SAS® Customer Analytics for Communications 5.4

User's Guide

SAS® Documentation

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SAS® Customer Analytics for Communications 5.4: User's Guide

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Contents

About This Book

Audience

This document focuses on explaining the tasks that you can perform by using the SAS Customer Analytics for Communications interface. You might be assigned to a specific role, which determines the tasks that you can perform. SAS Customer Analytics for Communications is designed for the following roles:

- administrators who are responsible for setting up and maintaining the application environment and scheduling the scoring run of a project.
- business analysts (also called analytical modelers) who perform the end-to-end tasks that are involved in the analytical workflow from analyzing the business problem to building the appropriate analytical models and capturing information about them.
- data analysts who can perform the tasks of defining the target population and building the analytical base table (ABT) and thereby assist business analysts with model-building tasks. In addition, data analysts also initiate the scoring-related tasks.

For details, see "Roles and Capabilities" on page 11.

Prerequisites

Users of SAS Customer Analytics for Communications should have high-level analytical capabilities, strong reporting skills, and high-level knowledge of data management. In addition, users should be familiar with the following tasks:

- analyzing the underlying business challenge and defining the target population
- defining variables and building analytical base tables
- building and registering analytical models in SAS Enterprise Miner
- interpreting the analytical results of different models and presenting relevant business insights to marketing managers and senior management

Before you start working with SAS Customer Analytics for Communications, make sure that all the following prerequisite tasks are complete as mentioned in the sequence below:

1. Complete tasks that are detailed in *SAS Communications Analytics Architecture: Administrator's Guide*. For information about how to access SAS Communications Analytics Architecture documentation, see **`http://support.sas.com/documentation/onlinedoc/securedoc/index_caa.html`**

2. Complete tasks that are detailed in *SAS Customer Analytics for Communications: Administrator's Guide*. For information about how to access SAS Customer Analytics for Communications documentation, see **`http://support.sas.com/documentation/onlinedoc/securedoc/index_cac.html`**

In addition, here are the prerequisites for using SAS Customer Analytics for Communications:

- a user ID and password for logging on to SAS Customer Analytics for Communications
- a supported browser installed on your desktop client
- a user ID and password for logging on to SAS Enterprise Miner to create and register analytical models

What's New in SAS Customer Analytics for Communications 5.4

Overview

SAS Customer Analytics for Communications has the following new features and enhancements:

- support for Teradata database
- support for integration with SAS Scoring Accelerator for Teradata
- usage of information maps
- support for new analytical component
- capability to deploy modeling ABT
- support for specifying time range for time-based variables
- support for specifying date for direct variables

Support for Teradata Database

In addition to SAS, SAS Customer Analytics for Communications now supports the Teradata database. If the Foundation data mart contains Teradata tables, you can choose whether you want to run the analytical processes in the Teradata database itself. For example, you can decide whether you want to build the modeling ABT and the scoring ABT in Teradata or SAS.

Support for Integration with SAS Scoring Accelerator for Teradata

If the Foundation data mart is in Teradata, SAS Customer Analytics for Communications supports integration with SAS Scoring Accelerator for Teradata. Using SAS Scoring Accelerator for Teradata optimizes the performance of the scoring process.

Usage of Information Maps

In addition to a single base table as a data source for an ABT, SAS Customer Analytics for Communications now supports a group of tables in form of star schema as data source. Relationship among these groups of tables is defined by using an information map. Data is populated in the information map tables directly from the dimension and fact tables of the Foundation data mart. As a result, data duplication is reduced. SAS Customer Analytics for Communications provides predefined information maps. These information maps have replaced most of the base tables. In addition to the predefined information maps, you can define new information maps according to your requirements.

The import data sources feature of the Administrative workspace enables you to import the information maps. You can configure these information maps according to your requirements and use them to define subset criteria and ABT variables.

Support for New Line of Business

In addition to prepaid and postpaid, SAS Customer Analytics for Communications now supports the new line of business for TV. As a result, you can build ABTs to analyze association rules, churn, customer segmentation, customer lifetime value, cross-sell, and up-sell for customers who avail the TV offers and services and telecast items such as Video on Demand (VOD) and Pay-per-view (PPV) from the communications service provider.

Capability to Deploy Modeling ABT

SAS Customer Analytics for Communications provides the capability to deploy the modeling ABT. When you deploy a modeling ABT, the information and infrastructure that is required to build the ABT is made available in a specific location. Your administrator can use this information to build the modeling ABT anytime later by using a suitable environment such as SAS Data Integration Studio.

Support for Specifying Time Range for Time-Based Variables

In the previous release, time-based variables could be defined for the most recent time when the particular event occurred. In the current release, you can define time-based variables for a specific time period. This feature enables you to extract the recent most information in the specified time period. When you define a time-based variable, you can select one and more time periods. Therefore, one variable is created for each time period. You can use this feature to compare the values that a variable has in various time periods.

Support for Specifying Date for Direct Variables

In the previous release, direct variables could not be defined for a particular date. The data that was available at the time of ABT build date was populated in these variables. In the current release, you can define direct variables for a specific date. This feature enables you to extract information that is available for a particular date. When you define a direct variable, you can select one and more time periods. Therefore, one variable is created for each time period. You can use this feature to compare the values that a variable has in various time periods.

General Enhancements

SAS Customer Analytics for Communications has the following general enhancements:

- Simple derived variable has been renamed as arithmetic derived variable.
- Complex derived variable has been renamed as logical derived variable.
- You can create a behavioral variable that calculates the average of the selected measure per record. In the previous release, behavioral variables could calculate the average only by time (for example, average of the selected measure per month).
- SAS Customer Analytics for Communications now supports both Date and Datetime data types while configuring data sources. In the previous release, only Datetime was supported.

Accessibility Features of SAS Customer Analytics for Communications

Overview

SAS Customer Analytics for Communications has not been tested for compliance with U.S. Section 508 standards and W3C web content accessibility guidelines. If you have specific questions about the accessibility of SAS products, send them to accessibility@sas.com or call SAS Technical Support.

Documentation Format

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

User Interface Layout

SAS Customer Analytics for Communications provides a framework to complete the entire modeling process from data selection and data processing to scheduling the scoring run of an analytical project. The application window contains the application bar and the workspace. Each workspace enables you to perform a group of related tasks within the application. The layout of the workspace differs depending on the workspace in which you are working.

To customize the application window and its features, select **File** ⇨ **Preferences**. For more information about the user interface layout, see Chapter 3 “The SAS Customer Analytics for Communications Interface.”

Themes

An application’s theme is the collection of colors, graphics, and fonts that appear in the application. The following themes are provided with this application: Default theme (SAS Blue Steel), Flex Halo, SAS Corporate, SAS High Contrast, SAS Light, SAS Light for Testers, and SAS Dark. To change the theme for the application, select **File** ⇨ **Preferences** and go to the **Global Preferences** page.

Keyboard Shortcuts

SAS Customer Analytics for Communications 5.4 can be navigated by using the keyboard. The following table includes some guidelines:

Keyboard Shortcuts

Task	Keyboard Control
Open a Help pop-up window from the button *Note:* To ensure that the correct Help is displayed, select the field or section that the button is associated with before you use the keyboard shortcut.	Ctrl+?
Zoom in	Ctrl++
Zoom out	Ctrl+-
Reset the zoom state	Ctrl+0
Maximize view (collapses the category pane and the tile pane, and hides the status bar and the application bar, which includes the menu bar and the workspace bar). or Exit maximized view (expands the category pane and the tile pane, and shows the status bar and the application bar).	Ctrl+Alt+Shift+M *Note:* This keyboard shortcut does not work when the focus is on the workspace bar.
Open a pop-up menu.	Shift+F9 (if a menu is available in that context) *Note:* If you use Shift+F9 to display the pop-up menu, then it is always displayed in the top left corner of the user interface control that you are using.
Temporarily invert or revert application colors (for the current session only) *Note:* You can set the **Invert application colors** preference in the Preferences window if you want the color change to persist across sessions.	Ctrl+~
Rename the selected tab.	Make sure that the focus is on the tab. Press F2 and specify the new name. To commit your changes, press Enter. To cancel your changes, press Esc.
Close the selected tab.	Make sure that the focus is on the tab, and then press Delete. *Note:* Some tabs cannot be closed.

Task	Keyboard Control
Switch in and out of Edit mode for a table cell.	To enter Edit mode, select a cell and press F2. To exit Edit mode, press Esc.
Navigate between table headings and table content	For a two-dimensional table, first make sure that focus is on the table and that you are not in Edit mode. Press Ctrl+F8 to switch focus between column headings and table cells. Use the arrow keys to navigate from heading to heading. For a multidimensional table, first make sure that focus is on a table cell and that you are not in Edit mode. Press Ctrl+F8 to switch focus between column headings, row headings, and table cells. Use the arrow keys to navigate from heading to heading.
Navigate the content rows of a table	When table cells are in Edit mode: • Press Tab and Shift+Tab to move from cell to cell horizontally across columns. • Press Enter and Shift+Enter to move from cell to cell vertically across rows. When table cells are not in Edit mode, use the arrow keys to move from cell to cell.
Sort columns in a table	To sort a single column, navigate to the column heading of the column that you want to sort. Press spacebar to sort the column. To sort additional columns, navigate to the column heading of each additional column that you want to sort. Press Ctrl+spacebar.

Recommended Reading

Here is the list of documents that you can refer to while using this document:

- *SAS Communications Analytics Architecture: Administrator's Guide*
- *SAS Customer Analytics for Communications: Administrator's Guide*
- *SAS Communications Analytics Architecture: User's Guide*

For a complete list of SAS publications, go to support.sas.com/bookstore. If you have questions about which titles you need, please contact a SAS Publishing Sales Representative:

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Part 1

Introduction

Chapter 1

About SAS Customer Analytics for Communications

Overview of SAS Customer Analytics for Communications

In the converged market, communications service providers (CSPs) face numerous business challenges to maximize their profits. At the same time, they have to focus on customer satisfaction. According to the recent research in the communications industry, acquiring new customers assures incremental revenues, and retaining profitable customers proves to be an effective driver of profit. Also, customer loyalty helps CSPs predict future profitability. In order to balance between profits and customer satisfaction, CSPs need an end-to-end analytical solution. This solution should enable them to address the following predominant business challenges:

- Segment customers based on their behavioral attributes.
- Acquire potential customers.
- Retain profitable customers.
- Predict the customer lifetime value.
- Implement appropriate strategies to offer new products and services to their existing customers.

SAS Customer Analytics for Communications helps you analyze complex behavioral patterns of customers in large volumes of data spread across multiple systems. It is a comprehensive solution that provides you with next-generation capabilities for predictive analysis, association rules analysis, and survival analysis. It alerts you about customers who are likely to purchase a new product or upgrade service. In addition, it also helps you identify customers who are likely to leave and customers who should be targeted in a campaign.

SAS Customer Analytics for Communications offers a complete package of analytical components to analyze data pertaining to the following business challenges:

- customer segmentation
- customer acquisition
- customer churn
- cross-sell
- up-sell
- association rules analysis
- customer lifetime

In addition, for each business challenge, SAS Customer Analytics for Communications analyzes data pertaining to three lines of business, namely prepaid, postpaid, and television (TV).

Benefits of SAS Customer Analytics for Communications

Optimized Data Management

SAS Customer Analytics for Communications is integrated with a fully documented, customer-centric Foundation data mart that contains information about each customer. The Foundation data mart covers various subject areas:

- billing
- customer complaints
- demographics
- equipment
- financial measures
- customer interaction
- loyalty
- payment information
- prepaid-specific variables
- product portfolio
- scores and segments
- suspension
- usage (inbound and outbound)
- advertisement and program viewership

This data enables the solution to build ABT variables that are required to perform predictive analysis and use the analytical results in business intelligence (BI) reports.

Dynamic Building of Analytical Base Tables

SAS Customer Analytics for Communications offers the flexibility to define and build analytical base tables (ABTs) at run time. As a result, analytical modelers can have the following benefits:

- complete user control over definition of variables through a user-friendly web application
- easy analysis and processing of variables that are relevant to the specific-business problem at hand, such as customer churn, cross-sell, up-sell, and so on
- ease of performing various derivations based on business requirements rather than a static list
- metadata integration with SAS Platform to ensure seamless user experience while exporting ABTs to SAS Enterprise Miner for analytical modeling
- end-to-end functional features to complete the entire modeling process from data selection and data processing to scheduling the scoring run of an analytical project

Customer Segmentation

SAS Customer Analytics for Communications offers the flexible customer segmentation component. This analytical component enables CSPs to analyze customer behavior based on their usage and revenue patterns and demographic profiles. This analysis helps CSPs understand the customer base better and gain insights of customers’ behavioral patterns. Based on this information, CSPs can implement appropriate campaigning strategies.

Customer Acquisition Analysis

According to recent studies, customer acquisition assures incremental revenue. However, it also incurs high costs. Therefore, it is essential for CSPs to target customers who are likely to be acquired. The customer acquisition component that SAS Customer Analytics for Communications offers produces the acquisition scores as an analytical output. This score gives the probability that a prospective customer will be acquired.

Customer Churn Analysis

With its customer churn component, SAS Customer Analytics for Communications enables CSPs to predict the likelihood that a customer might depart. The output of this analytical component is the churn score, which CSPs can use to gain insight into timing and reasons for departure.

