server. If you do not modify the flow, and you select **Create engine deployment** after you publish the code to a repository, the engine deployment is created very quickly.

For more information, see "Flows" on page 63.

All flows should be validated, tested, and approved before being marked for deployment.

You can refresh data and delete old records after a flow has been marked for deployment and published to the common data model. Create a new version of the flow and mark the new version for deployment.

Working with Documents

Overview of Documents

Documents are reports that summarize the information in your flow. Documents are created in PDF format.

Create Documents

To create documents, open a flow and click in the toolbar.

In the Create Document window, you select the content that you want to include in a document.

Display 11.72 *Create Document*

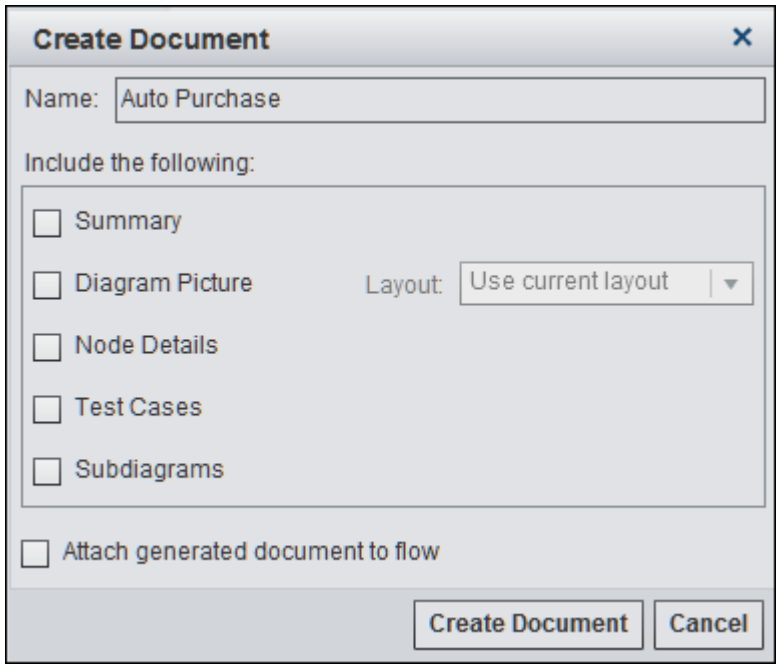


Image annotations are not included in the document.

You can select the following types of documents:

Summary
displays all of the information about a flow. If the flow definition has custom details, tables appear in the report for those items.

Diagram Picture
displays an image of the diagram. To change the direction in which the nodes are displayed in the main diagram in the document, select an item from the **Layout** list.

Test Cases
displays information about test cases.

Subdiagrams
displays information about subdiagrams that are connected to the flow.

Select **Attach generated document to flow** to save the document on the Attachments page. If you do not select this option, the generated documents are not saved. The name of the attachment is the name that you have specified for the document. The name does not have to be unique. The date and time that the document is saved differentiate it from other attachments with the same name. This option is not available if the flow does not have an Attachments page or if you do not have Edit access to the flow.

Click **Create Document** to create and view the types of documents that you have selected. You can save the documents to another location.

Note: To view a non-Western language in Adobe PDF format, you might need to download the font pack for that language from **www.adobe.com**.

Chapter 12

Creating Nodes

Copying and Pasting Nodes

Overview of Copying and Pasting Nodes

You can copy nodes by selecting a node or a group of nodes, or by right-clicking and selecting **Copy**. Press Ctrl - A to select all of the nodes in a diagram. To paste the copied nodes, right-click and select **Paste**.

You can copy and paste nodes into the same diagram or a different diagram. You cannot copy and paste between selection and decision diagrams, or between diagrams that are in different business contexts.

The pasted node is named *nodename (n)*, where *n* is an incremented number. The description is retained with the pasted node. If the node contains a code, such as a cell code, it is pasted according to the rules of the current business context. If the code is generated automatically, a new code is generated. If the code is set manually, the **Code** field in the pasted node is blank. In the pasted node, the **Total** and **Last run on** fields are blank. Counts and percentages are cleared in the pasted node.

The pasted node group is named *nodegroupname (n)*, where *n* is an incremented number. Incremented numbers begin with the (2) for node groups.

Copy and Paste Nodes in Decision Flows

The following considerations apply when you copy and paste in decision flows:

All nodes
: When a pasted node references a variable and the source of the variable is not copied, the node is marked **Not Ready**.

A/B Test node

- Copying the node will automatically generate cell codes if **Retain all code values when pasting** is selected for the business context.
- Variables are copied with the node. If the upstream source of the variable is also copied or if the variable already exists upstream of where the A/B Test node was copied, then the reference is automatically restored.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.

Branch node

- Variables are copied with the node. If the upstream source of the variable is also copied or if the variable already exists upstream of where the Branch node was copied, then the reference is automatically restored.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.

Business Rules node

- Variables are copied with the node. Copying preserves all values, including any manually entered values and selected identifiers for a variable. If the upstream source of the variable is also copied or if the variable already exists upstream of where the Business Rules node was copied, then the reference is automatically restored.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.

calculated variables

- Calculated variables are copied with the node in which they were defined. When the node is pasted, the calculated variable is available in the new node.
- References to any global variables that are used in a calculated variable are restored.
- If an upstream variable that is referenced in the calculated variable is available in the location to which the node is copied, then the reference is restored. If the upstream variable is not available, then the name of the upstream variable is retained and the pasted node is marked **Not Ready**.
- If a calculated variable of the same name exists in the destination, an incremented number is appended to the name of the pasted variable (for example, Pasted Variable (2)).
- If an implicit process that is referenced in the calculated variable is available in the location to which the node is copied, then the reference is restored. If the implicit process is not available, then the name of the implicit process is retained and a message notifies you that the implicit process is not available in that location. The pasted node is marked **Not Ready**.
- If another calculated variable that is referenced in the calculated variable is available in the location to which the node is copied, then the reference is restored. If the referenced calculated variable is not available, then the name of the referenced calculated variable is retained and a message notifies you that the referenced variable is not available in that location. The pasted node is marked **Not Ready**.

Cell node

Generated cells cannot be copied by themselves, but can be included in a copy of the parent node.

Cross Table node

Variables are copied with the node. If a variable does not exist, you can select another variable without losing the criteria that are specified in the node.

Filter node

- Variables are copied with the node. If the upstream source of the variable is also copied or if the variable already exists upstream of where the Filter node was copied, then the reference is automatically restored.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.

Process node

- Variables are copied with the node. Copying preserves all values, including any manually entered values and selected identifiers for a variable. If the upstream source of the variable is also copied or if the variable already exists upstream of where the Process node was copied, then the reference is automatically restored.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.
- No process variable validation will occur during pasting of the node to the destination.

Reply node

- Variables are copied with the node. Copying preserves all values, including any manually entered values and selected identifiers for a variable. If the upstream source of the variable is also copied or if the variable already exists upstream of where the Reply node was copied, then the reference is automatically restored.
- Create a Start node that has been assigned the same events before you paste the Reply node into another flow. In this way, you will be able to retain the events in the pasted Reply node.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.
- If you copy a Reply node with a Decision History page into a diagram where SAS batch functionality is enabled, the Decision History page is not displayed.For more information, see “Flows” on page 63.

Score node

- Variables are copied with the node. Copying preserves all values, including any manually entered values and selected identifiers for a variable. If the upstream source of the variable is also copied or if the variable already exists upstream of where the **Score** node was copied, then the reference is automatically restored.
- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.

Start node

- There can be only one Start node per diagram.
- When you paste a Start node into a diagram, the event is retained.
- If a Start node that contains an event with an array or a data grid is pasted from another diagram into a decision flow that has been marked as a batch flow, the event is cleared and the node displays a warning icon.

Subdiagram node

- Variables are copied with the node. Copying preserves all values, including any manually entered values and selected identifiers for a variable. If the upstream source of the variable is also copied or if the variable already exists upstream of

where the **Subdiagram** node was copied, then the reference is automatically restored.

- If the upstream source of the variable was not copied, the name of the variable is maintained, and the node is no longer linked to the upstream source.
- If you do not have access to a diagram that is selected in the Subdiagram node, you can copy and paste the node, and the node status will change to **Ready** when you have access to the diagram.

A/B Test Node

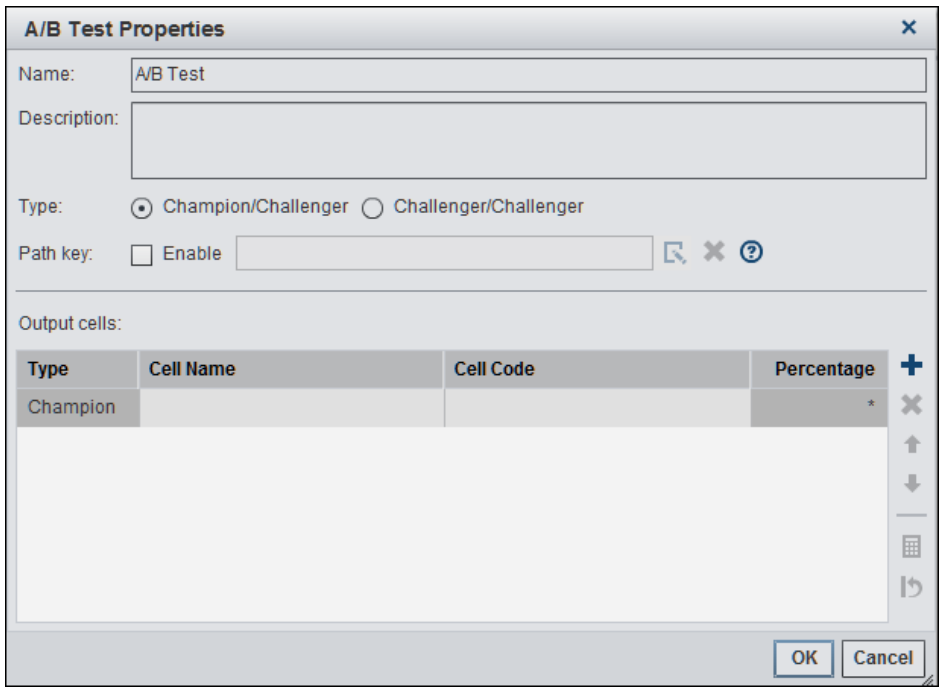
Overview of the A/B Test Node

The A/B Test node enables you to direct incoming data into a champion group or a challenger group for testing. The data is sorted randomly between the groups. The node generates output cells, which can then be linked to Reply nodes.

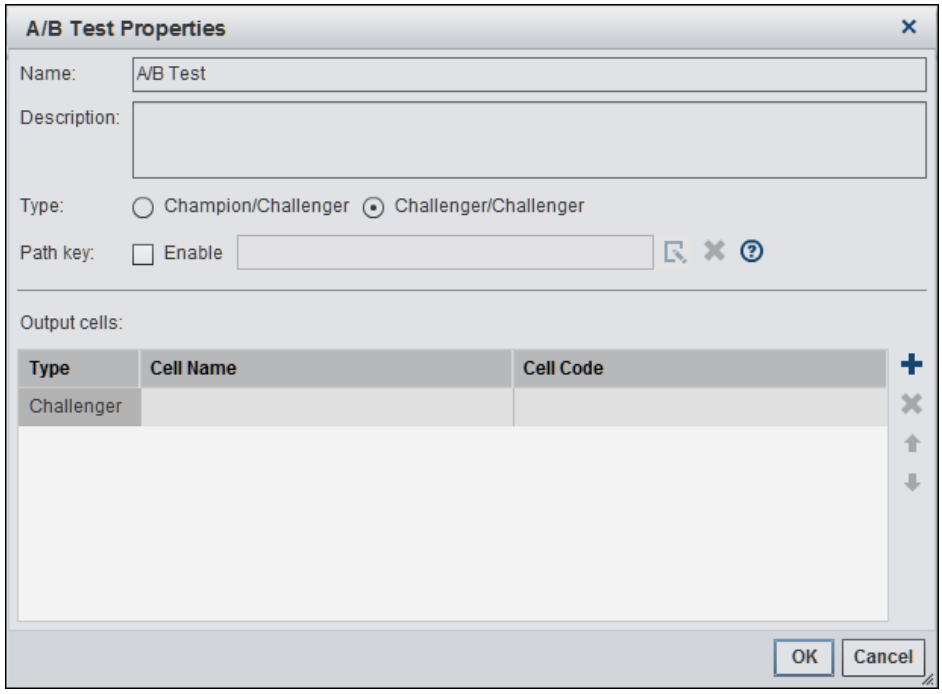
Specify A/B Test Node Properties

The A/B Test Properties window displays information about the node.

Display 12.1 *A/B Test Node with Champion/Challenger Selected*



Display 12.2 *A/B Test Node with Challenger/Challenger Selected*



Select one of the following types:

Champion/Challenger
generates cells for a champion group and one or more challenger groups. In the **Champion/Challenger** type, the champion is the control group that the challengers are compared against.

The size of the challenger groups is specified as a percentage that is greater than 0 and less than 50. The champion receives the remainder of the population after the sizes of all of the challengers have been met. The size of the champion must be at least as large as the smallest challenger. The total of all of the percentages of both champion and challenger cannot be greater than 100%.

Click to use the Statistical Size Estimator to calculate a percentage. For more information, see "Determine Sample Size" on page 253. Click to restore the challenger percentages to their default values.