Greater Precision for Cross-Sell and Up-Sell

SAS Customer Analytics for Communications offers the cross-sell and up-sell model that enables the CSPs to have a clear understanding of each customer’s propensity to depart or to purchase additional products and services. As a result, CSPs can maximize average revenue per user (ARPU), minimize churn, and reduce risk.

SAS Customer Analytics for Communications also supports building association rules analysis models based on the association rules technique. By using these models, you can perform market basket analysis (MBA), association rules analysis, and sequence analysis. The output of these models is a set of association rules that are produced at various levels, such as offer or service. This analysis in turn helps CSPs enhance cross-sell and up-sell to a great extent.

Customer Lifetime Value (CLTV) Analysis

SAS Customer Analytics for Communications gives insights about the lifetime value of a customer. This value indicates for how long customers will be on the network. As a result, CSPs can target their most profitable customers and retain them by implementing appropriate business strategies.

Multiple Lines of Business

For each analytical component such as customer segmentation, customer churn, cross-sell, and up-sell SAS Customer Analytics for Communications supports three lines of business, namely prepaid, postpaid, and TV.

Seamless Integration with Other Solutions

With its flexible and scalable architecture, SAS Customer Analytics for Communications can easily be integrated with other solutions, such as SAS Communications Analytics Architecture and SAS Offer Optimization for Communications.

The analytical scores that are generated in SAS Customer Analytics for Communications can be used to generate business intelligence (BI) reports in SAS Communications Analytics Architecture. These reports can be used by decision makers to make quick business decisions and implement appropriate business strategies. For details, see *SAS Communications Analytics Architecture: User's Guide*.

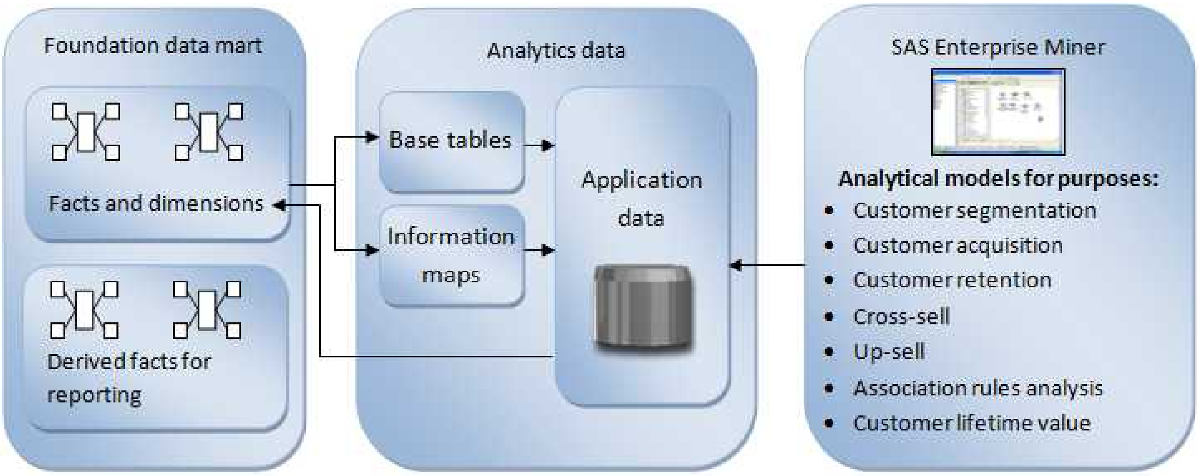
Similarly, SAS Offer Optimization for Communications can interface with SAS Customer Analytics for Communications to build ABTs for the microsegmentation and offer ranking workflow steps. For details, see *SAS Offer Optimization for Communications: Administrator's Guide*.

How Does SAS Customer Analytics for Communications Work

Overview of the Solution Workflow

SAS Customer Analytics for Communications turns data into insights about customer behavior. It extracts data from the Foundation data mart. This data is required for building ABTs and analytical models. The results of the analytical models are also written back to the Foundation data mart, and then these results are used in the BI reports. These reports help CSPs make strategic decisions and take proactive business actions.

Figure 1.1 Solution Workflow



Foundation data mart
: stores data extracted from external source systems. This data is used by the reporting data structures.

Analytics data
: stores data that is required for completing the analytical tasks. You must configure the Analytics data with appropriate data before you start working with SAS Customer Analytics for Communications.

Table 1.1 Components of Analytics Data

Name	Description
Base tables	A set of input tables that SAS Customer Analytics for Communications requires to complete the analytical tasks. These tables are populated with data from the Foundation data mart tables.
Information maps	A set of related tables that is defined as a star schema. Data is populated in the information maps tables from the dimension and fact tables of the Foundation data mart.
Application data	Stores the configuration information that is required for generating ABTs for different analytical models. The analytical results that are generated as an output of the analytical models are also stored in this data. These results are finally written back to the Foundation data mart and then are used to generate BI reports for the analytical components.

Analytical models
: SAS Enterprise Miner enables analytical modelers to create and register analytical models. Sample SAS Enterprise Miner models are prepackaged for all the analytical components. In the model building phase, the model is built based on the ABT.

During the scoring process, results are stored in the Analytics data and finally written back to the Foundation data mart.

Solution Workflow

Here is the list of high-level steps that are involved in the SAS Customer Analytics for Communications workflow:

1. Make sure that the Foundation data mart tables are populated with the required historical data. For details, see *SAS Communications Analytics Architecture: Administrator's Guide*.
2. Populate the base tables with the required data. These tables are populated with data from the Foundation data mart. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*.
3. Log on to SAS Customer Analytics for Communications as an administrator and configure the dimensional attribute values and any additional input tables or columns that are not configured through the post-installation instructions. For details, see Chapter 10 "Configuring the Input Data Sources" on page 155.
4. Log on to SAS Customer Analytics for Communications as a business analyst or a data analyst and define the business problem for which the analytical model is to be built.
   a. Define a project with a definite purpose to address the business problem. For details, see Chapter 5 "Managing Projects" on page 25.
   b. (Optional) Define the target population for the project. For details, see Chapter 6 "Managing the Subset Criterion" on page 33.
5. Log on to SAS Customer Analytics for Communications as a business analyst or data analyst and perform the following tasks related to a modeling ABT. For details, see Chapter 7 "Managing Analytical Base Tables" on page 54.
   a. For a specific project, define the modeling ABT and its variables.
   b. Build the modeling ABT.

      Note: Alternatively, you can deploy the ABT and request your administrator to build it later.
   c. Register the modeling ABT with the SAS Metadata Server.
6. Log on to SAS Enterprise Miner and complete the model-building tasks.
   a. Build the appropriate analytical model by using the ABT that you have created depending on the purpose of your project.

Table 1.2 *Project Purposes*

Business Challenge	Available Purposes
Customer Segmentation	• Segmentation Prepaid • Segmentation Postpaid • Segmentation TV
Customer Acquisition	Customer Acquisition

Business Challenge	**Available Purposes**
Customer Churn	• Churn Prepaid • Churn Postpaid • Churn TV
Cross-sell	• Cross-sell Prepaid • Cross-sell Postpaid • Cross-sell TV
Up-sell	• Up-sell Prepaid • Up-sell Postpaid • Up-sell TV
Association rules analysis	• Association Rules Prepaid • Association Rules Postpaid • Association Rules TV Offers and Services • Association Rules VOD and PPV
Customer Lifetime Value	• Customer Lifetime Value Prepaid • Customer Lifetime Value Postpaid • Customer Lifetime Value TV

   b. Register the model with SAS Metadata Server.

7. Log on to SAS Management Console and grant appropriate permissions on that model. For details, see "Grant Permissions on Models" on page 126.

8. Log on to SAS Customer Analytics for Communications as a business analyst and complete the modeling tasks. For details, see Chapter 8 "Managing Models" on page 123.

   a. Capture the model's information.

   b. Publish the model if you want to create a scoring template for the model.

   Note: Perform steps 8 and 9 for models that you want to score.

9. Log on to SAS Customer Analytics for Communications as a business analyst and complete tasks for the scoring mode. For details, see Chapter 9 "Introduction to the Scoring Process" on page 145.

   a. (Optional) Edit the subset criterion that is associated with the scoring model.

   b. Define a scoring template for the published model.

10. As an administrator, complete the scoring tasks. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

    a. Schedule and run the scoring process and generate the analytical scores.

    b. Write back the scores to the Foundation data mart.

11. View business intelligence reports and analyze your data. For details, see *SAS Communications Analytics Architecture: User's Guide*.

Chapter 2

Managing Access to SAS Customer Analytics for Communications

Roles and Capabilities

Different users might have access to different functionality depending on their assigned roles. Each role is mapped to a set of predefined capabilities. A capability, also known as an application action, defines the operations that a user can perform.

SAS Customer Analytics for Communications has three predefined roles—business analysts (also called analytical modelers), data analysts, and administrators. A predefined set of capabilities is available for each role. Capabilities are further categorized into three levels—project-related, scoring, and administrative.

Project-related capabilities

Project-related capabilities are assigned to business analysts. These capabilities enable business analysts to view a project and its workflow, create new projects, create and build ABTs, capture and publish models, and so on. All project-related capabilities except for capabilities related to models are also assigned to data analysts. The following are examples of project-related capabilities:

- View, create, and delete projects.
- View, create, and delete subset criteria.
- View, create, deploy, build, register, and delete ABTs.
- View, capture, publish, and delete models.

Note: Administrators can view projects, subset criteria, ABTs, and models. In addition, they can also delete models.

Scoring capabilities

Scoring capabilities are assigned to business analysts. Scoring capabilities enable business analysts to perform the following tasks:

- Edit the subset criterion that is associated with the published models.
- View, create, and delete scoring templates.

Note: Administrators can view scoring templates.

Administrative capabilities
: Administrative capabilities are assigned to administrators. Administrative capabilities enable administrators to configure the Application data.

Using SAS Management Console, a system administrator can modify the roles and specify the capabilities according to the roles and responsibilities that are defined at your organization. The system administrator can also define new roles. If you have questions about your assigned role, contact your system administrator.

Log On to SAS Customer Analytics for Communications

To log on to SAS Customer Analytics for Communications, complete these steps:

1. To display the SAS Customer Analytics for Communications logon window, click the URL that is supplied by your system administrator or paste it in the address field of your web browser. For example, you might enter **`http://server01.abc.com:9080/SASCustAnalyticsComm/`**

   Display 2.1 *Logon Window for SAS Customer Analytics for Communications*

2. To log on, complete these steps:

   a. In the **User name** field, enter your user ID.

   b. In the **Password** field, enter the password for the user ID that you just entered.

   c. Click **Log On**.

   The main application window appears. For details, see "Overview of the SAS Customer Analytics for Communications Interface" on page 15.

Note: Your password is case sensitive. Your user name might be case sensitive, depending on the operating system that hosts the web application server. For assistance, contact your system administrator.

Log Off from SAS Customer Analytics for Communications

To log off from SAS Customer Analytics for Communications, click **Log Off** on the application bar. Alternatively, on the **File** menu, select the **Log Off** option.

If you lose your connection to SAS Customer Analytics for Communications (for example, your session times out), you must begin again at the point where you last saved your work. By default, if there is no activity for 30 minutes, SAS Customer Analytics for Communications automatically logs you off and displays the logon window. Your system administrator can change the inactivity period and decide whether the **Log On** button will be available. As a best practice, you must save your work frequently.

The following is an example of the message that appears when your session has timed out:

Display 2.2 *Session Timed Out Message for SAS Customer Analytics for Communications*

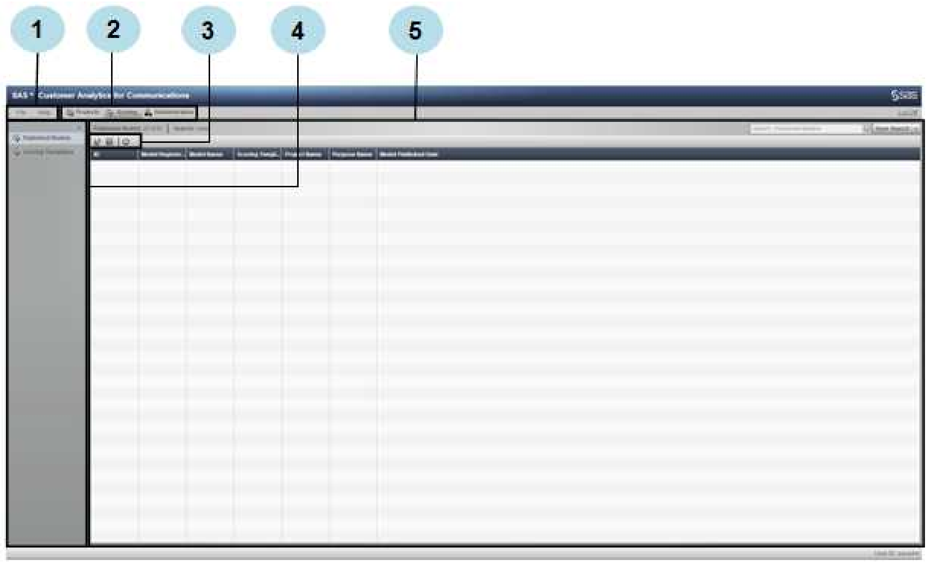
Chapter 3

The SAS Customer Analytics for Communications Interface

Overview of the SAS Customer Analytics for Communications Interface

When you log on to SAS Customer Analytics for Communications, the main application window appears. The application window contains the application bar and the workspace. Each workspace enables you to perform a group of related tasks within the application.