Challenger/Challenger
generates cells for two or more challenger groups that are compared against each other. The **Challenger/Challenger** type sets up groups of equal size. Each challenger is a control group for all of the other challengers. Any two challengers can be compared to each other.

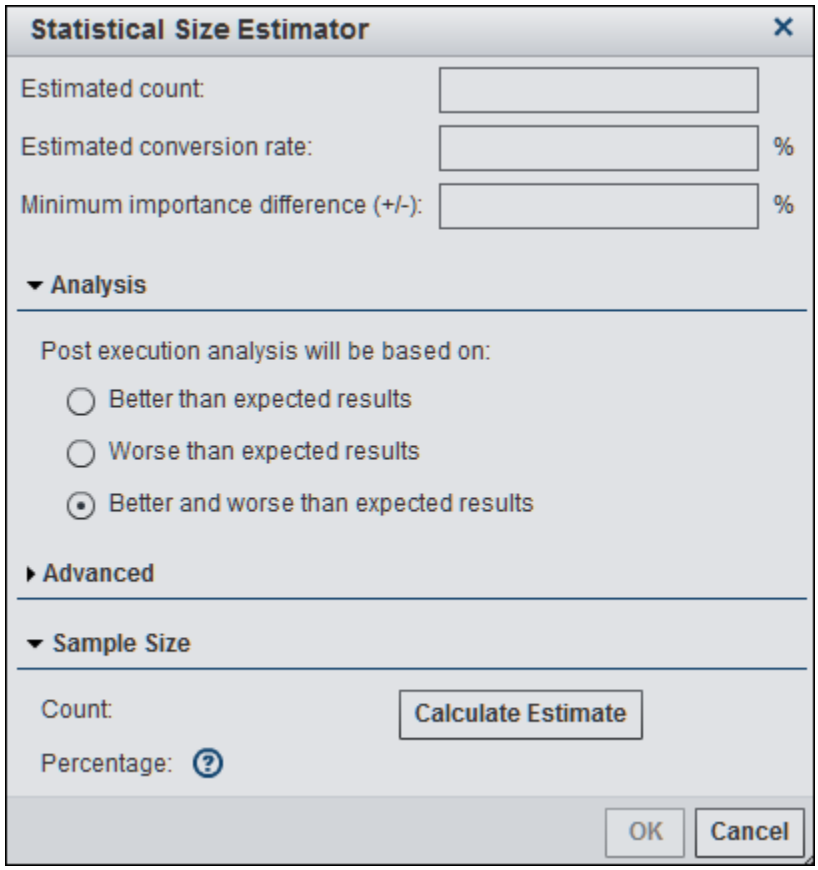
Select **Enable** next to the **Path key** field and click to use a key to direct incoming customers. For example, if the path key is `Customer_ID`, the same customer with the same event variables follows the same path in the decision flow each time there is a response. Enabling the path key ensures consistent results. This is also useful in unit testing, so that the same customer is always processed by the same cell. The path that a customer follows through the decision flow is randomly selected, but the same customer always follows the same path.

When you select to save a flow, or when you import a flow, the customer follows the same path as in the original flow. When you copy and paste the node, the customer might follow a different path because the random number seed for the node is reset.

Determine Sample Size

With the statistical size estimator, you can determine a sample size, and then analyze response rates for statistically significant differences.

Display 12.3 *Statistical Size Estimator*



Estimated count is the total number of subjects. This value is used to determine what percentage the computed group represents in comparison to the total number of individuals.

Estimated conversion rate reflects the estimated conversion rate of offers to responses, including both positive and negative responses, that you predict that this interaction will generate. For example, experience might show that a certain style of flow typically will produce a 3% conversion rate. You can specify this historic rate, or you can assume that the rate will be higher with this group in this flow and raise that estimated conversion rate.

Minimum importance difference represents the level of granularity that the analytical reports are able to identify. If this number is very small, there will be a very fine level of granularity, but the size of the group will be larger. If this number is very large, it will be difficult to identify improvements unless the improvements are extremely large. For example, a choice of 0.1% would allow the analytical reports to determine the difference

between 3.1% and 3.2% conversion rates. A choice of 0.5% would allow the analytical reports to make decisions based only on the difference between 3.1% and 3.6%.

The Analysis section determines the basis for post-execution analysis. Do you expect to base your post-execution analysis on better-than-expected results, or on both better-than-expected results and worse-than-expected results?

In the Advanced section, **Nominal power** specifies the desired power of the test and is expressed as a probability. You can select **High** (0.9), **Medium** (0.75), or **Low** (0.6).

Alpha specifies the level of significance of the statistical test. The default value is 0.05, or a 5% level of significance.

Method specifies a modeling technique. You can select **Pearson's chi-square**, **Fisher's exact**, or **Likelihood ratio chi-square**.

Click **Restore Defaults** to return to the values that were set for the current business context.

In the Sample Size section, click **Calculate Estimate** to execute the statistical size calculations. The **Count** value is ignored. The **Percentage** value is rounded to three decimal places.

Branch Node

Overview of the Branch Node

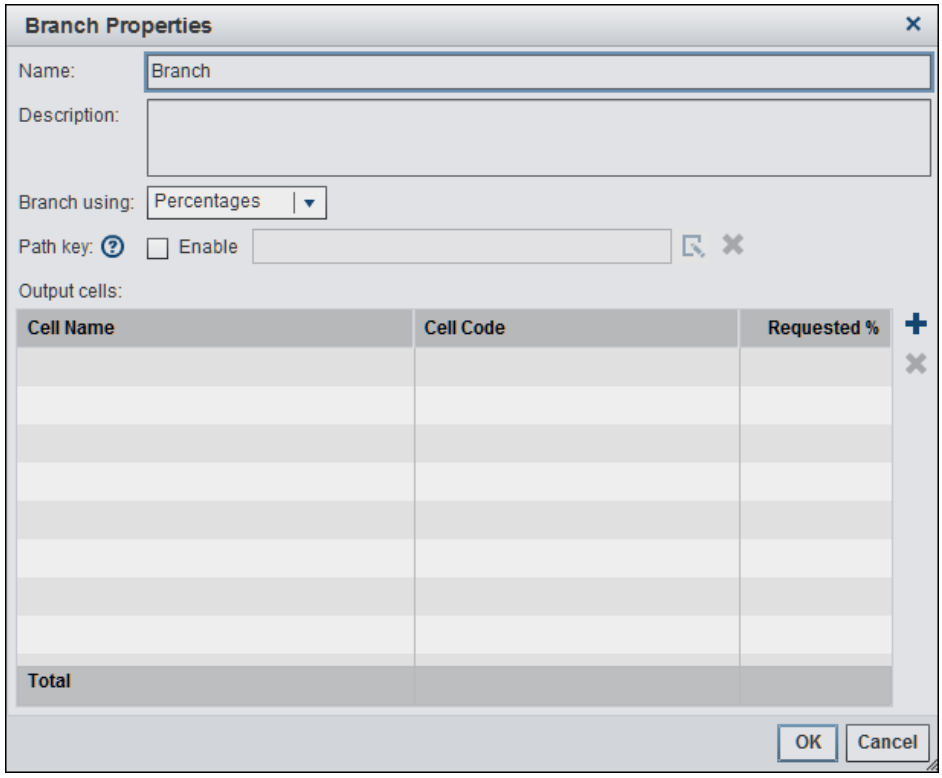
The Branch node distributes data so that different processes can be performed on different subjects. Each output cell can receive a different reply. The Branch node must be preceded by an input node, which can be any node except the Reply node or another Branch node.

The total count for the Branch node is the number of records that are passed to the next node that is downstream. The dropped counts are subtracted from the total count.

Branch Using Percentages

To create output cells that are based on percentages of the data, select **Percentages** from the **Branch using** list.

Display 12.4 *Branch Using Percentages*



Follow these steps to create branches according to percentages:

1. Add a row to the table for each cell that you want to create by clicking ✚. Specify a name for each cell in the **Cell Name** column.
2. Specify a cell code for each cell in the **Cell Code** column. If you do not enter a cell code, then one is assigned using the format that is specified in the business context setting. The Branch node cannot change to Ready status if cell codes are blank.
3. In the **Requested %** column, enter the percentage of the segment that you want to assign to of the cells. Fractional numbers and values less than 1% are valid. Use an asterisk (*) in the last row to indicate the remainder percentage.

Select **Enable** next to the **Path key** field and click to use a key to direct incoming customers. For example, if the path key is `Customer_ID`, the same customer with the same event variables follows the same path in the decision flow each time there is a response. Enabling the path key ensures consistent results. This is also useful in unit testing, so that the same customer is always processed by the same cell. The path that a customer follows through the decision flow is randomly selected, but the same customer always follows the same path.

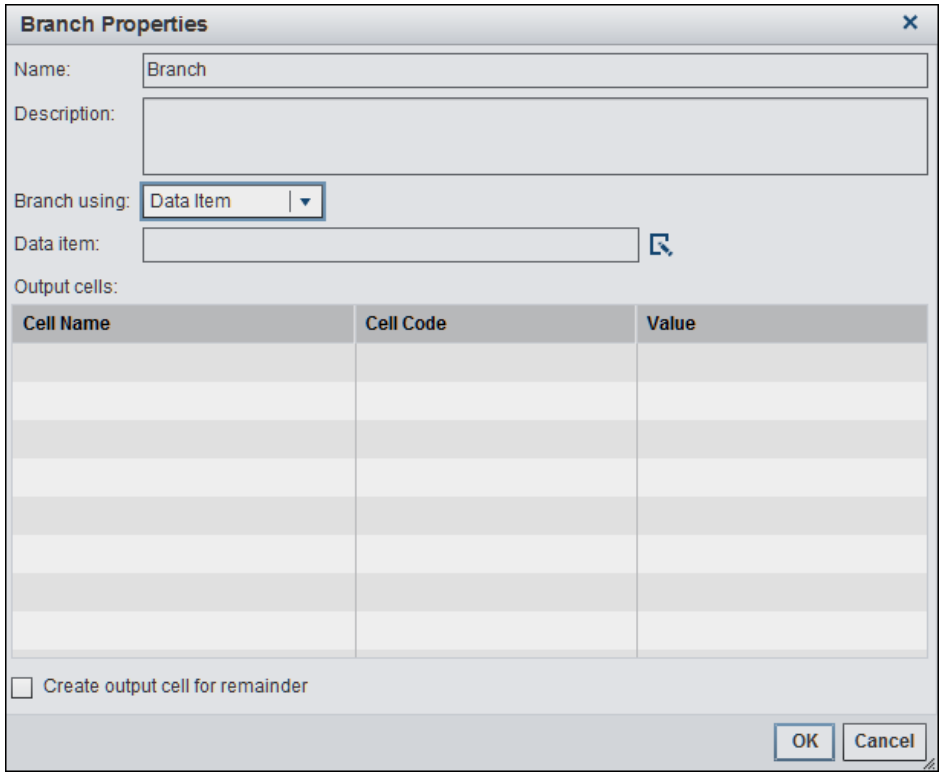
When you select to save a flow, or when you import a flow, the customer follows the same path as in the original flow. When you copy and paste the node, the customer might follow a different path because the random number seed for the node is reset.

Branch Using a Data Item

You branch using a data item in order to create an output cell for a variable that is different from the input node.

To branch using a data item, select **Data Item** from the **Branch using** list.

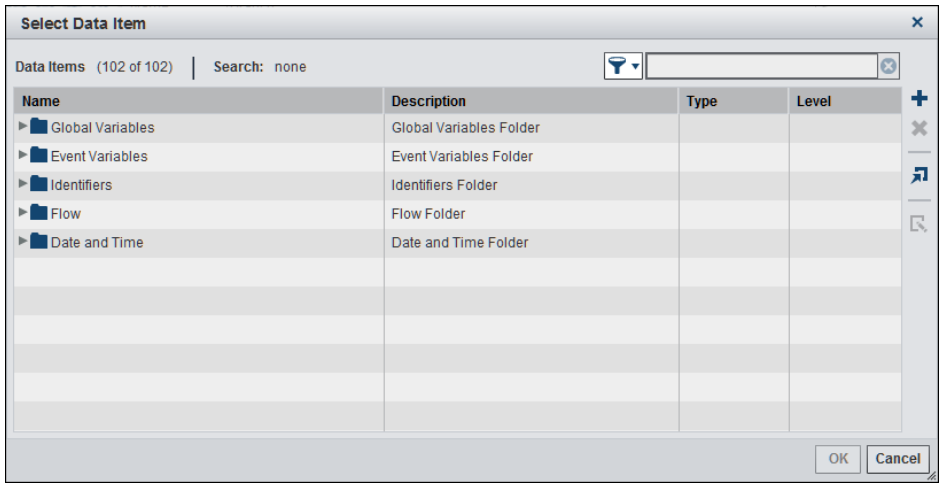
Display 12.5 *Branch Using a Data Item*



Follow these steps to create branches according to the values from a data item:

1. Click to select the data item that you want to use.

Display 12.6 *Select Data Item*



To create a calculated variable, click . For more information, see “Create a Calculated Variable” on page 276.

If you have permission, you can edit a calculated variable by selecting the variable and clicking .

Click to import a calculated variable from another flow in the same business context. For more information, see "Import Calculated Variables" on page 280.

2. Assign values to the data item. If you change a data item to another data item of the same type, the rest of the cell values are maintained.
3. By default, the values of the data items that you select become the output cell names. You can change the cell names in the **Cell Name** column.
4. Specify a cell code for each cell in the **Cell Code** column. If you do not enter a cell code, then one is assigned using the format specified in the business context setting.
5. By default, the population that does not meet the criteria is indicated by the dropped count on the node and this population receives a standard reply. Select **Create output cell for remainder** to generate an output cell that contains the population that does not meet the criteria. You can then connect this cell to another node for further processing.

Business Rules Node

Overview of the Business Rules Node

The Business Rules node applies a set of rules to a list of input variables and generates specified output variables that are available to downstream nodes.

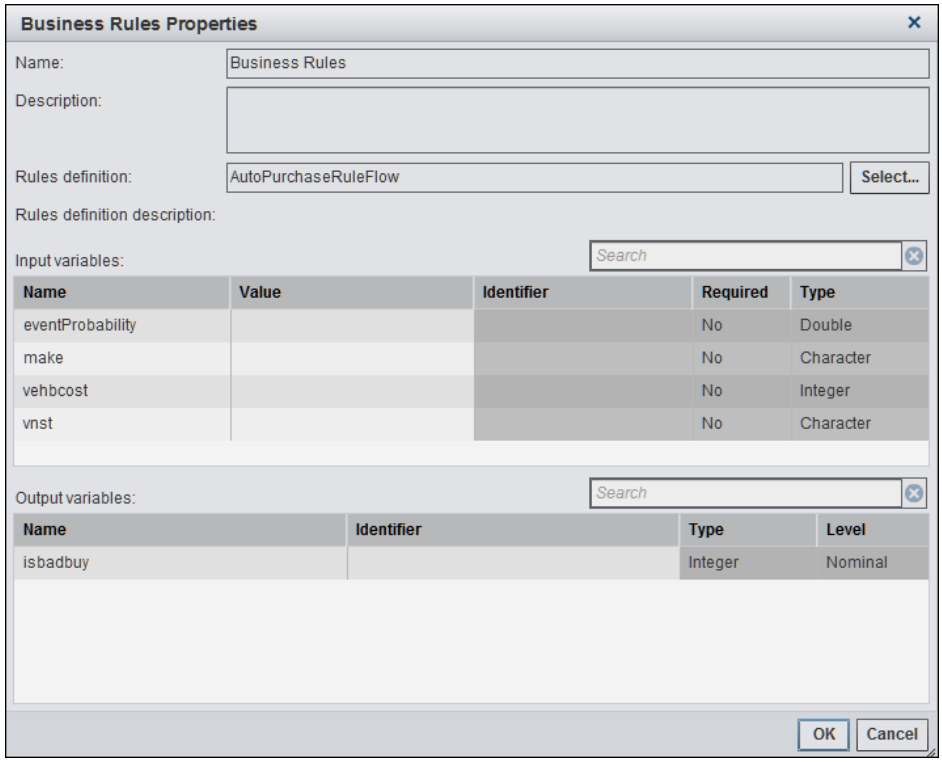
You can connect a series of Business Rules nodes to each other. You cannot connect a Business Rules node to a Reply node.

When you first open the Business Rules node, you select a business rules definition.

Specify Business Rules Node Details

The variables that are displayed depend on the business rules definition that you select.

Display 12.7 *Business Rules Properties*



To select a different business rules definition, click **Select**.

Enter a value in the **Value** field in the table, or click to select or enter a value.

Cell Node

Overview of the Cell Node

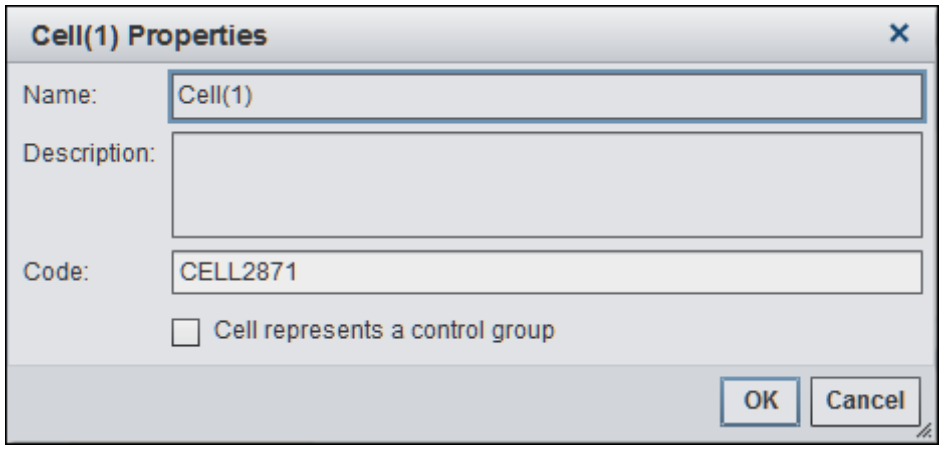
The Cell node applies a cell code to incoming subjects. You can also use the Cell node to designate subjects as part of a control group.

The result cell is the Cell node that directly precedes the Reply node. You assign treatments to the result cell on the Treatments page.

Specify Cell Node Details

The Cell Properties window displays information about the cell.

Display 12.8 *Cell Properties*



The **Code** field displays the cell code. Cell codes are required and can be either specified manually or generated automatically, depending on the setting for the business context. Cell codes are used to identify groups of populations.

Select **Cell represents a control group** to designate the contents of the cell as a control group. That information is written to the flow report when the flow is published.

Cross Table Node

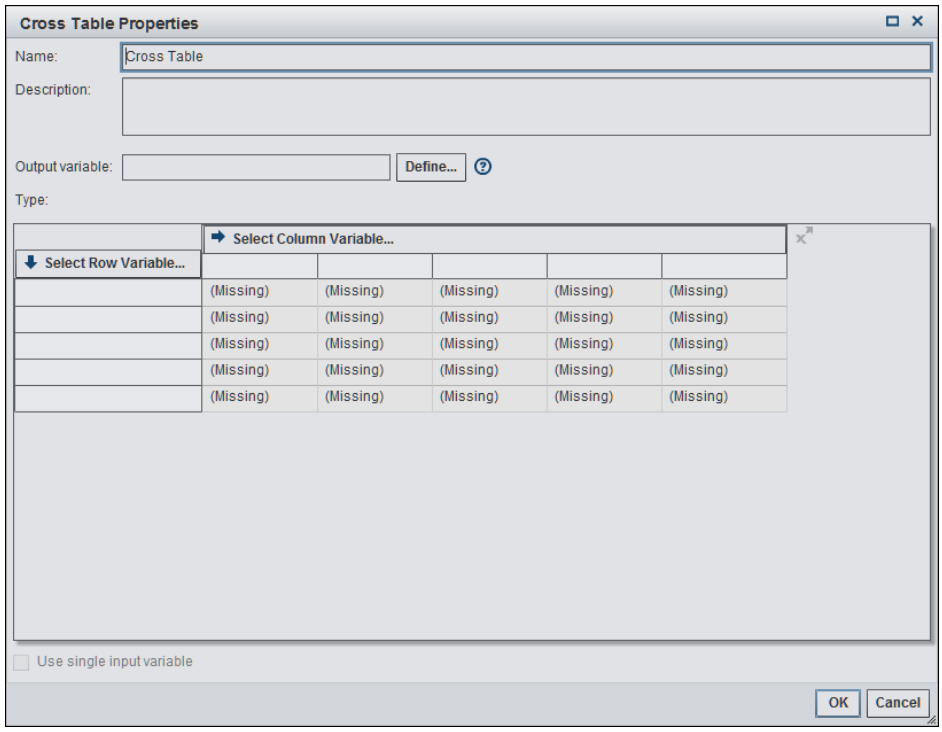
Overview of the Cross Table Node

With the Cross Table node, you can cross-reference two variable values to produce a single output value that is available for use in any downstream node in which a variable can be selected. You can use the Cross Table node output variable in one of the criteria for the Filter node.

Specify Cross Table Node Details

In the Cross Table Properties window, you select input variables and define the output variable. To enter values in the table, specify the input variable criteria for the rows and columns, and the output variable.

Display 12.9 *Cross Table Node*



Click **Select Row Variable** and **Select Column Variable** to select the input variables. For more information, see "Select Input Variables" on page 261.

If the row variable criteria are modified by adding or deleting a row or changing a row input variable, the values of the output cells are maintained if possible. For example, if you add a new row, the cell values of the existing rows are unchanged. The new row is populated with the default value of the output variable. If you change a variable to another variable of the same type, all of the cell values are maintained.

To map a single variable, select **Use single input variable**.

The output variable is used as a value in another node or calculated variable. Click **Define** to define the output variable.For more information, see "Define Output Variables" on page 262.

Copy and Paste the Contents of the Table

To copy and paste selected text within a cell, take the following steps:

1. Click the cell that contains the text that you want to copy.
2. Highlight the text.
3. Press Ctrl-C.
4. Click the cell where you want to paste the copied text.
5. Press Ctrl-V.

To copy and paste the contents of a cell, take the following steps:

1. Click the cell that you want to copy.
2. Press Esc.

3. Press Ctrl-C.
4. Click the cell where you want to paste the copied text.
5. Press Ctrl-V.

To copy and paste multiple cells, take the following steps:

1. Click the first cell that you want to copy.
2. Press Esc.
3. Press the Shift or Ctrl key to select additional cells. You can copy and paste cells only in rectangular blocks.
4. Select the upper left cell to paste the copied text, or select a rectangle of the same shape as the block of copied cells.
5. Press Ctrl-V.

To copy headers and values to an Excel spreadsheet, take the following steps:

1. Click  .
2. Open a Microsoft Excel spreadsheet.
3. Click the upper left cell in the spreadsheet and press Ctrl-V. If necessary, expand the cells to display the contents.

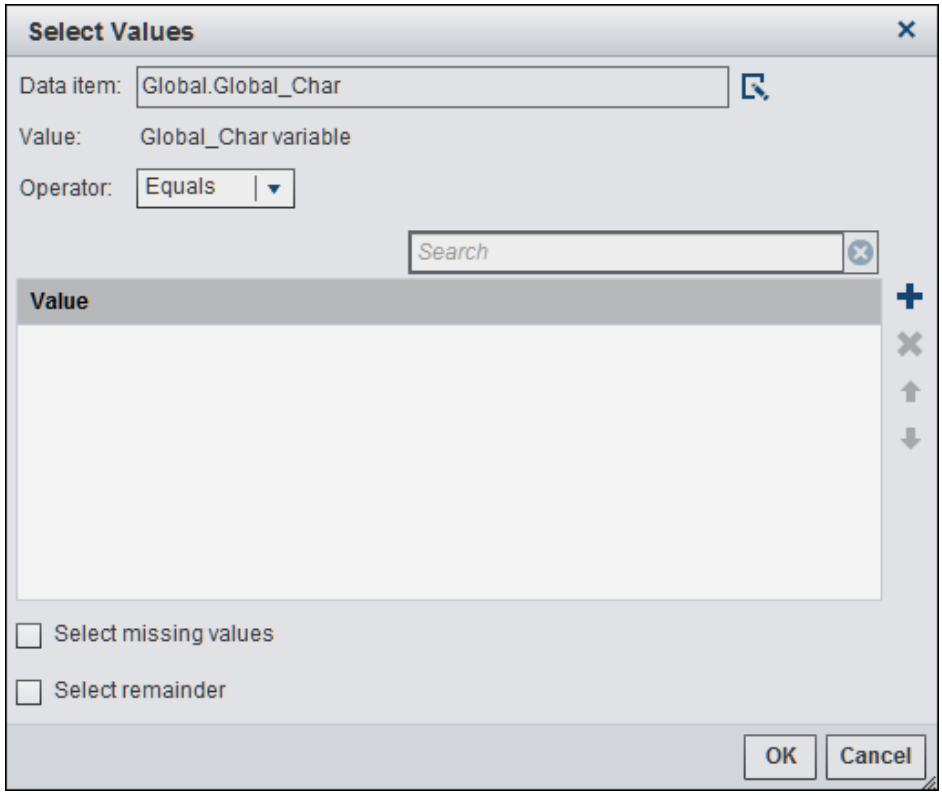
To copy the contents of a Microsoft Excel spreadsheet to the Cross Table node, take the following steps:

1. Open a Microsoft Excel spreadsheet.
2. Select the cells that you want to copy and press Ctrl-C. You can copy and paste cells only in rectangular blocks.
3. Open the Cross Table node.
4. Select the upper left cell to paste the copied text, or select a rectangle of the same shape as the block of copied cells.
5. Press Ctrl-V.

Select Input Variables

When you click **Select Row Variable** or **Select Column Variable**, you select a data item. Specify the values for the data item in the Select Values window.