Figure 3.1 *The SAS Customer Analytics for Communications Interface*



1 Menu bar

2 Workspace bar

3 Toolbar

4 Object Manager

5 Workspace

Using the Application Bar

Overview of the Application Bar

The application bar is located at the top of the application window and is part of the application banner. The application bar contains the menu bar, the workspace bar, and the **Log Off** option.

The Menu Bar

Overview of the Menu Bar

The menu bar provides you the common menu options.

The File Menu

The following options are available on the **File** menu:

Recent Work
enables you to quickly access the recent most objects that you are working on.

Preferences
enables you to define your preferences for displaying information in the user interface.

Log Off
enables you to log off from the application.

The Help Menu

The following options are available on the **Help** menu:

User's Guide (PDF)
opens the *SAS Customer Analytics for Communications: User's Guide* in a separate browser window.

SAS on the Web
includes links to product support page, SAS customer support, and SAS home page. The product support page gives information about the documentation that is available for SAS Customer Analytics for Communications.

About SAS Customer Analytics for Communications
displays copyright and other information about SAS Customer Analytics for Communications.

The Workspace Bar

The workspace bar contains buttons that enable you to navigate across workspaces.

Table 3.1 *Workspace Buttons*

Button	Purpose
	Opens the Projects workspace
	Opens the Scoring workspace
	Opens the Administrative workspace

The Log Off Option

Use the **Log Off** option to log off from the application.

Working in the Workspaces

Overview of Workspaces

The SAS Customer Analytics for Communications interface contains workspaces for performing a group of related tasks within the application. You can navigate across the workspaces by using the workspace buttons that are available on the application bar. The SAS Customer Analytics for Communications interface contains the following workspaces:

- Projects
- Scoring

- Administrative

The Toolbar

The toolbar contains various options that enable you to quickly complete certain commonly performed tasks.

Note: The toolbar options might not be the same for each workspace.

Table 3.2 *Toolbar Options*

Icon	Description	Related Task
	New	Creates a new object such as a project, subset criterion, ABT, variable, or scoring template
	Edit	Modifies an existing object
	Delete	Deletes an existing object
	Import	Imports an object such as a table, variable, and so on
Not available	**Menu** button	Enables you to open, create, delete, or import an object

The Projects Workspace

Overview of the Projects Workspace

The Projects workspace enables you to create and manage your projects. A project enables you to view, group, organize, and track all your tasks that you must perform it to address a specific business problem. For details, see Chapter 5 “Managing Projects.”

The Projects workspace is divided into three pages, which appear when you double-click a project in the Projects workspace. These pages enable you to define the project’s workflow. Each page is represented by a tab.

Pages in the Projects Workspace

Subset Criterion

On this page, you create and manage your subset criterion. A subset criterion is a set of filters that you apply to obtain your target population—the population on which you want to build the ABT and the analytical model. For details, see Chapter 6 “Managing the Subset Criterion.”

Analytical Base Table

On this page, you perform tasks related to the modeling ABT. These tasks include defining an ABT, creating variables for the ABT, registering ABT, sharing the ABT variables, and building the ABT. For details, see Chapter 7 “Managing the Modeling ABT.”

Models

On this page, you capture the model-related information, manage the captured information, link a model to an ABT, and publish a model for scoring. This page is available only after you have created a modeling ABT. For details, see Chapter 8 “Managing Models.”

The Scoring Workspace

This workspace enables you to perform tasks related to the published models. These tasks involve editing the subset criterion that is associated with the published model and managing the scoring templates. For details, see Chapter 9 “Introduction to the Scoring Process.”

The Administrative Workspace

This workspace displays a list of tables that are configured in the Analytics data. You can use the Administrative workspace to configure the usage of these tables. You can also use this workspace to import metadata from the Foundation data mart tables into the Analytics data. For more information, see Chapter 10 “Working in the Administrative Workspace.”

Where to Find Help

The Help components embedded in the SAS Customer Analytics for Communications interface give you just-in-time and just enough information to complete a task. In addition, you can access the user’s guide from the **Help** menu.

The SAS Customer Analytics for Communications interface has the following embedded help components:

Help pop-up
: displays detailed information about the corresponding field or interface element.

  Help pop-up is represented using the Help icon . Click the Help icon to view the information, which is displayed in a pop-up dialog box.

Tooltip
: displays short, descriptive information about icons in a pane. A tooltip appears when you move your pointer over an icon in the interface.

Instructional text
: displays information persistently in the interface near a field, group of fields, or a table. For example, data entry instructions and introductory text for fields and tables are a few examples of instructional text.

Chapter 4

Performing Common Tasks

Overview of Common Components

Here are the common components of the SAS Customer Analytics for Communications interface:

- panes
- sections
- tables
- lists

This chapter explains the common tasks that you can perform when you work on these components.

Resize a Window

You can resize a window if the default size of the window does not display complete information.

To resize a window, complete these steps:

1. Move your pointer to any of the borders of the window.
2. When your pointer changes to a , , , or , drag to resize the window.

Resize a Pane

You can resize a pane if the default size of the pane does not display complete information. Also, you can resize a certain pane in order to provide more area for other panes.

To resize a pane, complete these steps:

1. Move your pointer to the horizontal or vertical divider.
2. When your pointer changes to a , drag to resize the pane.

Working with Tables

Change the Width of a Column

If the default width of a column does not display complete information, you can change the column width. To change the width of a column, drag the boundary on the right side of the column heading until the column is the width that you want.

Move a Column

If the order in which the columns are displayed does not meet your needs, you can change the sequence of the columns. To move a column, click the column heading and drag the column to the desired location.

Change the Sort Order of a Column

You can sort data by only a single column at a time. To change the order in which a column is sorted, click the up or down arrow that is displayed in the column heading.

Part 2

Working in the Projects Workspace

Chapter 5

Managing Projects

About Projects

Overview of Projects

SAS Customer Analytics for Communications is built around the concept of projects. A project is a group that you create in order to address a specific business challenge such as customer acquisition, customer segmentation, cross-sell, up-sell, customer churn, and so on. Each project contains certain predefined tasks that you need to perform in order to analyze the business challenge. In order to perform these tasks, a project is categorized into three components, subset criterion, ABT, and models. For details, see “Define a Project’s Components” on page 29. Therefore, each project has a definite purpose depending on the business challenge that it addresses. Moreover, a project enables you to focus your analysis at a particular level (subject of analysis) and a subject group. The subject of analysis and the subset group for which you can analyze your data are predefined depending on the purpose of your project.

Each project is a collection of predefined tasks that you must perform to analyze the business challenge. A project enables you to group, organize, and track all these tasks. These tasks include the following:

1. Define the target population.
2. Define an ABT and its variables.
3. Build and register the ABT.

   Note: Alternatively, you can deploy the ABT, so that your administrator can build it anytime later.

4. Capture information about the analytical models that you built in SAS Enterprise Miner.
5. Publish the model if you want to use it for scoring.

Examples of Projects

Business Challenge: Churn in Postpaid Customers

In the postpaid scenario, customer churn is one of the most important business challenges. Recent studies in the communications industry indicate that reducing the customer churn rate is one of the major drivers to increase profits. Therefore, it is essential for communications service providers (CSPs) to retain their most profitable customers.

In SAS Customer Analytics for Communications, you can define a project to address customer churn for the postpaid payment mode. A customer can have one or more subscriptions. Therefore, for this project, the subject of analysis can be subscription and you can aggregate your data at the customer level. You can also restrict your target population to contain data pertaining to postpaid offers. Therefore, you can select the postpaid offers as the subject group.

Subsequently, you can define your target population, and by using appropriate predictive analysis technique, SAS Customer Analytics for Communications produces the churn score as the probability that these customers will churn in the outcome period. Based on these scores, you can implement proactive business strategies to reduce customer churn.

Business Challenge: Customer Lifetime Value

Along with predicting the churn probability of a customer, it is also essential to know when the customer is likely to churn. In other words, the churn probabilities at varied time intervals need to be computed during the entire tenure of the customer. As a result, the customer lifetime value can be computed, which can give information about how long the customer will continue to be on the network.

In SAS Customer Analytics for Communications, you can define a project to compute the expected tenure of a customer. For this project, you can define customer as the subject of analysis.

Subsequently, you can define your target population and by using appropriate survival analysis technique, SAS Customer Analytics for Communications computes the expected tenure of a customer. Based on this output, the customer lifetime value can be computed, and you can implement proactive business strategies to increase customer loyalty.

More about Subject of Analysis and Subject Group

In addition to the purpose, each project is associated with a subject of analysis, which determines the level at which you want to analyze your data. For example, when you define a project for customer acquisition, you would want your target population to contain only prospective customers. Therefore, your subject of analysis for this project can be prospective customers. The subject of analysis for a project depends on the purpose of the project. For example, for a project that you have created for customer churn, **Subscription** can be the only subject of analysis. However, for a project that you have created for association rules analysis, you can choose the subject of analysis from a predefined list of values. If you want to work with rules by using the market basket analysis node of SAS Enterprise Miner, then the subject of analysis can be **Customer**

Offer or **Customer Service**. Similarly, if you want to work with rules by using the association node of SAS Enterprise Miner and use this node for sequence analysis, then subject of analysis can be **Customer Offer Agreement Date** or **Customer Service Activation Date**.

You can define a subject group for a project. The subject group enables you to define your target population based on certain predefined groups. A subject group is a predefined group of members that share a common set of attributes. Thus, a subject group enables you to filter your target population. If you do not select a subject group, the target population will contain all records pertaining to the selected subject of analysis.

For details about how to configure values for subject of analysis and subject group, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Defining Projects

Overview of Project Creation

In SAS Customer Analytics for Communications, you create and manage projects in the Projects workspace. Depending on your assigned role, you can create projects and work on them. When you define a project, you are the owner of that project. Therefore, you can view and work on only those projects that you create. You can also modify or delete your projects. However, you cannot view or access projects that other users create.

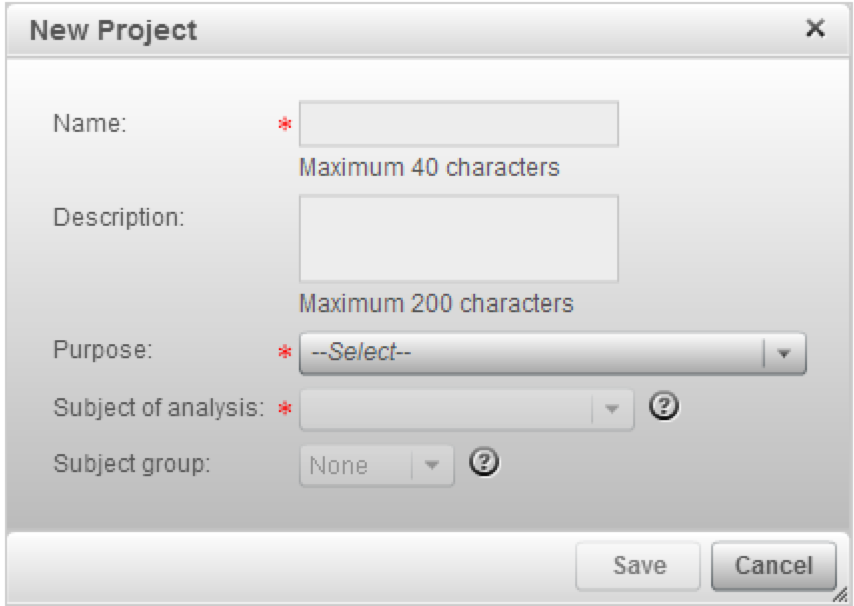
Note: When you create a project, you are the default owner of the project. Other users cannot view your projects. However, if required, your administrator can assign the ownership of the project to another user. For more information, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Create a Project

To create a project, complete these steps:

1. Select the Projects workspace.
2. On the workspace toolbar, click . Alternatively, on the workspace toolbar, select **Menu** ⇨ **New Project**. The New Project window appears.

Display 5.1 *New Project Window*



3. In the **Name** field, enter a name of the project.
4. In the **Description** field, enter a description of the project.
5. From the **Purpose** list, select the business need that the project addresses. Select the appropriate option depending on whether you are defining the target population for postpaid or prepaid payment modes. For example, if the project analyzes the churn problem in postpaid customers, select **Churn Postpaid** as the purpose of your project.
6. From the **Subject of analysis** list, select the level at which you want to analyze your data. Consequently, the subject of analysis determines the level of the ABT that is created later for the project.

   Note: The subject of analysis that you can select for a project depends on the purpose that you select for the project. The following table lists the sample combinations of values that can be defined for **Purpose** and **Subject of analysis**.

Table 5.1 *Examples of Subjects of Analysis*

Purpose	**Available Options for Subject of Analysis**
Association Rules TV Offers and Services	• Customer Service Activation Date • Customer Offer • Customer Offer Start Date • Customer Service • Subscription Service Activation Date • Subscription Service
Association Rules VOD and PPV	• Subscription Telecast Item • Subscription Telecast Item Order Date

Purpose	**Available Options for Subject of Analysis**
• Association Rules Postpaid • Association Rules Prepaid	• Customer Offer Agreement Date • Customer Service Activation Date • Customer Offer • Customer Service • Subscription Service Activation Date • Subscription Service
• Churn TV • Churn Postpaid • Churn Prepaid	Subscription
• Cross-sell TV • Cross-sell Postpaid • Cross-sell Prepaid	• Customer • Subscription
Customer Acquisition	Prospect Customer
• Customer Lifetime TV • Customer Lifetime for Postpaid • Customer Lifetime for Prepaid • Segmentation TV • Segmentation Prepaid • Segmentation Postpaid	Customer

7. From the **Subject group** list, select the appropriate subject group for the project. For details, see "Purpose-Specific Predefined Implicit Subset Criteria" on page 177. The subject group that you can select for a project depends on the purpose and subject of analysis that you select for the project. For certain purposes, such as Cross-Sell TV and Up-Sell TV, SAS Customer Analytics for Communications does not provide any subject group. You can configure your own subject groups. For more information, see *SAS Customer Analytics for Communications: Administrator's Guide*.
8. Click **Save**. The project is added to the list of projects in the Projects workspace.