Display 12.10 *Select Values*



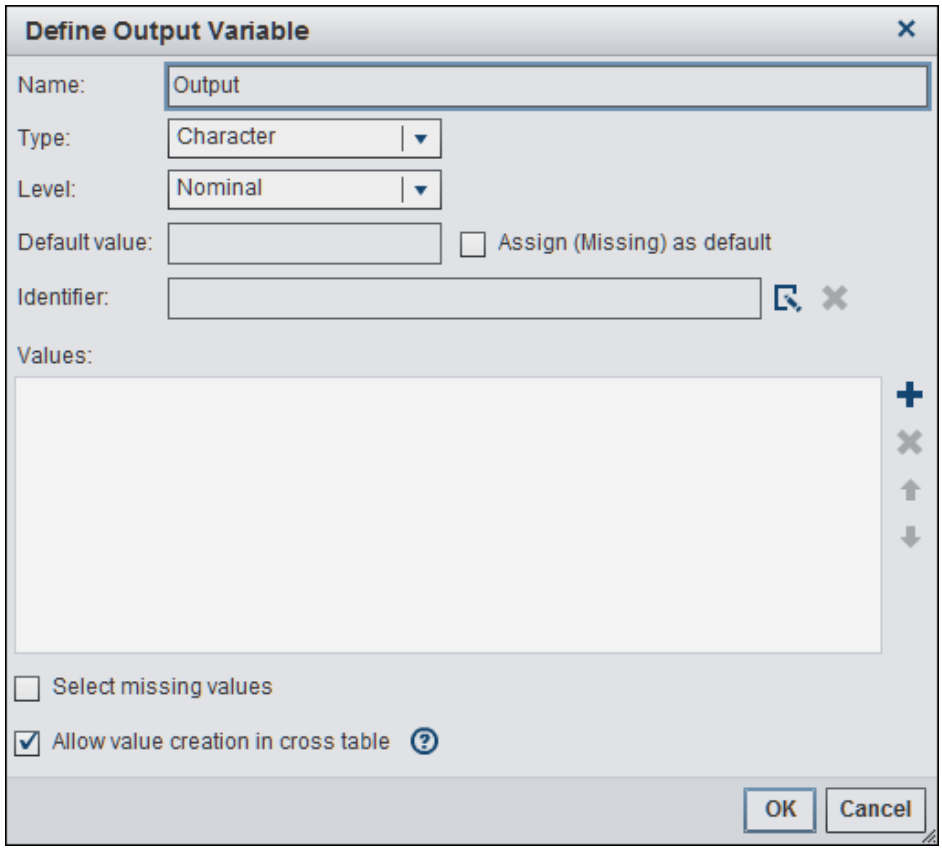
Click ✚ to add a value.

Select **Select remainder**, to add a (Remainder) row. The (Remainder) row represents all of the values that not selected in the Values list. Select **Select missing values** add a (Missing) row. The (Missing) row represents null input values.

Define Output Variables

Select a type and level for the output variable. You can also specify a default value.

Display 12.11 *Define Output Variable*



An output variable might be set to nominal, and the variable referenced in a downstream node. In that case, the values specified in the output variable dialog box are displayed as values that can be selected.

Identifiers are used to reference upstream variables.

Click to select an identifier from the list of identifiers that have been assigned to variables.

Select **Select missing values** add a (Missing) row. The (Missing) row represents null output values.

If the level of the output variable is **Nominal**, select **Allow value creation in cross table**. Values are added to the table without first being defined as output variables. If this option is not selected, only defined output variables can be entered in the cross table.

For example, the level of a **Character** type output variable is **Nominal**. You could specify **value1**, **value2**, and **value3** as the values for the output variable. If **Allow value creation in cross table** is not checked, you can enter only **value1**, **value2**, and **value3** in the table. If **Allow value creation in cross table** is checked, other nominal values, such as **value4**, can be entered in the table. Currently, note that only the values in the Output Variable dialog box are displayed.

Note: If **Allow value creation in cross table** is checked, variable values that are added to the table are not selectable in downstream nodes.

Changing the output variable affects the cell values in the cross table when one of the following conditions is met:

- The type of the output variable is changed. In this case, all of the output cells are set to the default value.
- **Allow value creation in cross table** is not selected. In this case, all cell values that are not defined output variables are set to the default values.
- **Allow value creation in cross table** is not selected, and an output value is removed. In this case, any cell in the output cross table that contained the removed value is reset to the default value.

Custom Node

If a custom node has been created, it is displayed in the Tool Palette. You can edit the name and description of the custom node. The variables depend on the specifications for the individual node. A custom node can be linked to only one output node.

Filter Node

Overview of the Filter Node

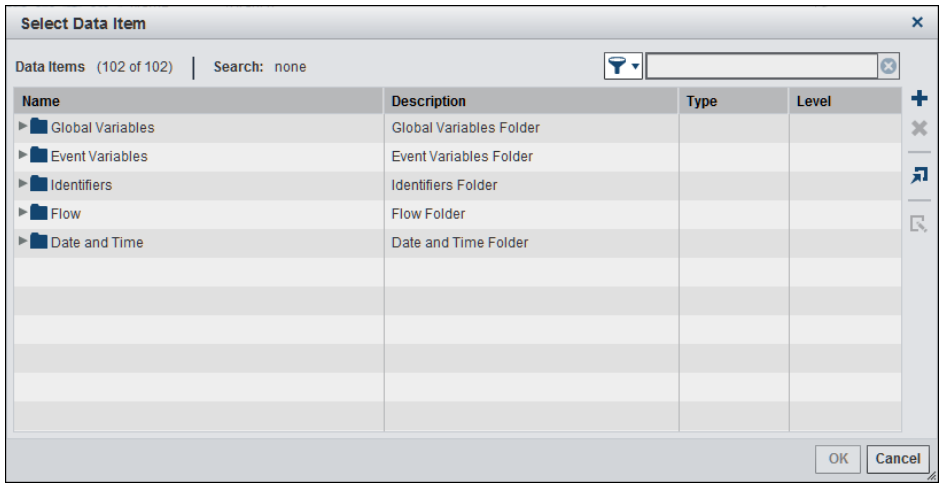
The Filter node selects incoming data based on criteria that are defined by a data item.

The total count for the Filter node is the number of records that are passed to the next node that is downstream. The dropped counts are subtracted from the total count.

Specify Filter Node Details

When you first open the Filter node, you select a data item.

Display 12.12 *Select Data Item*



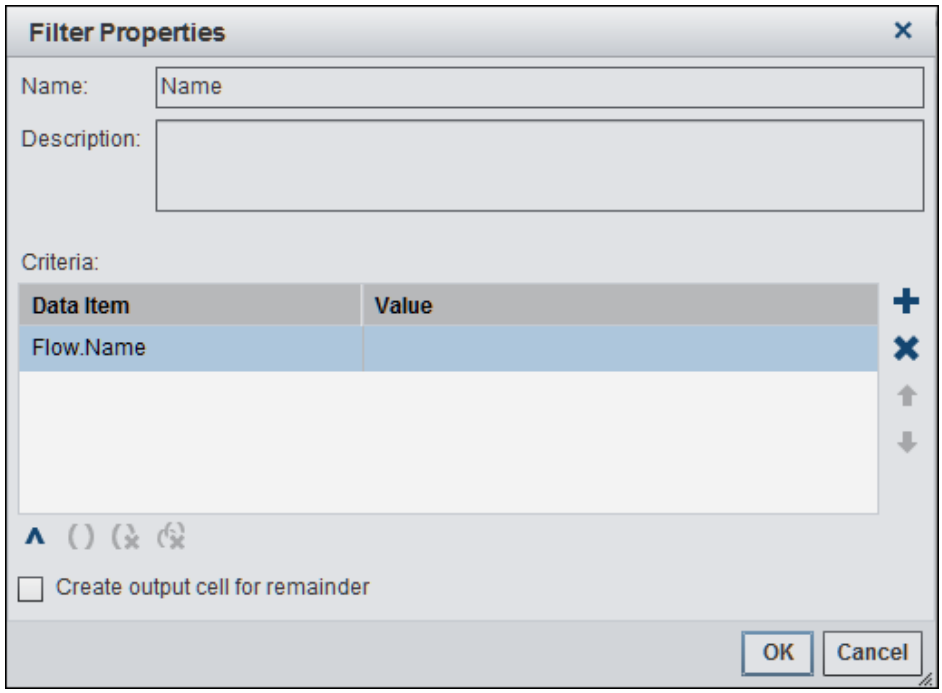
To create a calculated variable, click ✚. For more information, see "Create a Calculated Variable" on page 276.

If you have permission, you can edit a calculated variable by selecting the variable and clicking .

Click to import a calculated variable from another flow in the same business context. For more information, see "Import Calculated Variables" on page 280.

The data item that you select is listed in the Filter Properties window.

Display 12.13 *Filter Properties*



Select the **Value** cell and enter a value or click . The values that you can enter depend on the type of data item.

- For nominal, binary, and ordinal data items, you can enter the value or select a value from a list.
- For interval data items, you can enter a value or a range of values. Click to create ranges of values.
- For date data items, enter a date or click to select a date type and to specify ranges of dates.

To select a customer based on more than one data item, click to add an item to the list of criteria.

If you change a data item to another data item of the same type, the rest of the cell values are maintained.

You can change the order of the criteria, group them, and ungroup them. Click the first cell in a row to append an **and** or an **or** to the preceding criterion. To move a row within an expression, select the row and use the arrows to change its position. To exclude a subset from your data selection, select a row and click not. To group criteria, select two or more rows and click . To ungroup criteria, select a row within a group and click . To remove all groups from the table, click .

By default, the population that does not meet the criteria is indicated by the dropped count on the node and this population receives a standard reply. Select **Create output cell for remainder** to generate an output cell that contains the population that does not meet the criteria. You can then connect this cell to another node for further processing.

Process Node

Overview of the Process Node

In the Process node, you select a process to include in your diagram.

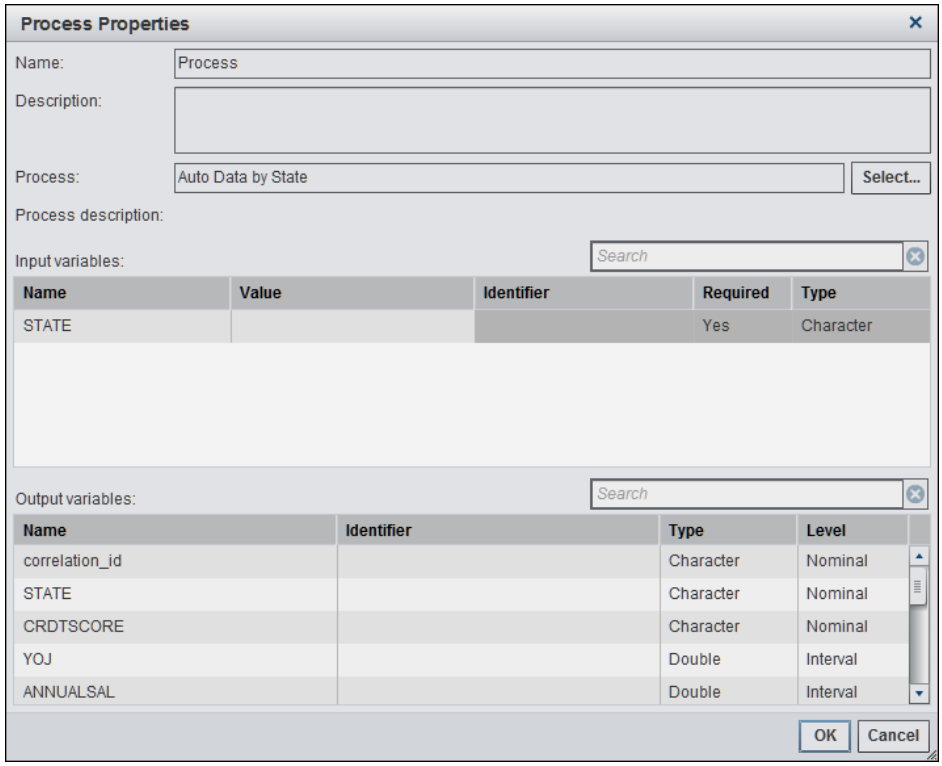
When you first open the Process node, you select a process from a list of defined processes.

Note: Web processes are not listed if SAS batch functionality is enabled. For more information, see "Flows" on page 63.

Specify Process Node Details

The Process Properties window displays the details of the process that you have selected.

Display 12.14 *Process Properties*



To select a different process, click **Select**.

Enter a value in the **Value** field in a table, or click to select a value for the process. For more information, see "Defining Values" on page 275.

Reply Node

Overview of the Reply Node

A Reply node represents a decision that is based on an event such as an insurance claim validation. The reply that is sent can be used by other systems. The reply can also be incorporated into data stores or reports.

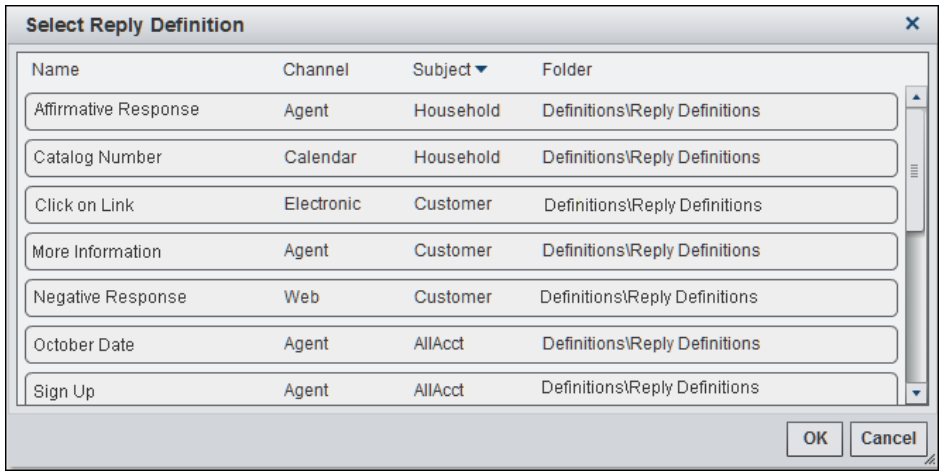
The Reply node is the last node in a diagram.

When you first open a Reply node, the Select Reply Definition window is displayed.

Select a Reply Definition

The Select Reply Definition window displays a list of reply definitions.

Display 12.15 *Select Reply Definition*

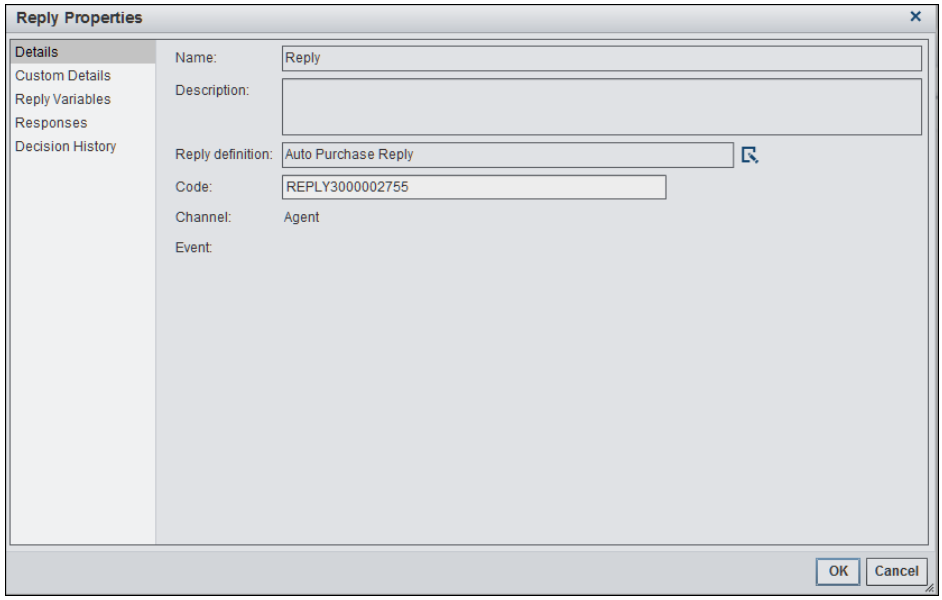


Select a reply definition.

Specify Reply Node Details

On the Details page, enter basic information about the Reply node.

Display 12.16 *Reply Details*



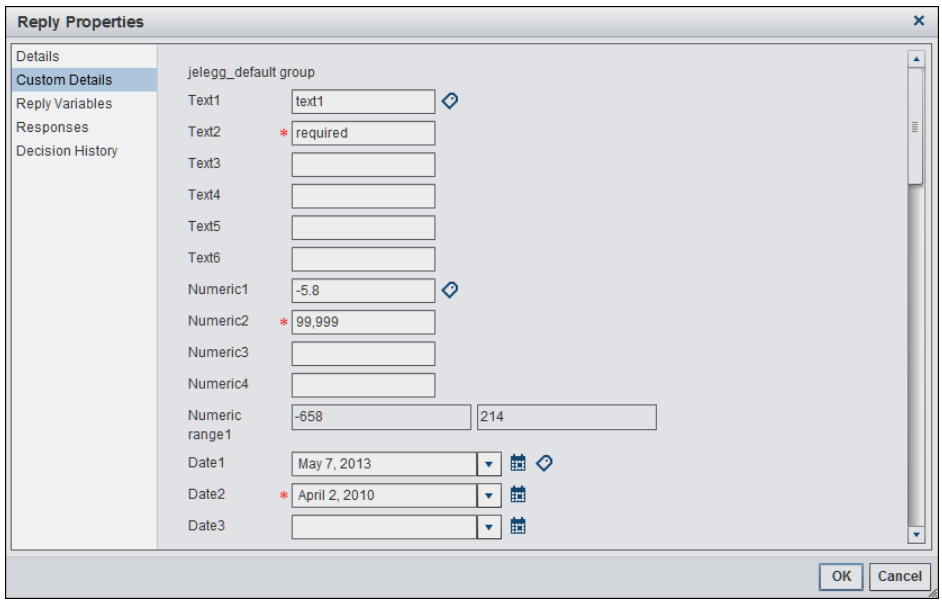
If the reply code is editable, you can edit the code in the **Code** field. The reply code is required.

Click **Select** to select a different reply definition.

Display Custom Details

The Custom Details page displays the custom details for the selected reply definition.

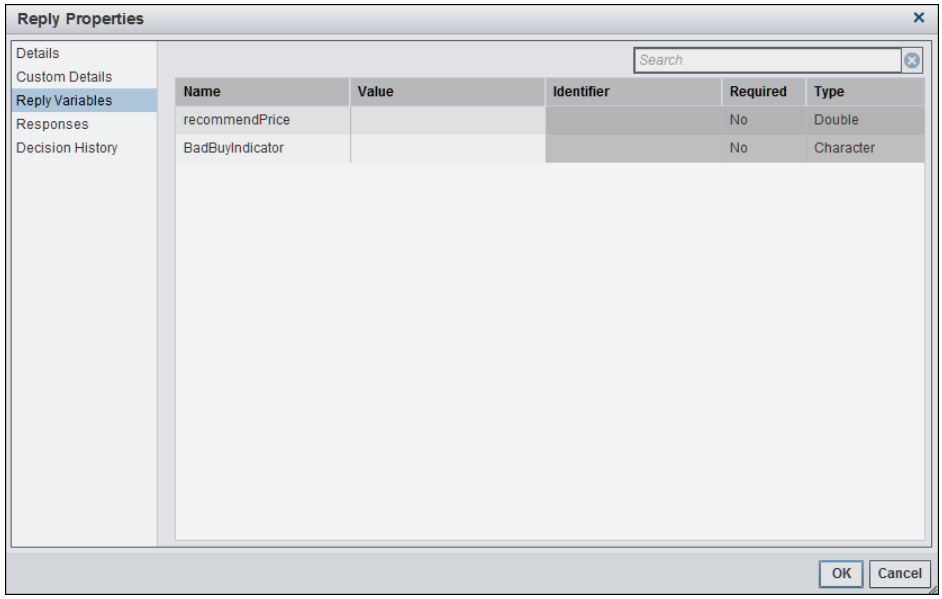
Display 12.17 *Custom Details*



Specify Reply Variables

The Reply Variables page displays a table of variables that were defined for the event.

Display 12.18 *Reply Variables*



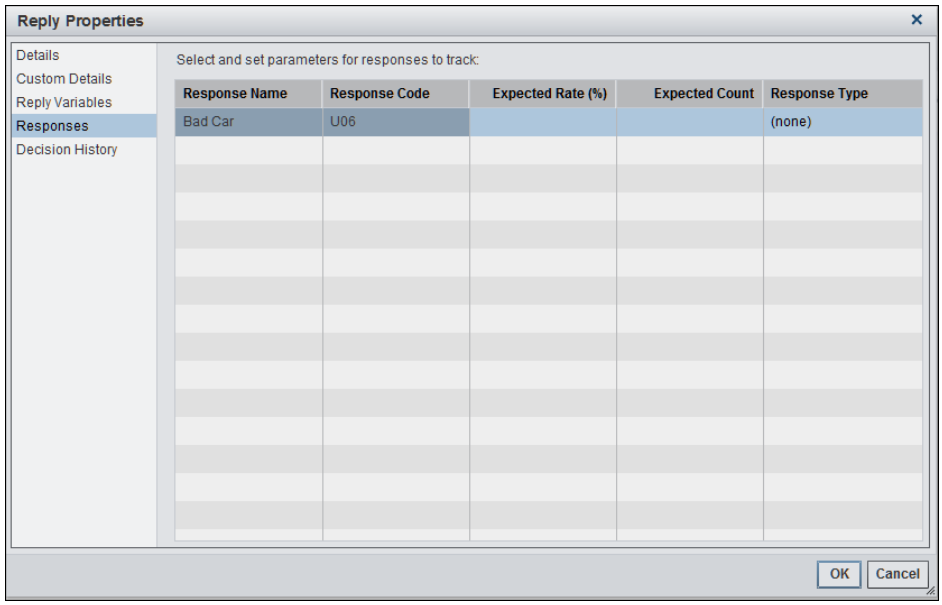
Enter a value in the **Value** column for an event variable, or click .

For more information, see "Defining Values" on page 275.

Specify Responses

On the Responses page, specify information about responses.

Display 12.19 *Responses*



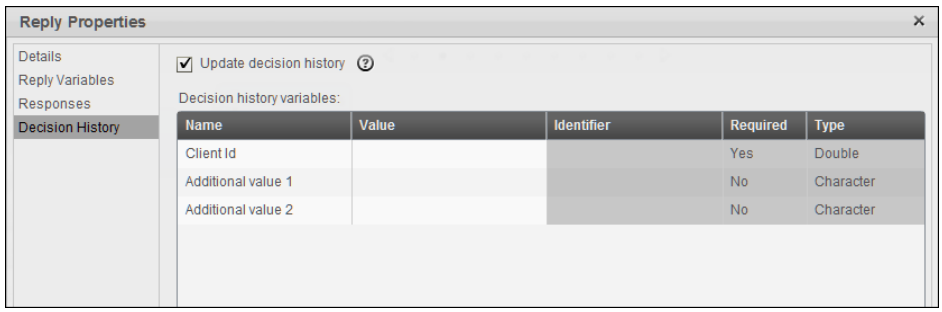
To specify an expected response rate, enter a value in the corresponding field in the **Expected Rate %** column. The values in the **Expected Count** field are not updated automatically. You can choose to provide the values for the expected count in this field.

To associate a value with the expected response for reporting purposes, select the **Converted**, **Responded**, or **(none)** from the **Response Type** list. **(none)** is the default value.

Specify Decision History Information

On the Decision History page, specify whether to write a history record when the reply is executed by the SAS Decision Services Run-Time server.

Display 12.20 *Decision History*



Note: The Decision History page is not displayed if SAS batch functionality is enabled. For more information, see "Flows" on page 63.

The **`Reply`** node remains in a **Not ready** state until all required values have been supplied.

Select **Update decision history** to write an updated decision history record when the reply is executed. Supply values for the decision history subject variables. This option is selected by default if the tracking of decision history is enabled in the reply definition.

Score Node

Overview of the Score Node

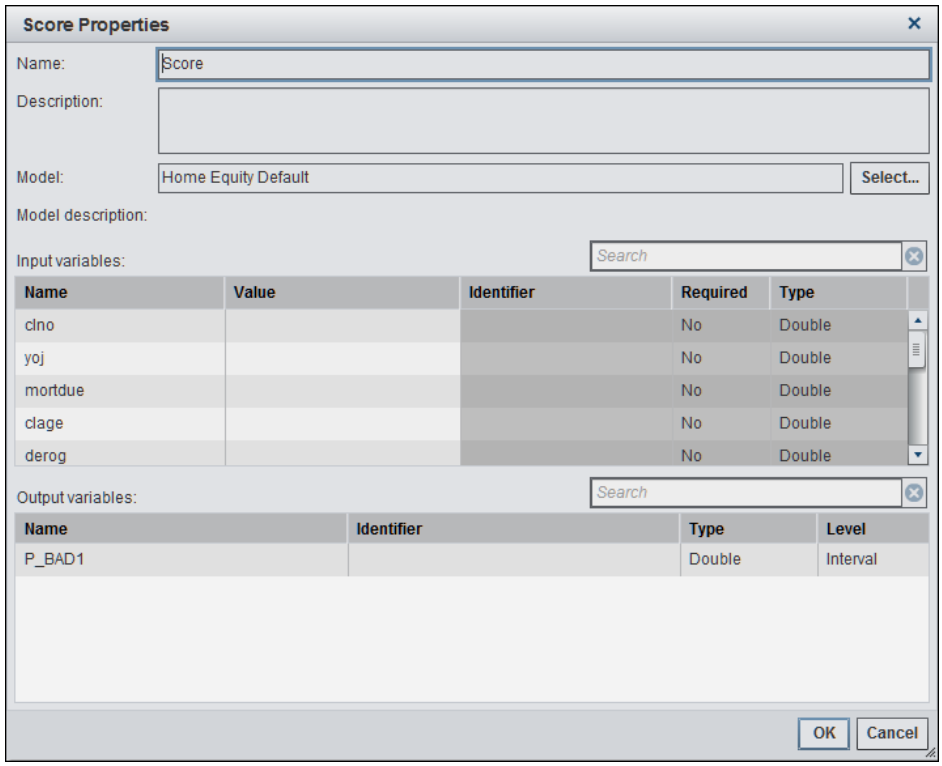
You can use models that are managed in SAS Model Manager to dynamically generate scores during deployment of a flow. You use the Score node to select a model to include in your diagram.

When you first open the Score node, you select a model.

Specify Score Node Details

The fields that are displayed depend on the model that you select.

Display 12.21 *Score Properties*



To select a different model, click **Select**.

Enter a value in the **Value** field in a table, or click to select a value for the model. For more information, see "Defining Values" on page 275.