   TIP When you create a project, a unique ID is automatically assigned to the project. You can use this ID to track your project in the application metadata. You can also use this ID to search for the project in the Projects workspace.

Define a Project's Components

After you create a project, you can define its components on the following three pages:

Subset Criterion
: enables you to define the target population for your project.

ABT
: enables you to perform tasks related to a modeling ABT. These tasks include creating the modeling ABT and its variables, sharing the ABT if required, deploying the ABT or building it, and registering the ABT.

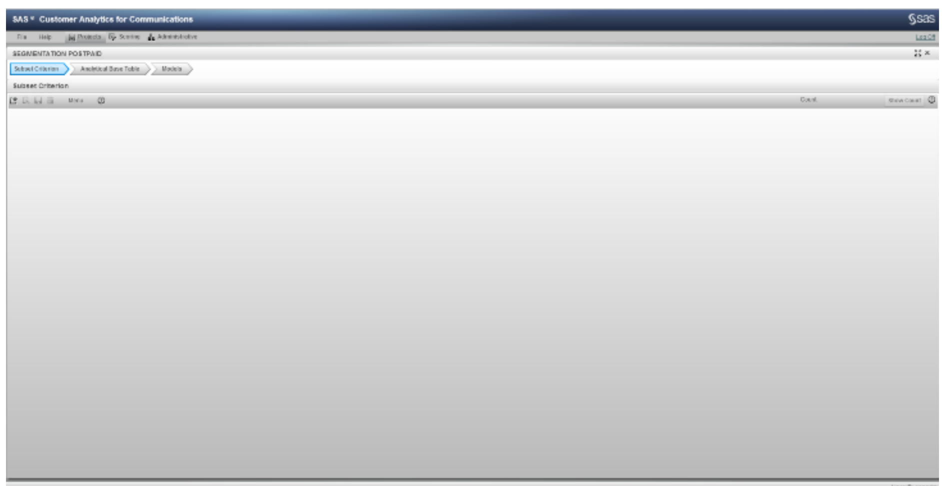
Models
: enables you to capture information about the analytical models that you have built for the project and publish these models if you want to use them for scoring.

These pages also indicate the workflow of a project.

To define a project's components, complete these steps:

1. In the Projects workspace, select the project for which you want to add components.
2. Open the project by double-clicking it. Alternatively, on the toolbar, select **Menu** ⇨ **Open**.

   Display 5.2 *Pages of a Project*

3. (Optional) On the Subset Criterion page, define a set of filters to obtain your target population. For details, see Chapter 6, "Managing the Subset Criterion," on page 33.
4. On the Analytical Base Table page, define the modeling ABT and the ABT variables. For details, see Chapter 7, "Managing Analytical Base Tables," on page 53.
5. On the Models page, capture the information about the models that you want to link to the ABT. For details, see Chapter 8, "Managing Models," on page 123.

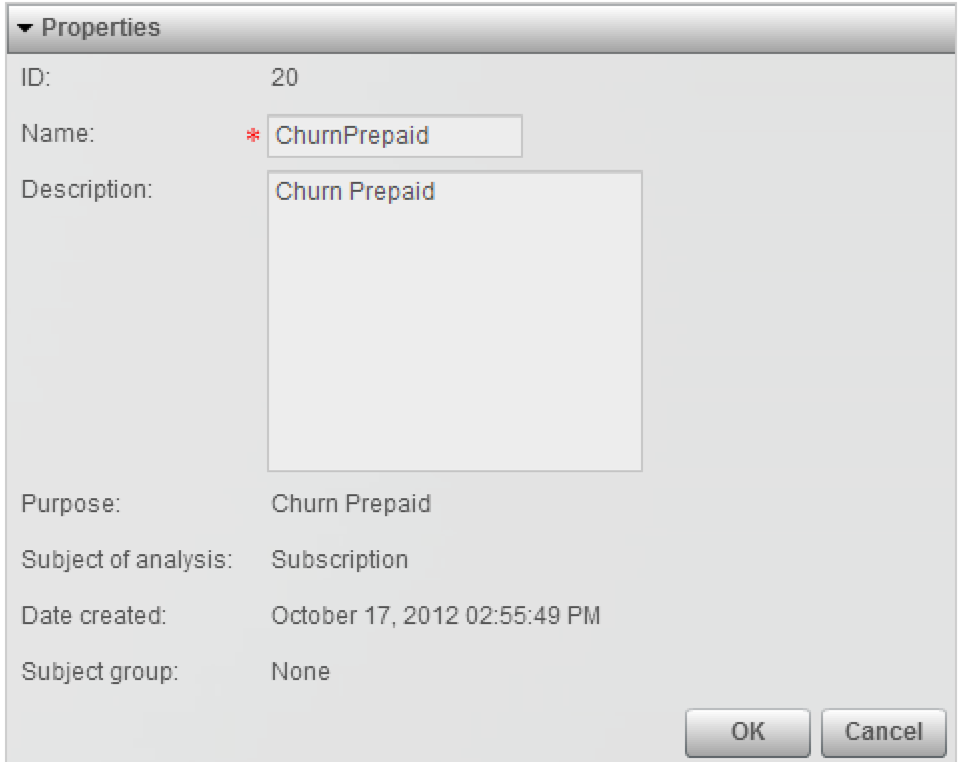
Edit the Details of a Project

You can edit only name and description of a project.

To edit a project's details, complete these steps:

1. In the Projects workspace, select the project that you want to edit.
2. In the Properties pane, click **Edit**.

Display 5.3 *Properties Pane of a Project*



3. Change the name and description of the project according to your requirement.
4. Click **OK** to save the changes.

You can also edit the components of a project.

- To edit the subset criterion, see "Edit a Subset Criterion" on page 50.
- To edit the ABT details, see "Edit an ABT" on page 57.
- To edit the model information, see "Edit a Model's Information" on page 138.

Delete a Project

When you delete a project, all components (subset criterion, ABT, and model information) that are associated with it are also deleted. You cannot recover the project data back. Therefore, make sure that you are deleting the correct project.

To delete a project, complete these steps:

1. In the Projects workspace, select the project that you want to delete.
2. On the toolbar, click . Alternatively, on the workspace toolbar, select **Menu** ⇨ **Delete**.
3. In the confirmation message box that appears, click **Yes**.

Chapter 6

Managing the Subset Criterion

About the Subset Criterion

Overview of Subset Criterion

A subset criterion enables you to define the target population for your project. It contains a set of filters that you define in order to filter records that are significant for your analysis. When you build an ABT, the records that fulfill the subject group and subset criterion are used to populate the variables of the analytical base table (ABT).

Note: For a few purposes such as Customer Acquisition, certain subset criteria are predefined and are not displayed in the SAS Customer Analytics for Communications interface. These are the mandatory subset criteria (also called implicit subset criterion) that must be applied to derive the target population. For more details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

In SAS Customer Analytics for Communications, you can define only one subset criterion for each project. However, a subset criterion is optional. For example, if you want to use the entire population of a particular subject of analysis and subject group, you do not need to define a subset criterion. If you do not want to create a subset criterion for your project, you can directly proceed to define the ABT. For details, see "Define an ABT" on page 55.

Note: A subset criterion is mandatory for an association rules analysis project. That is, you must not proceed with the subsequent tasks on the ABT and Models pages unless you define the subset criterion for the project.

About Subset Maps

You apply the subset criterion on a subset map. A subset map is a group of tables that contain inter-related data about a particular subject of analysis. Defining a subset map is an administrative task. For details about how to define a subset map, see *SAS Customer Analytics for Communications: Administrator's Guide*.

A subset map is defined for a particular subject of analysis. For example, the subjects of analyses for a communications service provider (CSP) can be customers and subscriptions. Thus, your administrator can define subset maps for customers and subscriptions. For example, at the customer level, a subset map for all customers who have an active status can be defined. Further, you might want your target population to contain customers who belong to a certain age group. In this case, you can create a subset criterion and apply it on this subset map. Similarly, at the subscription-level, a subset map for all subscriptions that have an active status can be defined. On this subset map, you can define a subset criterion to filter subscriptions that are active for more than a certain period.

SAS Customer Analytics for Communications provides a set of predefined subset maps. Each subset map is based on different business attributes that can be considered while selecting the target population. Depending on the purpose for which you will be building the modeling ABT, you can use the appropriate subset map to define the subset criterion. The following table gives information about the predefined subset maps.

Table 6.1 *Predefined Subset Maps*

Subset Map	Purpose
All Prospects	Enables you to select only prospective customers in your target population. You must use this subset map when you want to build an analytical model for customer acquisition.
Customer Offer Selection Postpaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of postpaid customers with reference to agreement dates of offers. In addition, after you choose this subset map, you can define filter conditions based on various offer-level and customer-level attributes. The target population contains customers who satisfy the subset criteria. Therefore, the ABT would contain records of postpaid customers for the offers that they signed up for at different points of time.

Subset Map	Purpose
Customer Offer Selection Prepaid	Enables you to create the modeling ABT for association rules analysis. You should select this subset map to analyze behavior of prepaid customers with reference to agreement dates of offers. In addition, after you choose this subset map, you can define filter conditions based on various offer-level and customer-level attributes. The target population contains the customers who satisfy the subset criteria. Therefore, the ABT would contain records of prepaid customers for the offers that they signed up for at different points of time.
Customer Service Selection	Enables you to create the modeling ABT for association rules analysis for postpaid or prepaid customers. You should select this subset map to analyze behavior of postpaid or prepaid customers with reference to the first activation of services. In addition, after you choose this subset map, you can define filter conditions that are based on various service-level and customer-level attributes. The target population contains the subscriptions that satisfy the subset criteria. Therefore, the ABT would contain records of postpaid or prepaid customers for the services that are activated by these customers at different points of time.
Subscription Service Selection	Enables you to create the modeling ABT for association rules analysis for postpaid or prepaid subscriptions. You should select this subset map to analyze behavior of postpaid or prepaid subscriptions with reference to the first activation of services. In addition, after you choose this subset map, you can define filter conditions that are based on various service-level and subscription-level attributes. The target population contains the subscriptions that satisfy the subset criteria. Therefore, the ABT would contain records of postpaid or prepaid subscriptions for the services that are activated by these customers at different points of time.
Rule-Based Customer Selection	Enables you to select customer population based on output of association rules analysis, which is rules. You should select this subset map to create a cross-sell or an up-sell model that is based on the association rules analysis models that you have created. In addition, after you choose this subset map, you can create filters based on various attributes of rules such as rule text, rule unit type (left hand or right hand of rule), and the ID values of services or offers, which are part of the rule.
Rule-Based Subscription Selection	Enables you to select subscription population based on output of association rules analysis, which is rules. You should select this subset map to create a cross-sell or an up-sell model that is based on the association rules analysis models that you have created. In addition, after you choose this subset map, you can create filters based on various attributes of rules such as rule text, rule unit type (left hand or right hand of rule), and the ID values of services or offers, which are part of the rule.

Subset Map	Purpose
TV Customers or Subscriptions and Services or Offers	Enables you to create the modeling ABT for any of the TV-related purposes. You should select this subset map to analyze behavior of TV customers or TV subscriptions. For churn, segmentation, cross-sell, and up-sell purposes, this subset map extracts data at customer or subscription level. If you want to build ABT for association rules analysis for customers or subscriptions for service-related transactions, this subset map extracts data with reference to activation date of services. However, if you want to build ABT for association rules analysis for customers or subscriptions for offer-related transactions, this subset map extracts data with reference to start date of offers. In addition, when you choose this subset map, you can define filter conditions that are based on various service-level, offer-level, subscription-level, and customer-level attributes. The target population contains TV subscriptions or TV customers that satisfy the subset criteria.
TV Customers or Subscriptions and Telecast Items	Enables you to create the modeling ABT for association rules analysis for various telecast items . You should select this subset map to analyze behavior of TV subscriptions with reference to the order date for telecast items. In addition, after you choose this subset map, you can define filter conditions based on various channel-level and subscription-level attributes. If you want to analyze telecast items of specific types such as pay per view (PPV) or view on demand (VOD), then you should manually enter these filter conditions while creating the subsets by using the SAS Customer Analytics for Communications interface. The target population contains the subscriptions that satisfy the subset criteria. Therefore, the ABT would contain records of TV subscriptions for the telecast items that are purchased by these subscriptions at different points of time.
Subscriptions or Customers Level Selection	Enables you to select customers or subscriptions with specific attributes. For example, you might want the target population to contain customers who have only mobile subscriptions. To do so, when you define a subset criterion, select this subset map. When you define the filter condition, select the **Subscription Type** variable, = (equal to) as the operator, and **Postpaid Mobile** as the value of the variable. *Note:* You have to configure the dimensional attribute values such as Prepaid Mobile and Postpaid Mobile for the **Subscription Type** column of the Subscription Dimension table. For details, see “Overview of Dimensional Attributes” on page 169.
Customers with Active Status	Selects customers whose status is active. *Note:* This subset map is used internally. Therefore, make sure that you do not select this subset map when you define a subset criterion for a project that you have created.