Start Node

Overview of the Start Node

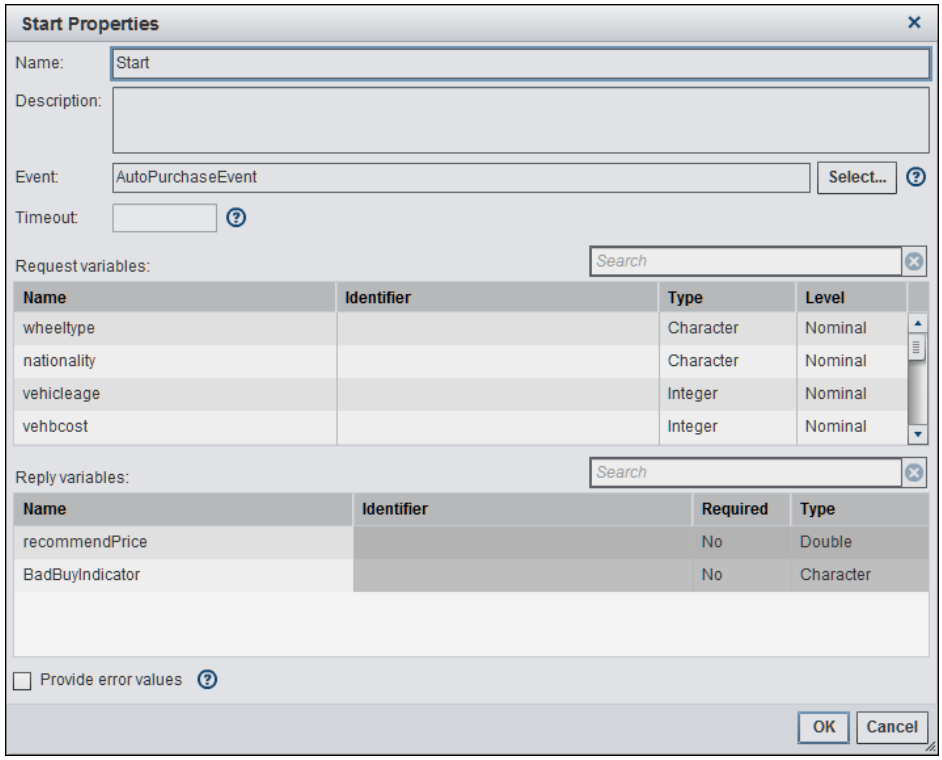
The Start node is a required part of a decision flow.Every diagram must contain only one Start node, and it must be the first node in the diagram. Only one node can be linked directly from the Start node. The second node can be any node except the Reply node.

Specify Start Node Details in a Decision Flow

In a decision flow, each Start node is associated with a web service event that determines the variables that begin the diagram. When you first open a Start node, you select an event. An event represents an action that triggers the decision process, such as a customer call to a hot line to request product information.

The information in the Start Node Properties window is based on the event that you have selected.

Display 12.22 *Start Node Properties Window in a Decision Flow*



To change the event or to reload an event definition that has changed, click **Select**. Each event can be used only once. Two diagrams cannot be driven by the same event in a production environment. You can, however, use an event to create a diagram that you want to use to replace a production diagram.

Timeout is the amount of time that the event waits to receive input. If desired, specify the number of milliseconds.

Events contain request variables and can contain reply variables. Some events do not require reply variables because the event does not expect a reply after the request variable has been sent.

You can enable error handling by checking **Provide error values** and selecting the Error Value cell to enter an error value for a reply variable. For more information, see "Defining Values" on page 275. In the event of a node failure, the designated error reply variables are returned. If there are no error values, a generic web service error is returned to the calling application rather than to the reply variables that are expected.

Identifiers can be used only once for each type of variable. For example, two request variables cannot be assigned the same identifier. For more information, see "Overview of Identifiers" on page 97. To remove an identifier from the table, select the identifier and press the Backspace key.

For information about the Type column, see "Data Types" on page 272.

The Level column displays the data type level, as in Nominal (such as gender), Interval (such as age), or Binary (such as yes and no).

Data Types

The following data types are available:

Boolean
specifies a value of 1 or 0.

Boolean List
is a list of Boolean values.

Data Grid
is a table. Table data can come from any source, but only SAS data sets can be used as data grids in test cases. Data grids can contain no more than 32000 characters. Column names in double-byte character sets are not supported.

Date
specifies a date value. The Date data type is not valid in decision flows.

Date List
is a list of date values

Double
specifies a floating-point number that is 64 bits long.

Double List
is a list of floating-point numbers that are each 64 bits long.

Integer
specifies an integer.

Integer List
is a list of integers.

Character
specifies a character string.

Character List
is a list of character strings.

Subdiagram Node

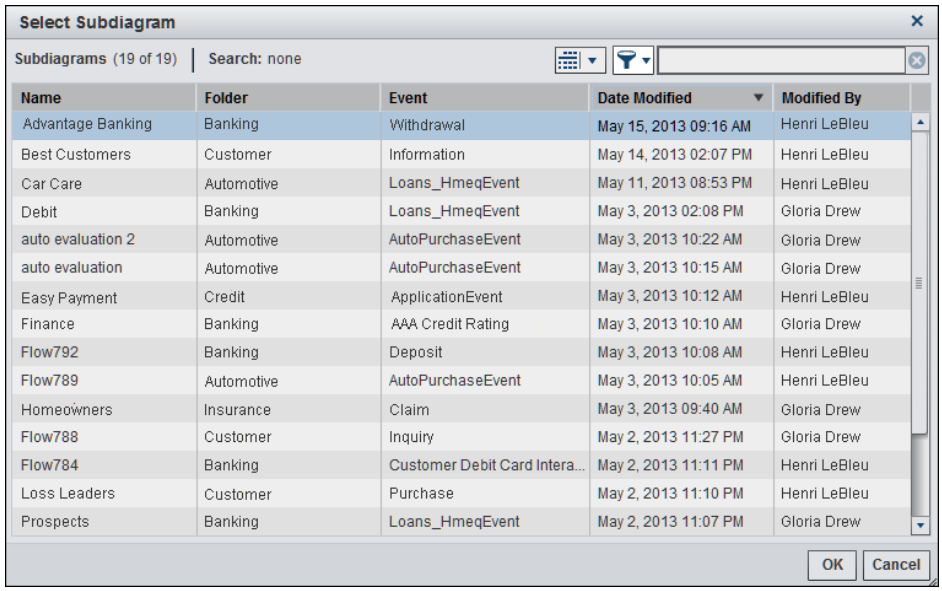
Overview of the Subdiagram Node

You can reference an external flow by adding the Subdiagram node to a diagram.

Select a Diagram

When you first open the Subdiagram node, you select a diagram in an external flow to reference.

Display 12.23 *Select Subdiagram*

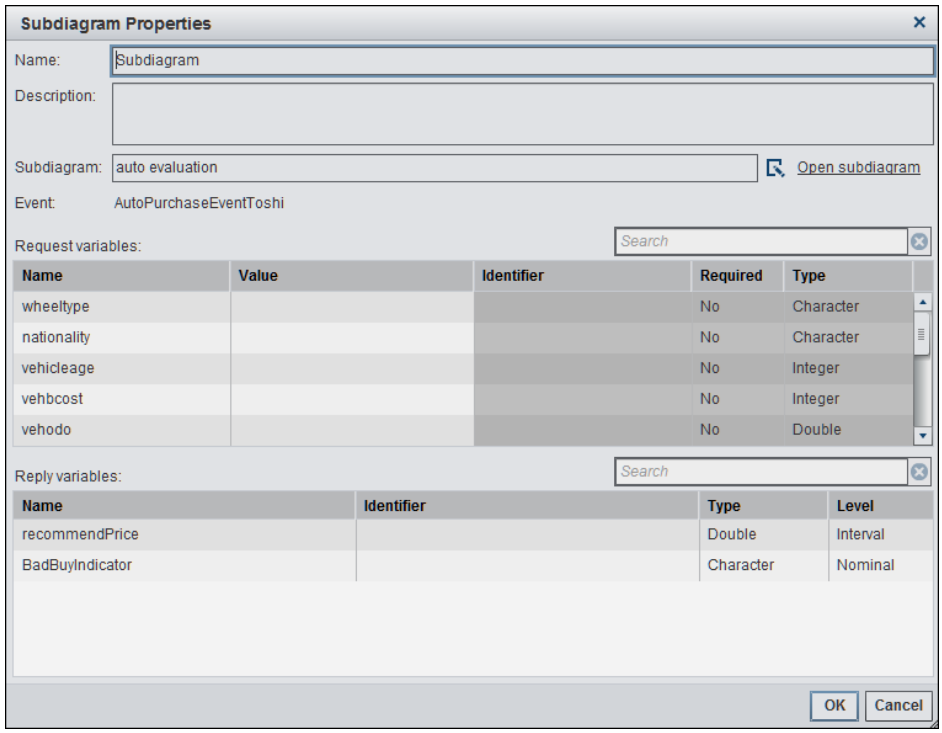


If the flow is restricted to support SAS batch functionality, the listed diagrams do not include arrays, data grids, contact history, or web processes. For more information, see "Flows" on page 63.

Specify Subdiagram Node Details

The Subdiagram Properties window displays the variables for the selected flow.

Display 12.24 *Subdiagram Properties*



Click to select a diagram in a different flow.

Click **Open subdiagram** to open the selected subdiagram.

Enter a value in the **Value** field in a table, or click to select a value.

Note: If there are changed values in the flow that you have linked to, you must close and reopen the current flow in order to display the changed values.

Defining Values

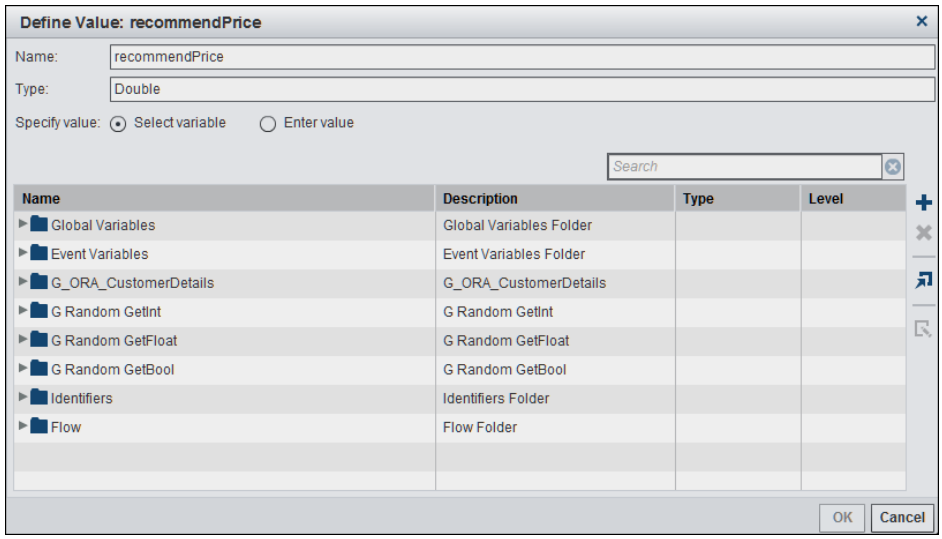
Overview of Defining Values

In several components of SAS Decision Manager, you can select variables, enter values, and create calculated variables.

Select a Variable

In the Define Value window, select **Select variable** to choose a variable that has been created.

Display 12.25 *Select Variable*



To create a calculated variable, click . For more information, see "Create a Calculated Variable" on page 276.

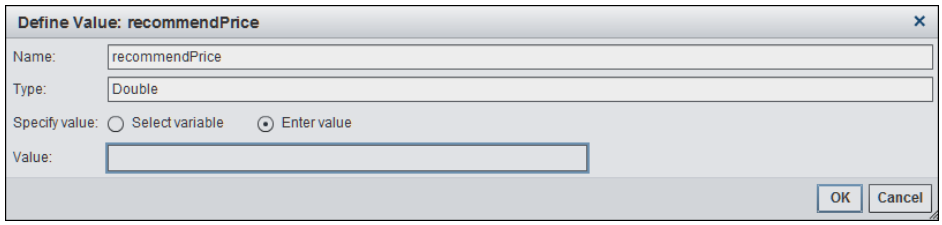
If you have permission, you can edit a calculated variable by selecting the variable and clicking .

Click to import a calculated variable from another flow in the same business context. For more information, see "Import Calculated Variables" on page 280.

Enter a Value

To enter a value, select **Enter value**.

Display 12.26 *Enter Value for Integer*

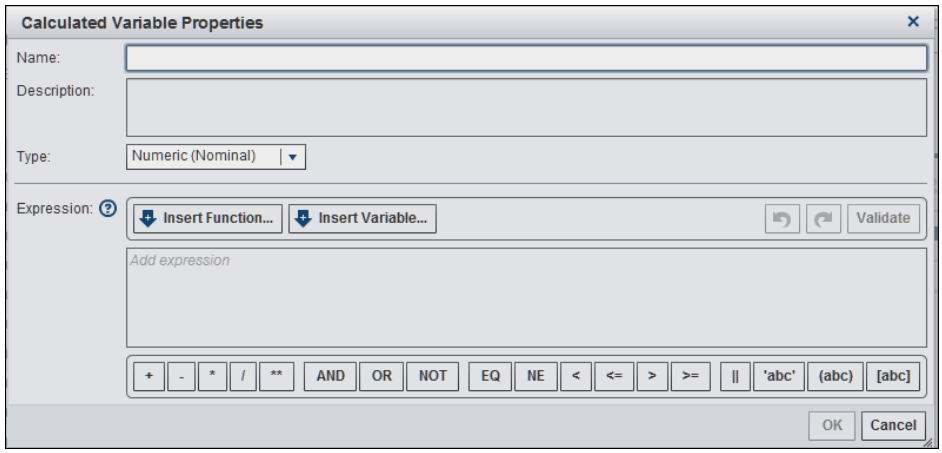


Enter a value in the **Value** field. For a list, click ✚ to add a row to the table, and enter a value in the new row.

Create a Calculated Variable

You create a calculated variable in the Calculated Variable Properties window. A calculated variable that you create is available for selection in downstream nodes in the same flow. Suppose, for example, you create a calculated variable for a Process node. In that case, the calculated variable is then available for selection as the value for a reply variable in a Reply node in the same flow. You cannot create calculated variables for treatments. However, calculated variables that have been created elsewhere are available for use within dynamic treatment custom details.

Display 12.27 *Calculated Variable Properties*



Select a type from the **Type** list.

To enter an expression, type directly in the field or click the operator buttons and the **Insert Function** and **Insert Variable** buttons. For more information about using SAS functions, see the Base SAS documentation. If you are using Scalable Performance Data Server, you can use only functions and methods that are supported by Scalable Performance Data Server.

For faster performance when defining a TRUE or FALSE expression such as **`(Age < 20)`**, enclose the expression in an SQL construct as follows:

```
"case when (Age < 20) then 1 else 0 end"
```

Some calculated variables, such as x > y, result in Boolean expressions. SAS Real-Time Decision Manager uses a value of 1 if the expression is true and a value of 0 if the expression is false.

Click  to delete the previously typed text. Click  to re-create the previously typed text.

Click **Validate** to verify whether the current expression text is valid.

For information about functions, see the Base SAS documentation.

Note: The percent sign (%) is used by SAS Decision Services as a wild card. During runtime generation, asterisks (*) that are used as wild cards in calculated variable expressions are converted to %.

The IIF Function

The IIF function uses IF-THEN-ELSE logic in a calculated variable to generate different results according to different conditions. The syntax of the IIF function is as follows:

```
IIF (condition, true value, false value)
```

Here is an example of using the IIF function to assign values to scores:

```
ApproveValue = IIF (score > 0.5, "approved", "not approved")
```

Scores that are greater than 0.5 are assigned a value of "approved." Scores that are not greater than 0.5 are assigned a value of "not approved."

The IIF function is located in the **Logical** category of the expression editor. Array and data grid types are not supported.

Type Conversion Functions

The following functions convert character or numeric values:

TOBOOLEAN(*input*)
converts character or numeric input into a Boolean value.

TOFLOAT(*input*)
converts character or numeric input into a float value.

TOINT(*input*)
converts character or numeric input into an integer value.

Using Data Grids in Calculated Variables

TABLECREATESORTEDCOPY Function

The TABLECREATESORTEDCOPY function sorts a data grid variable based on column values.

Here is an example of using the TABLECREATESORTEDCOPY function to sort a data grid:

```
TABLECREATESORTEDCOPY(MyExistingTableVariable, 'column_name ASCENDING;
another_column DESCENDING')
```

Column names are case-sensitive.

In the following calculated variable, a grid with a column of product codes and purchase dates is returned from a web process:

```
TableRowDataGet(TableSelectTopN(TableCreateSortedCopy(TableSelect(Products,
'*', 'Products.price GT 40.0'), 'purchase_date'), 1), 'product_code');
```

The condition **'Products.price GT 40.0'** reduces the size of the product list to a price greater than 40. The grid is sorted in descending order of purchase date. The grid is truncated to one row to get the most recent purchase. A reply is sent with a product code list of one row.

TABLEROWCOUNT Function

The TABLEROWCOUNT function returns the number of rows in the specified *dataGrid*.

Here is an example of using the TABLEROWCOUNT function to return the number of rows in a data grid:

```
TABLEROWCOUNT(Event Variables.My Grid)
```

TABLESELECT Function

The TABLESELECT function takes the following arguments:

dataGrid
is the data grid that you want to select.

columnClause
specifies the columns that appear in the new data grid variable. Use an asterisk (*) to specify all of the columns in the data grid. Use a list of column names that are separated by semicolons (;) to designate specific columns. These column names must be specified as strings and must be the actual column names in the data grid. You cannot use identifiers to specify column names.

whereClause
is the condition or WHERE clause that you want to use. References to table columns must be fully qualified and specify the name of the table and of the column within the table. The following operators are allowed within the WHERE clause:

- LT (less than)
- LE (less than or equal to)
- EQ (equals)
- NE (not equals)
- GT (greater than)
- GE (greater than or equal to)
- AND (logical AND)
- OR (logical OR)

Here is an example of using the LIKE function within the TABLESELECT function to search for the string VISA%:

```
TABLESELECT(Event Variables.My Grid, '*',
"LIKE(Event Variables.My Grid.B, 'VISA%')")
```

DATETIME constant values are specified as SAS DATETIME literals, for example, **'01Jun1958:15:30:05'dt**.

Here is an example of using the TABLESELECT function to search for rows with a date before 3:30 p.m. on June 1, 2007:

```
TABLESELECT(Event Variables.MyGrid, '*',
"Event Variables.MyGrid.my_datetime LT '01Jun2007:15:30:00'dt")
```

TABLESELECTBOTTOMN and TABLESELECTTOPN Functions

The TABLESELECTBOTTOMN and TABLESELECTTOPN functions take the following arguments:

dataGrid
is the name of the data grid.

numberToSelect
returns the number of rows from the top or the bottom of the data grid.

Here is an example of using the TABLESELECTBOTTOMN function to return rows from the bottom of the data grid:

```
TABLESELECTBOTTOMN(Event Variables.MyGrid,
Event Variables.My Grid.Least Popular Product Count)
```

You can use the LIKE function to search for a pattern in data grids. The LIKE function takes the following arguments:

stringToCompare
is a string to compare for likeness, based on *matchPattern*

matchPattern
is a string that might contain special regular expression characters

escapeCharacter
is an optional argument that is a string containing one character. The escape character, when used as a prefix to special characters, causes the special characters to be interpreted as normal characters..

Aggregate Functions

An aggregate function summarizes data and produce a statistic such as a sum, an average, a minimum, or a maximum. The following aggregate functions can be used with data grids.

TABLEMAX(*data_grid*, *column_name*)
returns the maximum value of the column in the data grid.

TABLEMEAN(*data_grid*, *column_name*)
returns the mean value of the column in the data grid.

TABLEMEDIAN(*data_grid*, *column_name*)
returns the median value of the column in the data grid.

TABLEMIN(*data_grid*, *column_name*)
returns the minimum value of the column in the data grid.

TABLESUM(*data_grid*, *column_name*)
returns the sum of the column in the data grid.

Functions That Accept Data Grids as Inputs

You can use the following functions that accept data grids as inputs:

- SUM
- MIN
- MAX
- MEDIAN
- MEAN

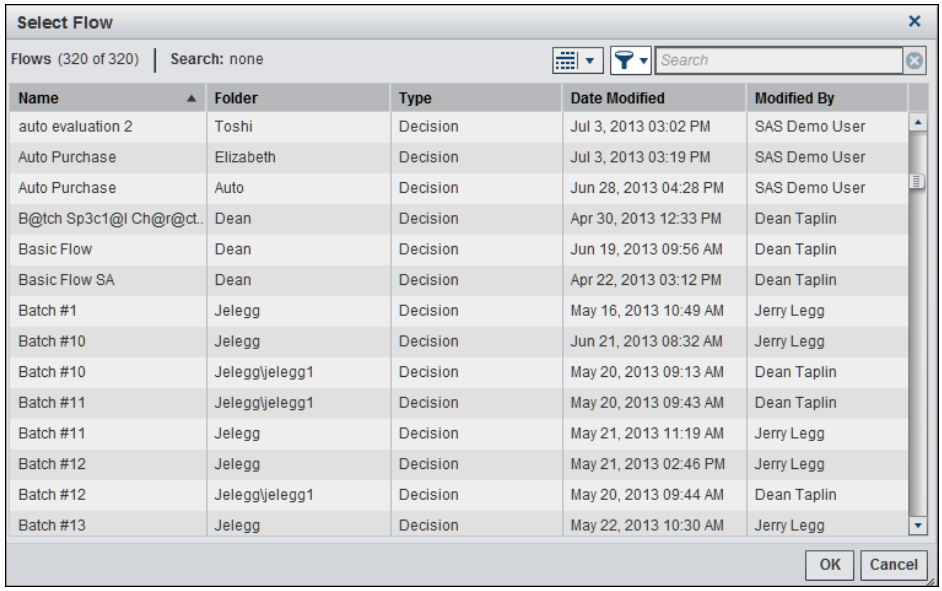
Here is an example of using multiple columns in the argument to the SUM function:

```
SUM(Event Variables.My Grid.IntegerColumn1,
Event Variables.My Grid.IntegerColumn2)
```

Import Calculated Variables

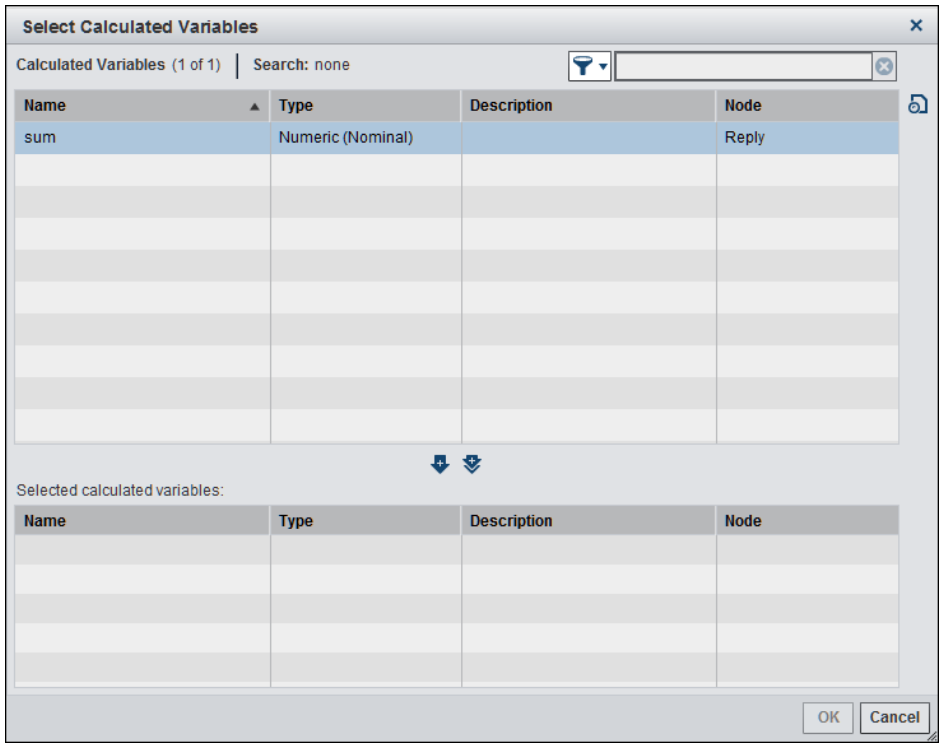
You can import calculated variables from other flows that are in the same business context.

Display 12.28 *Select Flow*



When you select a flow, you select the calculated variables in the flow.

Display 12.29 *Select Calculated Variables*



Select a row and click to view the contents of a calculated variable.

Imported calculated variables are associated with the current node. Nodes that are downstream from the current node are able to use the imported variable. Nodes that are not downstream from the current node are not able to use the imported variable.

If the calculated variable contains references to variables that are available from the destination node, the expressions that include the references are automatically imported. If there are calculated variables of the same name within the flow, the references are linked to those calculated variables.

If the name of an imported calculated variable is already in use, the imported calculated variable is renamed to *Variablename* (*n*), where *n* is an incremented number. If the renamed calculated variable is referenced by another calculated variable that is imported at the same time, the reference is updated automatically to use the new name.

Appendix 1
Keyboard Shortcuts

The following keyboard shortcuts are available in SAS Decision Manager.

Table A1.1 *Keyboard Shortcuts*

Keys	Result	Example
Ctrl+F8	Activates Test Mode.	Press Ctrl+F8 on the Diagram page to toggle between Test Mode and editing the diagram.
Ctrl-Delete	Clears the user state. The user state is the position and views of pages, and the position and size of windows.	Press Ctrl-Delete to display the Page Manager in its default position.
Ctrl+S	Saves the item.[1]	Press Ctrl+S in an open flow to save the flow.
Ctrl+Shift+Left Arrow	Moves the highlighted item from the list of selected items to the list of available items	In the Select Flow Treatments window, press Ctrl+Shift +Left Arrow to move the highlighted treatments from the list of selected treatments to the list of available treatments.
Ctrl+Shift+Right Arrow	Moves the highlighted item from the list of available items to the list of selected items	In the Select Flow Treatments window, press Ctrl+Shift +Right Arrow to move the highlighted treatments from the list of available treatments to the list of selected treatments.
Ctrl+Shift+S	Opens the Save As window	Press Ctrl+Shift+S in an open flow to save the flow under a different name or to save a new flow.
Ctrl+Shift+Spacebar	Adds a new item	Press Ctrl+Shift+Spacebar to add a new flow.