Subset Map	Purpose
Subscriptions with Active Status	Selects subscriptions whose status is active. *Note:* This subset map is used internally. Therefore, make sure that you do not select this subset map when you define a subset criterion for a project that you have created.
Customers or Subscription for BG	Selects customers or subscriptions that belong to a specific business group (BG). You can use this subset map if you have installed SAS Offer Optimization for Communications along with SAS Customer Analytics for Communications.

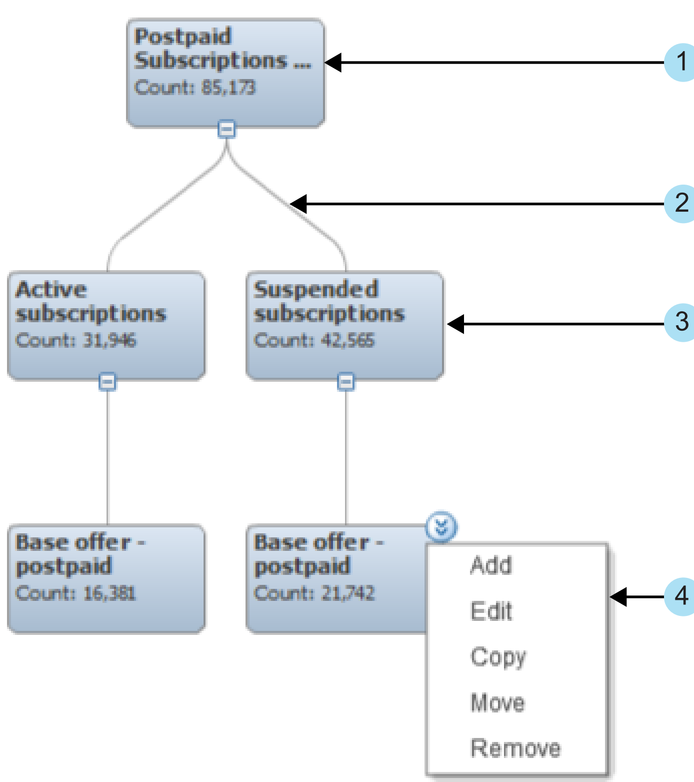
For a project, you have to select the correct combinations of purpose, subject of analysis, subject group, and subset map. For details, see "Purpose-Specific Predefined Implicit Subset Criteria" on page 177.

How Is a Subset Criterion Represented?

About Subset Criterion Representation

A subset criterion is represented as a hierarchical list, which progresses from top to bottom. A hierarchical list contains one or more levels of information. Each level is displayed as a node, also called a filter definition. A filter definition enables you to define specific business rules (also called filter conditions) to derive the target population. The hierarchical structure indicates the relationships between the nodes.

Figure 6.1 *Structure of a Hierarchical List*



1 Primary node

2 Branch

3 Child node

4 Pop-up menu

Structure of a Hierarchical List

The first level of a hierarchical list contains a single node, which is called the primary node. This node is created based on the subset map that you select for the subset criterion. Any subsequent level of the list is called a child level. At each child level, there can be one or more nodes, which are called child nodes. Each child node originates from a single parent node, which can also be a child node at the previous level. The lines that originate from the primary node and connect the child nodes are called branches. Each branch can connect one or more child nodes. A pop-up menu that is available for each node enables you to add, edit, or remove child nodes. It also enables you to copy or move nodes. For details, see “Working with Hierarchical Lists” on page 46.

Example: Subset Criterion

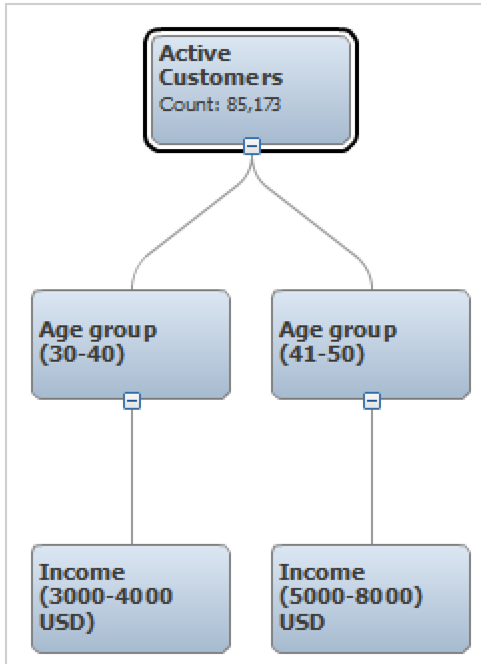
You have created a project, which has **Customer Lifetime Postpaid** as its purpose. For this project, you want to define the target population as customers who have an active status and satisfy any one of the following conditions:

Condition 1
: All customers in the age group of 20–30 years whose monthly income is greater than 3000 USD.

Condition 2
: All customers in the age group of 31–50 years whose monthly income is greater than 5000 USD.

In this case, when you define a subset criterion, you can choose the subset map that is defined for active customers. You can then define the filter conditions as illustrated in the diagram below.

Display 6.1 *Subset Criterion Definition*



Define a Subset Criterion

Overview

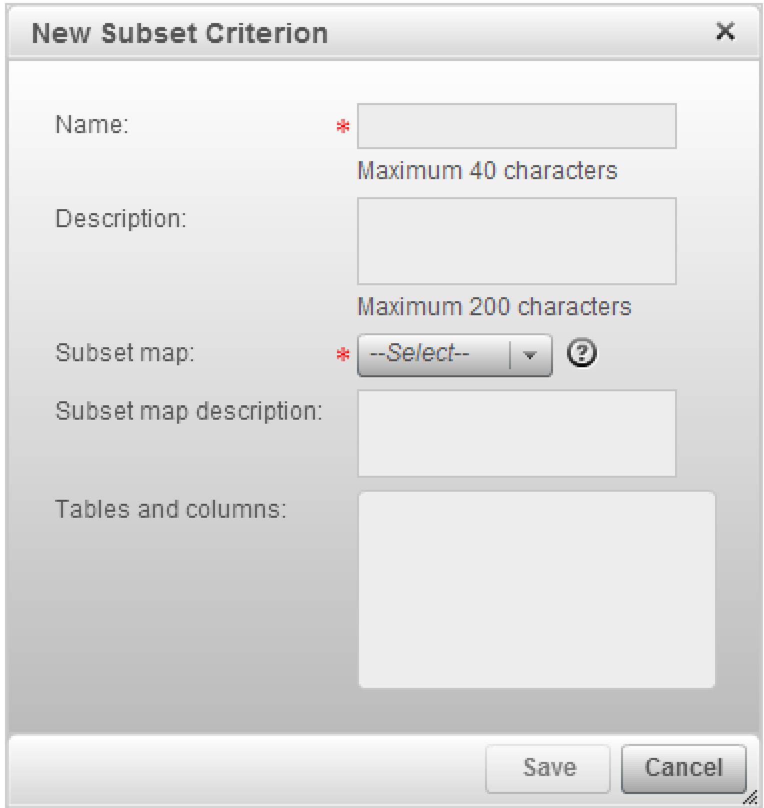
To define a subset criterion, first define the primary node of the hierarchical list. The primary node represents the entire population in a subset map. You can then add filter definitions (child nodes) to the primary node to derive the target population.

Define the Primary Node

To define the primary node of a subset criterion, complete these steps:

1. In the Projects workspace, double-click the project for which you want to define the subset criterion.
2. Select the Selection Criterion page.
3. On the toolbar, click . Alternatively, on the toolbar, click **Menu** ⇨ **New**. The New Subset Criterion window appears.

Display 6.2 *New Subset Criterion Window*



4. In the **Name** field, enter a name of the subset criterion.

5. In the **Description** field, enter a description of the subset criterion.

6. From the **Subset map** list, select the subset map that defines the population of your interest. If the subset map that you need is not available in the list, contact your administrator.

   TIP After you select a subset map, you can check the **Subset map description** and **Tables and columns** fields to make sure that you have selected the right subset map. The **Tables and columns** field shows the tables and columns that constitute the subset map. While creating child nodes, you can apply filters on these columns.

7. Click **Save**. The New Subset Criterion window closes, and the primary node of the subset criterion is displayed in the Subset Criterion window.

   The name of the primary node is same as the subset map that you choose. You can rename the primary node according to your requirement. For details, see “Rename the Primary Node” on page 47.

8. (Optional) Click **Show Count**. The root node shows the number of subjects of analysis that fulfill the following conditions as of the system date and time:

   - implicit filter criteria
   - filter conditions in the subject group of the project

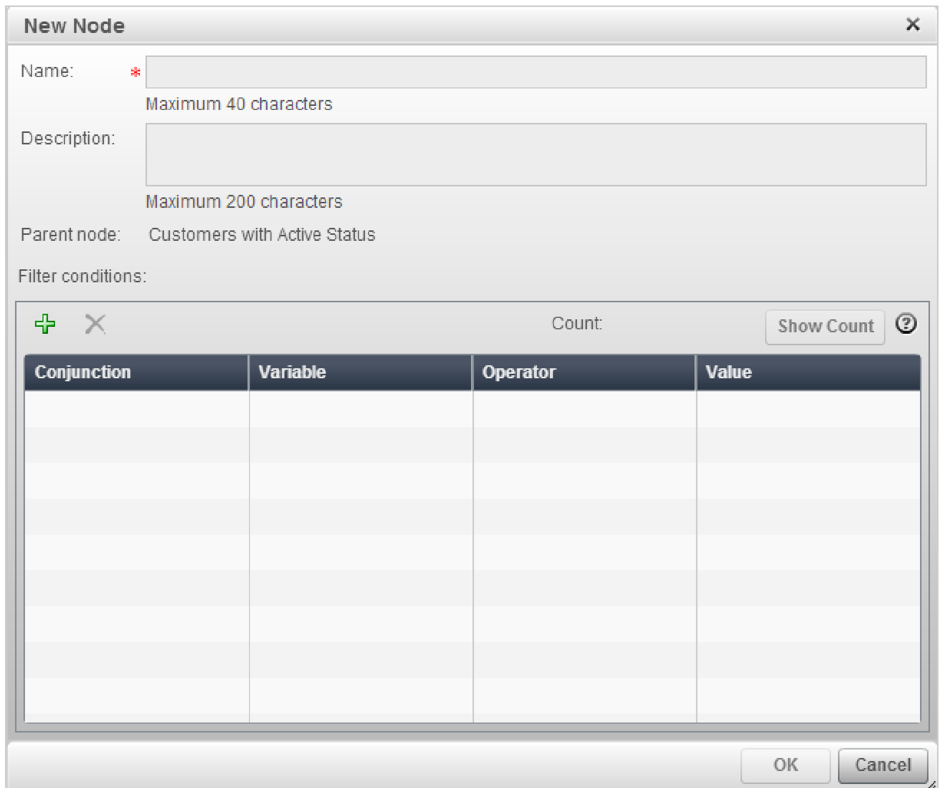
   For details, see “Purpose-Specific Predefined Implicit Subset Criteria” on page 177.

Add a Child Node

To add a child node to the primary node of a subset criterion, complete these steps:

1. Point to the primary node, click , and then select **Add**. The Add Node window appears.

Display 6.3 *New Node Window*



2. In the **Name** field, enter a name for the filter. The name that you enter here is assigned as the node name in the hierarchical list. Make sure that you enter a meaningful name so that you can easily identify the filter definition.

   TIP The node in the hierarchical list from which this node originates is displayed as the **Parent node**.

3. In the **Description** field, enter a description for the filter.

4. Use the **Filter definition** table to define the filter conditions. The filter conditions filter records of your subject of analysis from the previous level (parent node) of the filter definition. Each row of the table represents a filter condition.

   a. Click to add a row in the table.

   b. In the **Variable** column, click . The Select Variable window appears.

      Select a variable from the list of variables and then click **OK**. The list contains all the variables (columns) that are available in the subset map that you selected for the subset criterion.

      TIP You can use the search feature to filter the list of variables. You can search either by variable name or by data source name. The variables or data sources that contain the text that you enter appear in the list.

c. Click in the **Operator** column, and then select the required operator from the list of operators. The operators in the list differ depending on which type of variable you select.

***Table 6.2** Variable Types and Available Operators*

Variable Type	Available Operators
Character	• = (equal to) • <> (not equal to) • IN • NOT IN
Numeric	• = (equal to) • <> (not equal to) • <= (less than or equal to) • >= (greater than or equal to) • < (less than) • > (greater than)
Date	• = (equal to) • <> (not equal to) • <= (less than or equal to) • >= (greater than or equal to)

d. In the **Value** column, click .

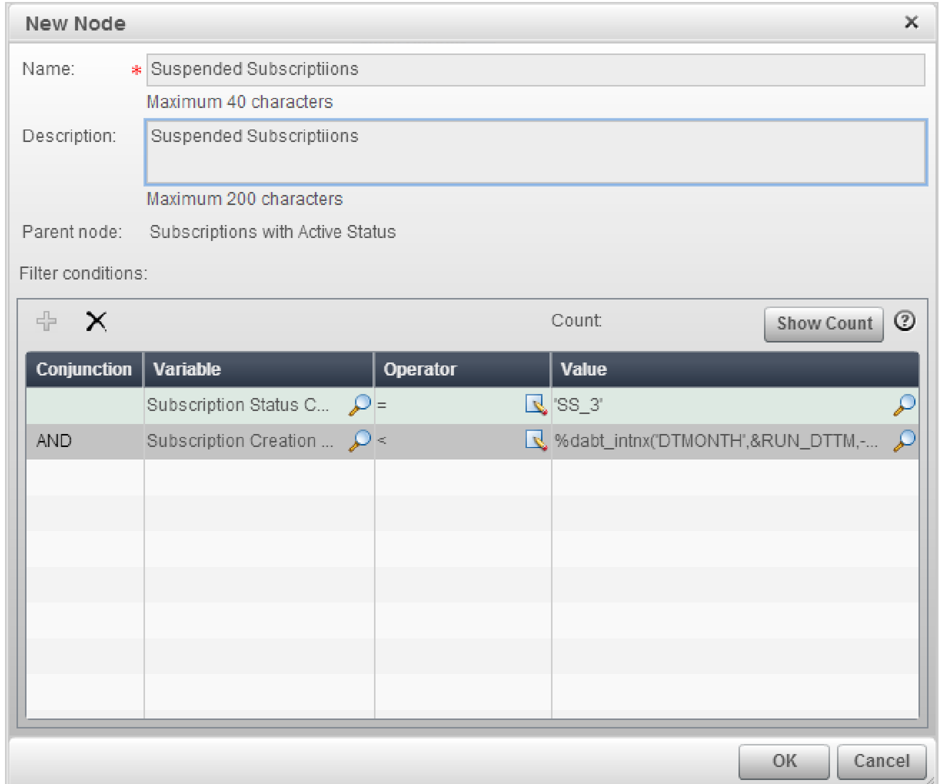
- For a character or numeric variable, the Specify Value window appears. Specify the appropriate value for the variable. For details, see "Working in the Specify Value Window" on page 43.
- For a date variable, the Specify Date window appears. Specify the appropriate date expression for the variable. For details, see "Working in the Specify Date Window" on page 45.

e. (Optional) If you want to add another filter condition, to add another row. From the **Conjunction** column, select an appropriate operator (**AND** or **OR**). Then, repeat steps from 4b to 4d.

TIP Select **AND** if you want the members in the target population to satisfy both the filter conditions. Otherwise, select **OR**.

Note: You can define a maximum of two filter conditions.

Display 6.4 *Child Node Filter Conditions*



T I P At each stage of defining a filter, you can verify the number of records of the subject of analysis that satisfy the following as of the system date and time. To do so, click **Show Count**.

- implicit filter criteria
- filter conditions in the subject group of the project
- filter conditions defined so far in the child node, including the filter conditions in all of the higher-level nodes on the same branch

For details about implicit filter criteria, see "Purpose-Specific Predefined Implicit Subset Criteria" on page 177.

5. Click **OK**. The filter definition is added as a child node of the primary node.
6. On the toolbar, click to save the changes.
7. (Optional) To add more filter definitions, select the primary node or the child node and repeat steps from 2 to 7.

Working in the Specify Value Window

In the Specify Value window, you can either select a value from the list or enter a value in the **Value** field.

Display 6.5 *Specify Value Window*

The Specify Value window shows values for a variable if your administrator has configured the dimensional attribute values for that variable. For details, see "Add Dimensional Attribute Values" on page 171.

Select a value from the list. You can select multiple values if you selected the **IN** or **NOT IN** operator.

If no dimensional attribute values are configured for the variable, you need to enter a value in the **Value** field. The value, exactly as you enter it, is used in the filter condition to identify your target population. Therefore, you must ensure the syntactical accuracy of the value. Follow these guidelines:

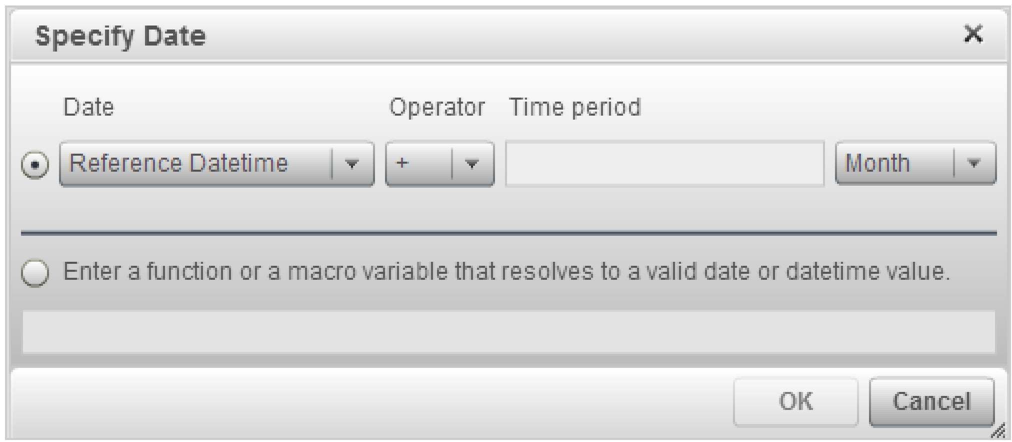
- For a numeric variable, you must enter a number in the field.
- For a character variable, you must enter a character or a text string in the field. You must enclose the character or the text string within single quotation marks. 'Y', 'ACTIVE', and 'Wilkes-Barre' are examples of valid character and text strings.

  If a text string contains an apostrophe, you must enclose the text string within double quotation marks. For example, "Coeur d'Alene" is a valid text string.
- You can enter multiple values only if you are using the **IN** or **NOT IN** operator. You must separate each value with a comma. For example, you can enter 'ACTIVE', 'INACTIVE' or 25, 50, 100.
- The values that you enter are case sensitive. You must enter the values in the same case in which they are present in the data source. For example, you want to specify values for the SUBSCRIPTION_STATUS variable. Let us assume that these values are configured in the Foundation data mart table as DORMANT and SUSPENDED. In this case, you can enter these values in the **Value** field as **'DORMANT', 'SUSPENDED'**.

Working in the Specify Date Window

In the Specify Date window, you can either select a **Date** or specify a date in the **Other** field. The filter condition returns the records that satisfy the filter condition as of the specified date.

Display 6.6 *Specify Date Window*



Reference Date or Reference Datetime

Note: The **Date** field shows **Reference Date** or **Reference Datetime**, depending on the data type of the variable that you selected in the Select Variable window (in step 4.b on page 41).

This option provides you the flexibility to specify a date before or after from the current system date and time. Select a reference date or reference datetime, select an operator, and then specify the number of months, weeks, or days by which you want to go forward or backward from the reference date.

When you click **Show Count**, **Date** (Reference Datetime or Reference Date) resolves to current system date. However, when you build your ABT, **Reference Datetime** or **Reference Date** automatically resolves to the specified ABT build date.

For example, you specify a filter condition similar to the following:

SUBSCRP_ACTIVATION_DT = Reference Datetime - 8 months

When you click **Show Count**, the filter returns all customers who activated their subscriptions on a date that is eight months before the system date. However, when you build your ABT, the ABT is populated with customers who activated their subscriptions on a date that is eight months before the ABT build date. Therefore, the number of customers that is displayed when you click **Show Count** and the number of customer records in the modeling ABT might not be the same.

For example, consider that the current system datetime when you define the filter is **May 15, 2011**. When you click the **Show Count** button, the filter condition will return the number of customers who activated their subscriptions before **September 15, 2010**.

Now, consider that when you build your ABT, you specify **April 30, 2010** as the ABT build date. After the ABT building process is complete, the ABT will contain records for customers who activated their subscriptions before **August 30, 2009**.

Function or macro variable

In this field, you can enter an expression, including functions or macro variables, that resolves to a valid date or datetime value depending on the data type of the variable that you selected in the Select Variable window (in step 4.b on page 41).

Here are a few examples of valid expressions (for the en_US English locale):

- intnx('dtday', DATETIME(), 0, 'SAME')

  resolves to the current system date and time.

- intnx('dtmonth', DATETIME(), -5, 'SAME')

  resolves to a date that falls five months before the current system date.

- intnx('dtyear', DATETIME(), -2, 'END')

  resolves to the last day of the year of the date that falls two years before the current system date.

- intnx('dtday', '23:AUG:2010:23:59:59'dt, 0, 'SAME')

  resolves to a constant datetime value of '23:AUG:2010:23:59:59'.

- intck('DAY', Date 1, Date 2)

  returns the difference between Date 1 and Date 2 in days.

If you are using Teradata, it is recommended that you use SAS/ACCESS functions that support implicit pass-through. These functions support in-database processing of date-related operations. In other words, these functions process the date-related operations in Teradata itself, and thus prevent data movement between Teradata and SAS.

For a list of SAS/ACCESS functions that support implicit pass-through, see "SAS/ACCESS Interface to Teradata" in SAS/ACCESS 9.3 for Relational Databases: Reference, which is located at **`http://support.sas.com/documentation/cdl/en/acreldb/65247/PDF/default/acreldb.pdf`**.

Certain commonly used date functions (for example, intck and intnx) do not support implicit pass-through. To perform these date operations in-database, your administrator creates certain user-defined functions while configuring SAS Customer Analytics for Communications. These functions are designed for in-database processing of the date-related operations. Here is a list of those functions with examples of valid expressions:

- %dabt_intnx('dtday', DATETIME(), 0, 'SAME')
- %dabt_intnx('dtmonth', DATETIME(), -5, 'SAME')
- %dabt_intnx('dtyear', DATETIME(), -2, 'END')
- %dabt_intnx('dtday', '23:AUG:2010:23:59:59'dt, 0, 'SAME')
- %dabt_intck('DAY', Date 1, Date 2)

For details about user-defined functions for Teradata, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Working with Hierarchical Lists

Overview of the Pop-up Menu

The pop-up menu that is available at each node of the hierarchical list enables you to manage the subset criterion that you define.

The pop-up menu of the primary node has the following options:

Add
: enables you to add a node to the primary node. For details, see "Define the Primary Node" on page 39.

Rename
: enables you to rename the primary node. For details, see "Rename the Primary Node" on page 47.

The pop-up menu of a child node has the following options:

Add
: enables you to add a new node to the child node. The steps for adding a node to a child node are similar to the steps for adding a node to the primary node. For details, see "Add a Child Node" on page 41.

Edit
: enables you to modify the name, description, and filter conditions of the child node. For details, see "Edit a Child Node" on page 47.

Copy
: enables you to create a copy of a child node in the same hierarchical list. For details, see "Create a Copy of a Child Node" on page 48.

Move
: enables you to move a child node below another node in the same hierarchical list. For details, see "Move a Child Node to Another Location" on page 49.

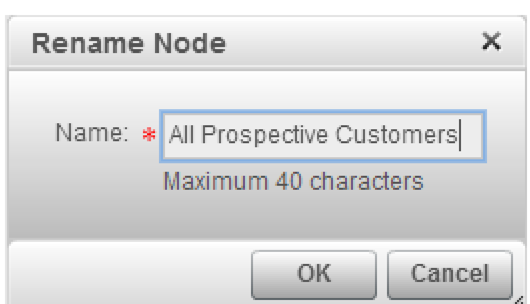
Remove
: enables you to remove the child node from the hierarchical list. For details, see "Remove a Child Node from a Hierarchical List" on page 50.

Rename the Primary Node

The primary node is the topmost node in a hierarchical list. To change the name of the primary node, complete these steps:

1. Point to the node, click , and then select **Rename**. The Rename window appears.

   Display 6.7 *Rename Node Window*

2. In the **Name** field, enter a new name for the node, and then click **OK**.

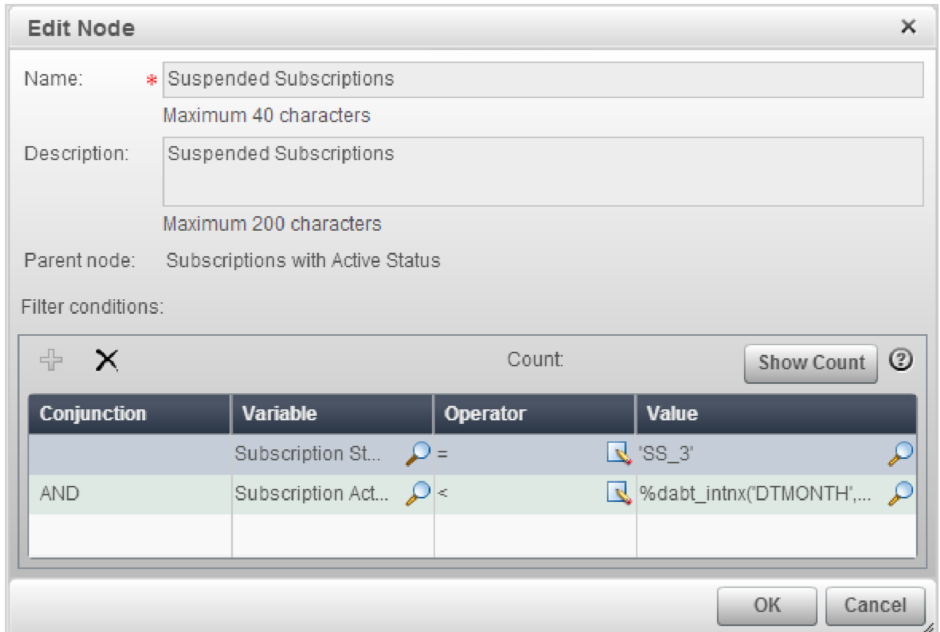
Edit a Child Node

You can change the name and description of a child node. You can also change the filter definition that the node represents.