1 The Ctrl+S keyboard shortcut is not available in Internet Explorer

Delete	Deletes the selected item	Select a flow name and press Delete to delete the flow.
End	Moves the selection to the last row in a list	Press End to select the last page name in the Page Manager.
Enter	Opens the selected item	Select a flow name and press Enter to open the flow.
Esc	Closes the open item	In the Cell Properties window, press Esc to close the window.
Home	Moves the selection to the first row in a list	Press Home to select the first flow name in the table.
Shift+Tab	Changes the focus to the previous user interface component	Press Shift+Tab to select the previous tool in the Tool Palette.
Spacebar	Opens the selected item	Tab to a page in the Page Manager and press the spacebar to open the selected page.
Up or Down arrow	Moves to the next or previous item in a list	Press the down arrow to select a flow name that is farther down in the table.
Tab	Changes the focus to the next user interface component	Press the Tab key to select the next tool in the Tool Palette.

Appendix 2
DS2 Functions

The following table lists the DS2 functions supported by SAS Decision Manager. For information about these functions see *SAS DS2 Language Reference* at **http://support.sas.com/documentation/onlinedoc/base/index.html**.

Table A2.1 *DS2 Functions Supported by SAS Decision Manager*

Category	Function	Description
Bitwise Logical Operations	BAND	Returns the bitwise logical AND of two arguments.
	BLSHIFT	Returns the bitwise logical left shift of two arguments.
	BNOT	Returns the bitwise logical NOT of an argument.
	BOR	Returns the bitwise logical OR of two arguments.
	BRSHIFT	Returns the bitwise logical right shift of two arguments.
	BXOR	Returns the bitwise logical EXCLUSIVE OR of two arguments.
Character	BYTE	Returns one character in the ASCII or the EBCDIC collating sequence.
	CAT	Does not remove leading or trailing blanks, and returns a concatenated character or numeric string.
	CATS	Removes leading and trailing blanks, and returns a character or numeric concatenated string.
	CATT	Removes trailing blanks, and returns a concatenated character or numeric string.

Category	Function	Description
Character	CATX	Removes leading and trailing blanks, inserts delimiters, and returns a concatenated character string.
	COALESCEC	Returns the first non-null or nonmissing value from a list of character arguments.
	COLLATE	Returns a character string in ASCII or EBCDIC collating sequence.
	COMPBL	Removes multiple blanks from a character string.
	COMPRESS	Returns a character string with specified characters removed from the original string.
	DEQUOTE	Removes matching single quotation marks from a character string that begins with a single quotation mark, and deletes all characters to the right of the closing quotation mark.
	INDEX	Searches a character expression for a string of characters, and returns the position of the string's first character for the first occurrence of the string.
	INDEXC	Searches a character expression for specified characters and returns the position of the first occurrence of any of the characters.
	INDEXW	Searches a character expression for a string that is specified as a word, and returns the position of the first character in the word.
	LEFT	Left aligns a character expression.
	LENGTH	Returns the length of a character string, excluding trailing blanks, and returns a 0 for a blank character string.
	LENGTHC	Returns the length of a character string, including trailing blanks.
	LENGTHM	Returns the amount of memory, in characters, that is allocated for a character string.
	LOWCASE	Converts all letters in a character expression to lowercase.
	QUOTE	Adds double quotation marks to a character value.
	RANK	Returns the position of a character in the ASCII or EBCDIC collating sequence.
	REPEAT	Repeats a character expression.
	REVERSE	Reverses a character expression.
	RIGHT	Right aligns a character expression.

Category	Function	Description
Character	SCAN	Returns the nth word from a character expression.
	STRIP	Returns a character string with all leading and trailing blanks removed.
	SUBSTR	Returns a substring, allowing a result with a length of zero.
	TRANSLATE	Replaces specific characters in a character expression.
	TRANWRD	Replaces or removes all occurrences of a word in a character string.
	TRIM	Removes trailing blanks from a character expression.
	UPCASE	Converts all letters in an argument to uppercase.
	VERIFY	Returns the position of the first character that is unique to an expression.
	WHICHC	Returns the first position of a character string from a list of character strings.
Date and Time	DATE	Returns the current date as a SAS date value.
	DATEJUL	Converts a Julian date to a SAS date value.
	DATEPART	Extracts the date from a SAS datetime value.
	DATETIME	Returns the current date and time of day as a SAS datetime value.
	DAY	Returns the day of the month from a SAS date value.
	DHMS	Returns a SAS datetime value from date, hour, minute, and second values.
	HMS	Returns a SAS time value from hour, minute, and second values.
	HOUR	Returns the hour from a SAS time or datetime value.
	INTCK	Returns the number of interval boundaries of a given kind that lie between two SAS dates, times, or timestamp values encoded as DOUBLE.
	INTDT	Specifies the number of days to add to a DATE value.
	INTNX	Increments a SAS date, time, or datetime value encoded as a DOUBLE, and returns a SAS date, time, or datetime value encoded as a DOUBLE.
	INTTS	Specifies the number of seconds to add to a TIMESTAMP value.
	JULDATE	Returns the Julian date from a SAS date value.
	JULDATE7	Returns a seven-digit Julian date from a SAS date value.

Category	Function	Description
Date and Time	MDY	Returns a SAS date value from month, day, and year values.
	MINUTE	Returns the minute from a SAS time or datetime value.
	MONTH	Returns a number that represents the month from a SAS date value.
	QTR	Returns the quarter of the year from a SAS date value.
	SECOND	Returns the second from a SAS time or datetime value.
	TIME	Returns the current time of day as a numeric SAS time value.
	TIMEPART	Extracts a time value from a SAS datetime value.
	TODAY	Returns the current date as a numeric SAS date value.
	WEEKDAY	From a SAS date value, returns an integer that corresponds to the day of the week.
	YEAR	Returns the year from a SAS date value.
	YYQ	Returns a SAS date value from year and quarter year values.
Descriptive Statistics	CSS	Returns the corrected sum of squares.
	CV	Returns the coefficient of variation.
	GEOMEAN	Returns the geometric mean.
	GEOMEANZ	Returns the geometric mean, using zero fuzzing.
	HARMEAN	Returns the harmonic mean.
	HARMEANZ	Returns the harmonic mean, using zero fuzzing.
	IQR	Returns the interquartile range.
	KURTOSIS	Returns the kurtosis.
	LARGEST	Returns the kth largest non-null or nonmissing value.
	MAX	Returns the largest value from a list of arguments.
	MEAN	Returns the arithmetic mean (average) of the non-null or nonmissing arguments.
	MIN	Returns the smallest value.
	N	Returns the number of non-null or nonmissing numeric values.

Category	Function	Description
Descriptive Statistics	NMISS	Returns the number of null and SAS missing numeric values.
	ORDINAL	Orders a list of values, and returns a value that is based on a position in the list.
	PCTL	Returns the percentile that corresponds to the percentage.
	RANGE	Returns the difference between the largest and the smallest values.
	RMS	Returns the root mean square.
	SKEWNESS	Returns the skewness.
	SMALLEST	Returns the kth smallest non-null or nonmissing value.
	STD	Returns the standard deviation.
	STDERR	Returns the standard error of the mean.
	SUM	Returns the sum of the non-null or nonmissing arguments.
	USS	Returns the uncorrected sum of squares.
	VAR	Returns the variance.
Mathematical	ABS	Returns the absolute value of a numeric value expression.
	COALESCE	Returns the first non-null or nonmissing value from a list of numeric arguments.
	DIGAMMA	Returns the value of the digamma function.
	EXP	Returns the value of the e constant raised to a specified power.
	GAMMA	Returns the value of the gamma function.
	GCD	Returns the greatest common divisor for a set of integers.
	LCM	Returns the least common multiple for a set of integers.
	LGAMMA	Returns the natural logarithm of the Gamma function.
	LOG	Returns the natural logarithm (base e) of a numeric value expression.
	LOG10	Returns the base-10 logarithm of a numeric value expression.
	LOG2	Returns the base 2 logarithm of a numeric value expression.

Category	Function	Description
Mathematical	MOD	Returns the remainder from the division of the first argument by the second argument, fuzzed to avoid most unexpected floating-point results.
	MODZ	Returns the remainder from the division of the first argument by the second argument, using zero fuzzing.
	POWER	Returns the value of a numeric value expression raised to a specified power.
	SIGN	Returns a number that indicates the sign of a numeric value expression.
	SQRT	Returns the square root of a value.
	TRIGAMMA	Returns the value of the trigamma function.
	WHICHN	Returns the first position of a number from a list of numbers.
Numeric	CAT	Does not remove leading or trailing blanks, and returns a concatenated character or numeric string.
	CATS	Removes leading and trailing blanks, and returns a character or numeric concatenated string.
	CATT	Removes trailing blanks, and returns a concatenated character or numeric string.
	CATX	Removes leading and trailing blanks, inserts delimiters, and returns a concatenated character string.
Special	INPUTN	Enables you to specify a numeric informat at run time.
	MISSING	Returns a number that indicates whether the argument contains a missing value.
	NULL	Returns a 1 if the argument is null and a 0 if the argument is not null.
	PUT	Returns a value using a specified format.
	SLEEP	For a specified period of time, suspends the execution of a program that invokes this function.
Trigonometric	ARCOS	Returns the arccosine in radians.
	ARSIN	Returns the arcsine in radians.
	ATAN	Returns the arctangent in radians.
	ATAN2	Returns the arctangent of the x and y coordinates of a right triangle, in radians.
	COS	Returns the cosine in radians.

Category	Function	Description
Trigonometric	COSH	Returns the hyperbolic cosine in radians.
	SIN	Returns the trigonometric sine.
	SINH	Returns the hyperbolic sine.
	TAN	Returns the tangent.
	TANH	Returns the hyperbolic tangent.
Truncation	CEIL	Returns the smallest integer greater than or equal to a numeric value expression.
	CEILZ	Returns the smallest integer that is greater than or equal to the argument, using zero fuzzing.
	FLOOR	Returns the largest integer less than or equal to a numeric value expression.
	FLOORZ	Returns the largest integer that is less than or equal to the argument, using zero fuzzing.
	FUZZ	Returns the nearest integer if the argument is within 1E-12 of that integer.
	INT	Returns the integer value, fuzzed to avoid unexpected floating-point results.
	INTZ	Returns the integer portion of the argument, using zero fuzzing.
	ROUND	Rounds the first argument to the nearest multiple of the second argument, or to the nearest integer when the second argument is omitted.
	ROUNDE	Rounds the first argument to the nearest multiple of the second argument, and returns an even multiple when the first argument is halfway between the two nearest multiples.
	ROUNDZ	Rounds the first argument to the nearest multiple of the second argument, using zero fuzzing.
	TRUNC	Truncates a numeric value to a specified length.

Glossary

business context
a designation that identifies the information that a user can access. Data access is restricted to only the information that is required for a specific business need. A user can have access to more than one business context.

business entity
an object in your business domain. An entity has one or more terms, which are attributes of an entity. For example, the business entity could be the customer, and the associated terms could be the name, account number, account type, and so on.

business rule
a statement of business logic that specifies conditions to be evaluated and actions to be taken if those conditions are satisfied.

business rule flow package
a business rule flow that has been saved to an XML file.

business rule service
a business rule flow that has been implemented as a web service.

champion/challenger control group
a type of control group. Members of a champion/challenger control group receive either a champion communication or a challenger communication that is intended to outperform the champion.

control group
a group that is used to evaluate the effectiveness of a communication.

decision tree
a set of rules that split data into a hierarchy of successive segments, and which can be used, for example, to determine a single result or appropriate action. The leaves represent an optimal segmentation of the branches above them according to a statistical measure.

diagram
a general term for a collection of nodes that make up a process.

downstream node
See successor node

holdout control group
a type of control group. Members of a holdout control group do not receive a communication. After a communication has been sent, the actions of the holdout control group can be compared with the actions of groups that received a communication.

key
See lookup key

listen port
in a network, a communications endpoint at which a server listens for requests for service from the client application.

lookup key
a value that uniquely identifies a specific record and its order among other records in a database or table.

lookup table
a table that contains lookup keys and their corresponding values.

lookup value
the value that is associated with a lookup key in a lookup table.

macro variable
a variable that is part of the SAS macro programming language. The value of a macro variable is a string that remains constant until you change it. Macro variables are sometimes referred to as symbolic variables.

node
a graphical region of a diagram that contains information about a process flow operation. A node consists of a graphical component (icon) as well as a properties window.

predecessor node
a node that precedes another node in a diagram. A predecessor node is also called an upstream node.

publish
to register a business rule flow in a SAS metadata repository.

response
the reaction that an individual has to a campaign, such as requesting a quote, making an inquiry, opening an e-mail message, or buying the product.

rule
See business rule

rule flow
a logical collection of multiple rule sets that define multiple conditions and actions. Rule flows can be tested and deployed as SAS programs and services that process input data, which contain conditions, in order to create output data, which contain actions.

rule set
a logical group of business rules.

successor node
a node that follows another node. A successor node is also called a downstream node.

term
an attribute of a business entity. Terms might or might not have a list of valid values. For example, a customer entity might have terms such as account type or age. Valid values for the account type term might include "commercial" or "personal."

upstream node
See predecessor node

vocabulary
the set of business entities that define your business domain.

Index