To edit a child node, complete these steps:

1. Point to the child node, click , and then select **Edit**. The Edit Filter window appears.

Display 6.8 *Edit Node Window*



2. Change the name, description, and filter conditions as required.
3. Click **OK**.

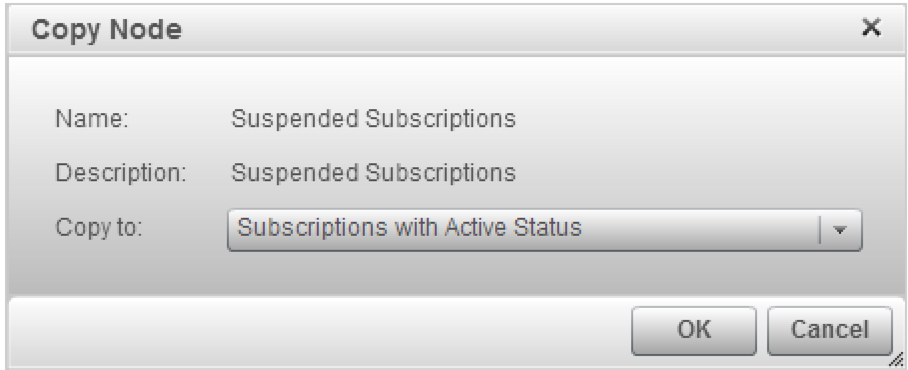
Create a Copy of a Child Node

The **Copy** option enables you to duplicate a filter definition that you have already defined as a child node. You can copy a child node and create another node, which can be above or below the current level or at the same level. However, you cannot copy a node to create another node as one of its child nodes. When you copy a node that has child nodes, all the child nodes are also copied.

To copy a child node, complete these steps:

1. Point to the child node, click , and then select **Copy**. The Copy Node window appears.

Display 6.9 *Copy Node Window*



2. From the **Copy to** filter list, select the node below which you want to copy the current node. This list displays the node names below which you can copy the current filter. In other words, you have to select the parent node below which you want to copy the current filter. You can copy a filter below another node that is not its child node.
3. Click **OK**.

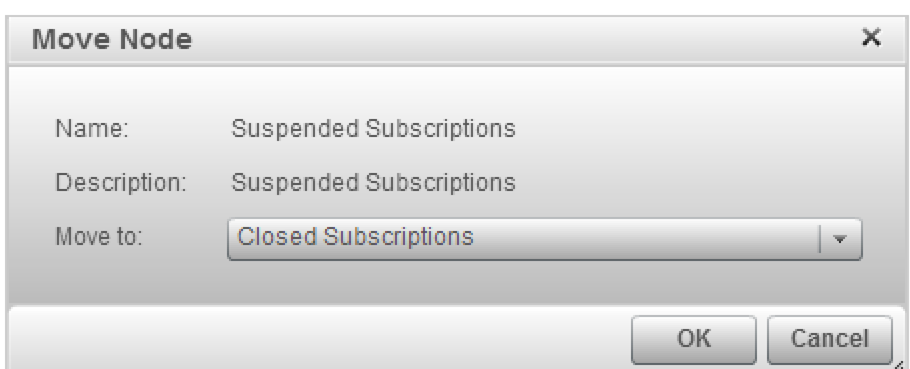
Move a Child Node to Another Location

The **Move** option enables you to restructure your hierarchical list. You can move a child node to another location, which is above or below the current level or at the same level. However, you cannot move a node to a location that is the same as that of its child node or parent node. When you move a node that has child nodes, all the child nodes are also moved.

To move a child node, complete these steps:

1. Point to the child node, click , and then select **Move**. The Move Node window appears.

Display 6.10 *Move Node Window*



2. From the **Move to** filter list, select the node below which you want to move the current node. This list displays the node names below which you can move the current filter. In other words, you have to select the parent node below which you want to move the current filter. You can move a filter below another node that is not its child node or immediate parent node.
3. Click **OK**.

Remove a Child Node from a Hierarchical List

When you remove a node from a hierarchical list, all its child nodes are also removed. However, removing a node from a hierarchical list does not permanently delete the node unless you save the changes. For example, if you remove a node (and you have not yet saved the changes), you can use the **Revert** option to undo the Delete operation. However, after you save the changes, the undo operation is not possible.

To remove a child node from a hierarchical list, complete these steps:

1. Point to the child node, click , and then select **Remove**.
2. In the confirmation message box that appears, click **Yes**.

Edit a Subset Criterion

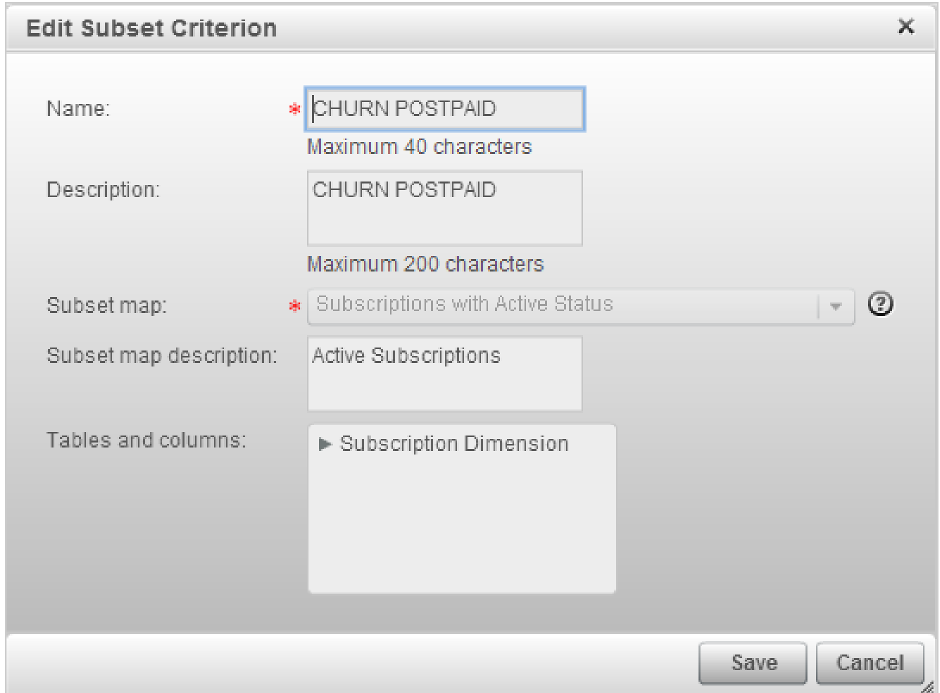
You can change the name and description of a subset criterion. However, you cannot change the underlying subset map. If you want a subset criterion with a different subset map, you must delete the subset criterion that you have defined, and then create a new one.

You can edit the filter definitions of a subset criterion as and when you want to change. However, if you edit the filter definitions, after the ABT or an analytical model is built, you have to build the ABT and the analytical model again.

To edit a subset criterion, complete these steps:

1. Select the **Subset Criterion** page.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Edit**. The Edit Subset Criterion window appears.

***Display 6.11** Edit Node Window*



3. Change the name and description of the subset criterion as required.
4. Click **Save** to save the changes.
5. In the hierarchical list, you can modify the filter definitions. For details, see "Edit a Child Node" on page 47.

Undo the Changes Made to a Subset Criterion

You can undo all the unsaved changes that you have made to a subset criterion. For example, if you edit a node and change the filter conditions, you can use the **Revert** option to retain the original filter conditions. To undo the changes made to a subset criterion, click the **Menu** button, and then select **Revert**.

Note: If there are no unsaved changes, the **Revert** option appears dimmed, indicating that it is unavailable.

Delete a Subset Criterion

When you delete a subset criterion, the hierarchical list representing the subset criterion is deleted. After you delete a subset criterion, the Delete operation cannot be undone. Therefore, before deleting a subset criterion, make sure that you have selected the right project.

You can delete the subset criterion of a project for which a modeling ABT or an analytical model is built. However, in this case, you have to build the ABT and the analytical model again.

To delete a subset criterion, complete these steps:

1. Select the Subset Criterion page.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Delete**.
3. In the confirmation message box that appears, click **Yes**.

Chapter 7

Managing Analytical Base Tables

About Analytical Base Tables

After you define your business problem and the target population, you can proceed with the modeling process. This process typically begins with defining modeling analytical base tables (ABTs). A modeling ABT (simply called ABT in this document) is a flat table that is used as an input for building analytical models. An ABT contains all the variables that are required for your analysis. It is built at the level of subject of analysis that you have selected for your project. An ABT contains records of the target population that you have defined based on the subject group, subset map, and subset criterion. A single record in this table represents the subject of analysis (for example, customer or subscription) and stores all data (variables) describing this subject. These variables are called ABT variables. The ABT variables that you define differ depending on the underlying business problem.

Process Flow for Building an ABT

The SAS Customer Analytics for Communications interface enables you to complete the end-to-end tasks that are required to define, build, and register an ABT. As a result, you can dynamically build the ABT, register it, and seamlessly use it as an input to build the analytical model in SAS Enterprise Miner.

The following tasks are included in the process flow of building an ABT:

1. Define an ABT. For details, see “Define an ABT” on page 55.
2. Create variables (columns) for the ABT. For details, see “Creating ABT Variables” on page 60.
3. (Optional) Define an outcome variable, if applicable for the purpose for which you are building the ABT. For details, see “Defining an Outcome Variable” on page 109.
4. Build the ABT. For details, see “Build an ABT” on page 117.

   Note: Optionally, you can deploy an ABT so that your administrator can build it later. For details, see “Deploying a Modeling ABT” on page 110.
5. (Optional) Share an ABT. For details, see “Share ABT” on page 108.
6. Register the ABT with the SAS Metadata Server. For details, see “Register an ABT with the SAS Metadata Server” on page 121.

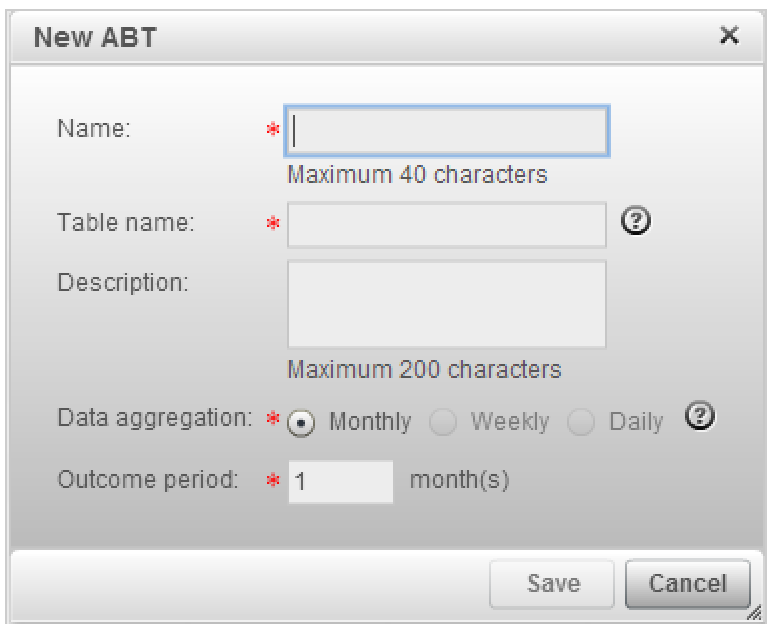
Define an ABT

SAS Customer Analytics for Communications enables you to define one ABT per project.

To define an ABT, complete these steps:

1. In the Projects workspace, double-click the project for which you want to define the ABT.
2. Select the Analytical Base Table page.
3. On the toolbar, click , and then select **New ABT**. Alternatively, on the toolbar, select **Menu** ⇨ **New** ⇨ **ABT**. The New ABT window appears.

   Display 7.1 *New ABT Window*

4. Enter the following information for the ABT:

   Note: When you define an ABT, you must select the correct combinations of purpose, subject of analysis, time grain, and outcome period. For details, see "Purpose-Specific Predefined Values for Outcome Period" on page 186.

   Name
   Enter a name of the modeling ABT. The modeling ABT is identified with this name across the SAS Customer Analytics for Communications interface.

   Table name
   Enter a name with which the ABT is to be created and stored in the database. When you register the ABT with the SAS Metadata Server, it is registered with the same name. The name must be a valid table name.

   Description
   Enter a brief description of the ABT.

Data aggregation

Depending on whether you want to store monthly aggregated data, weekly aggregated data, or daily aggregated data in the ABT, select the **Monthly**, **Weekly**, or **Daily** option. The option that you choose defines the time grain of the ABT. This option also restricts the tables (data sources) and the time periods that will be available to you when you define behavioral variables for your ABT. For example, if you select **Monthly**, the data sources that can be aggregated at the monthly level will be available to you for defining behavioral variables for the ABT. However, if you select **Daily**, the data sources that can be aggregated at the daily level will be available to you.

Note: The option will be available for your selection, depending on how your administrator has configured these options for each purpose. For example, for the Churn Prepaid purpose, your administrator might configure the **Weekly** option. In this case, only the **Weekly** option would be available for your selection. For more information, see *SAS Customer Analytics for Communications: Administrator's Guide*.

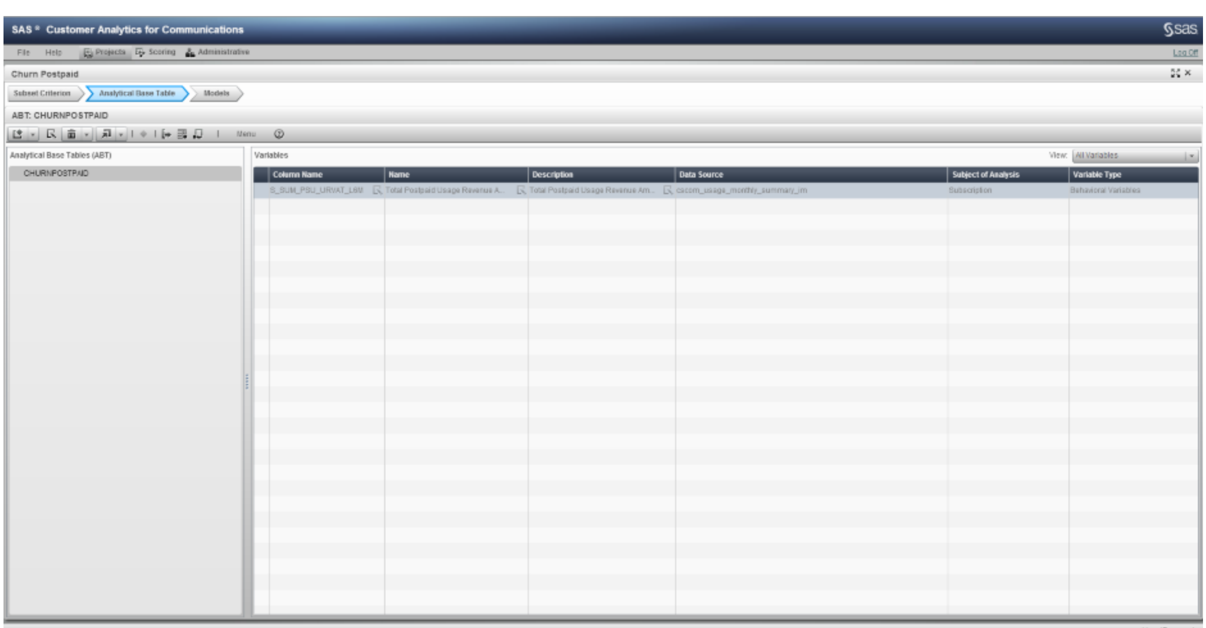
Outcome period

Specify the time period for which you want to observe (after the ABT build date) the particular event of interest. The values for the outcome variable are computed for the period between the ABT build date and the date that is computed by adding the number of days, weeks, or months specified in this field to the ABT build date. The time period that you specify is in months, weeks, or days depending on the option that you choose for the **Data aggregation** field. The value for an outcome variable is calculated with reference to the last day of the outcome period. For details, see "Overview of an Outcome Variable" on page 109.

Note: This field is not applicable to all types of models. For example, for a segmentation model, the outcome period is not applicable. However, if you are defining a customer churn model, then you must define the outcome period.

5. Click **Save**. The ABT name appears in the left pane of the Analytical Base Table page.

***Display 7.2** Analytical Base Table Page*



Note: Depending on the purpose for which you are creating the ABT, after you create the ABT, certain variables (also called implicit variables) that appear dimmed are available in the Variables list. These are mandatory and predefined variables. You cannot delete these variables. For more information, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Edit an ABT

You can edit an ABT of a project that you own. You can change the name, description, and the outcome period of an ABT.

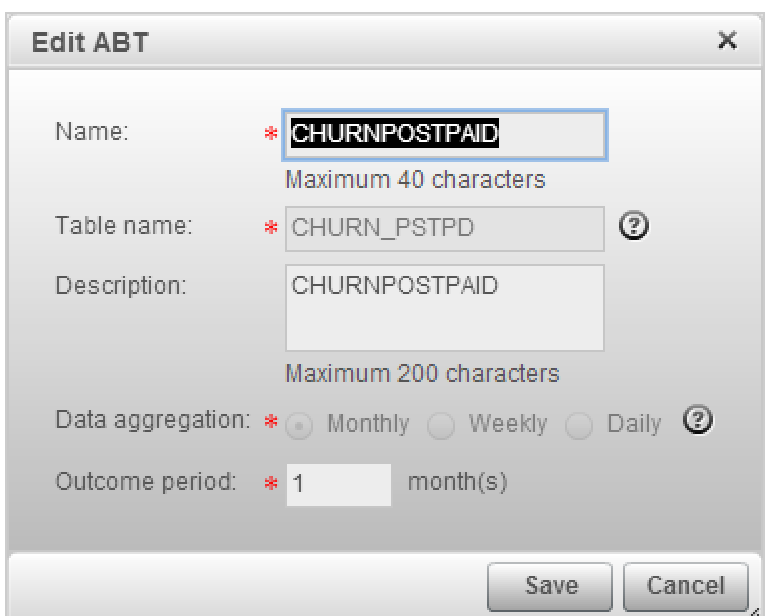
Note:

- If you have built an ABT, and then change the outcome period, you have to build the ABT again.
- If you want to change grain of analysis (daily, weekly, or monthly) of an ABT, you have to delete the ABT and define it again.

To edit an ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that is displayed in the table.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Edit ABT**. The Edit ABT window appears.

Display 7.3 *Edit ABT Window*



3. Change the name, description, and outcome period of the ABT as required.
4. Click **Save**.

Delete an ABT

When you delete an ABT, all its ABT variables will also be deleted.

To delete an ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that you want to delete.
2. On the toolbar, click , and then select **Delete ABT**. Alternatively, on the toolbar, select **Menu** ⇨ **Delete** ⇨ **ABT**.

About ABT Variables

An ABT variable is a column in an ABT. SAS Customer Analytics for Communications provides you the framework to dynamically create ABT variables at run time. You do not have to create and maintain a huge list of variables in advance. You can create only as many variables as you need, and you can create them only when you need them—that is, when you are working on your project.

SAS Customer Analytics for Communications enables you to create the following types of ABT variables. The variables are categorized on the basis of how they are derived and what type of information they store.

Basic variables
These variables are further categorized as:

Table 7.1 *Basic Variables*

Type	**Description**
Behavioral	A variable that stores aggregated information about a customer's behavior over a period of time. For example, you can define a behavioral variable to compute the total number of outbound voice calls of a customer in the past three months.
Time-Based	A variable that stores information about the last occurrence of a given activity in a defined time period. For example, you can define a time-based variable to determine the channel type of the last interaction of a customer during a period from June 01, 2011, to December 31, 2011.
Direct	A variable that stores information as of a particular date. The marital status of a customer three months back or monthly income of a customer six months back are examples of direct variables.

Derived
: a variable that you can derive from existing ABT variables, with the help of mathematical or logical operators. Depending on whether a variable is derived using mathematical operators or logical operators, the variable can be categorized as follows:

Table 7.2 *Derived Variables*

Type	**Description**
Arithmetic Derived	A variable that is derived with the help of mathematical operators such as + (addition), – (subtraction), * (multiplication), / (division), and log. For example, you can use behavioral variables to create a derived variable that computes the usage proportion of voice calls. These behavioral variables can be D_CNT_VOC_PSU_CN_L1M (total number of voice calls for postpaid customers in the last month) and D_CNT_VOC_PSU_CN_L12M (total number of voice calls for postpaid customers in the past 12 months). Arithmetic derived variables are further categorized based on the type of expression that you define for these variables. The types of expressions that are available for defining an arithmetic derived variable include: **Based on Numeric Variables**, **Based on Date Difference**, **Based on Date Operations**, and **Based on Prebuilt Formula**.

Logical Derived	A variable that is derived with the help of logical operators such as = (equal to), <> (not equal to), > (greater than), < (less than), AND, OR, IN, and NOT IN. For example, you can create a variable that indicates a churn event if the current status code of a subscription is DEACTIVATED, SUSPENDED, or CLOSED. Therefore, you can define the expression for this variable as follows:
	
	`CHURN = IF LST_SUB_STATUS IN ('DEACTIVATED',`
	
	`'SUSPENDED', 'CLOSED') THEN 1`
	
	`ELSE 0`

Creating ABT Variables

Overview

The procedure to create a variable is the same irrespective of the type of variable that you are defining. This procedure includes the following steps:

1. Select the ABT for which you are defining the variables.
2. Select the type of variable that you want to define.
3. Depending on the type of variable that you want to define, specify appropriate details for the variable.
4. Save your variable definition.

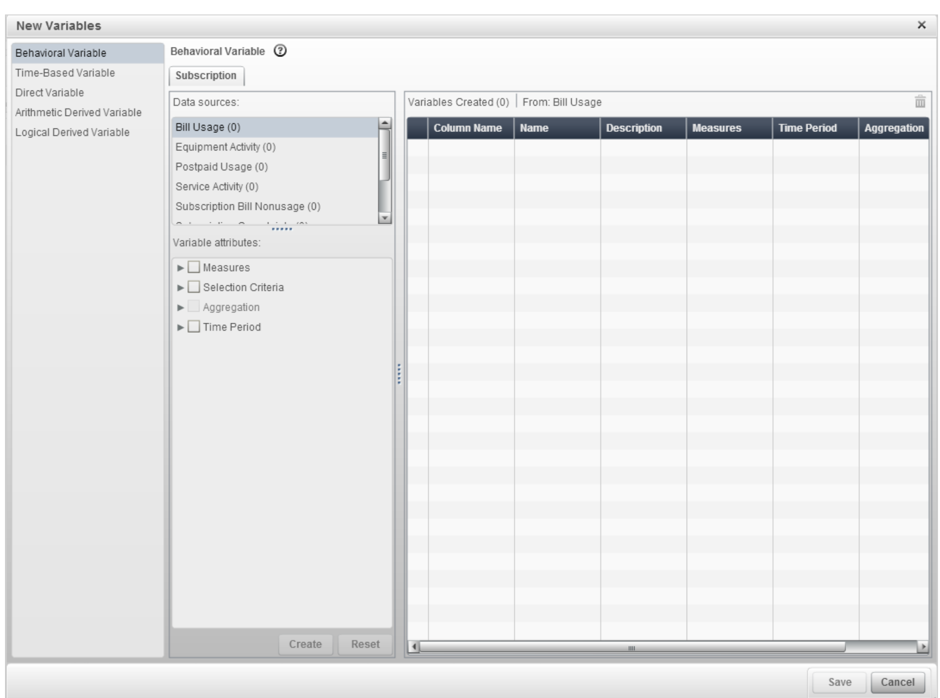
Select the ABT

To define the ABT variables, you have to first select the ABT for which you are defining the variables.

To select the ABT, complete these steps:

1. In the Projects workspace, double-click the project for whose ABT you want to define the variables.
2. On the Analytical Base Table page, select the ABT that is displayed in the left pane.
3. On the toolbar, click and select **ABT Variable**. Alternatively, on the toolbar, select **Menu** ⇨ **New** ⇨ **Variable**. The New Variables window appears.

Display 7.4 *New Variables Window*



Working in the New Variables Window

The New Variables window enables you to define all types of ABT variables. The New Variables window is divided into three panes:

left navigation pane
: enables you to choose the type of variable that you want to define.

central pane
: enables you define the variable attributes. The attributes that you specify for an ABT variable differ depending on the type of variable that you are defining.

right pane
: contains the Variables Created table, which displays the properties of the variables that you have created.

Specifying the Variable Attributes

For basic variables, you have to specify details such as the data source and one or more attributes. The details that you can specify for a basic variable depends on how your administrator has configured the input tables. For details, see Chapter 10 "Configuring the Input Data Sources" on page 155.

Data source
: is the source table or information map from which your ABT variable is created. You have to select the data source from the list. Select the data source depending on the type of information that you want your variables to store.

The **Data source** list shows all of the data sources that are configured for the specified basic variable, and that also meet all of the following criteria:

- The purpose of the data source matches that of the project.
- The subject of analysis of the data source matches that of the project.
- The data aggregation level of the data source matches that of the ABT.

Variable attributes
: enables you to define the type of information the ABT variable stores. Depending on the type of variable, you have to define one or more attributes. These attributes define the rules by which the ABT variables will be created.

Measures
: columns of the selected data source that are configured as measures that can be aggregated while creating behavioral variables. One variable is created for each measure that you select. In other words, an ABT variable contains aggregated information pertaining to the corresponding column of the selected data source.

Note: If you select a measure, you cannot select the **Count** aggregation type. Also, you must select a measure if you select aggregation types other than **Count**. For details, see Table 7.3 on page 62.

Display Columns
: the configured columns of the selected data source. You have to select the columns that you want to use to create your variables. The columns that you select constitute the attributes of your interest about the record. One variable is created for each display column that you select.

Selection Criteria
: enables you to define filters for a behavioral or a time-based variable. The first level of the list shows all those columns of the selected data source that are configured as dimensional attributes and that have values configured.. The second level (when you expand a dimensional attribute) shows all the preconfigured values for the corresponding dimensional attribute. These values are referred to as dimensional attribute values. For details, see "Add Dimensional Attribute Values" on page 171.

A variable can have only one criterion from the set of criteria (dimensional attribute values) available for a particular column (dimensional attribute) of the data source. For example, a variable can have either Service Category Code = Message, Service Category Code = Data, or Service Category Code = Voice as a selection criterion. If you select all three codes, three different variables are created for each type of service. However, a variable can have multiple selection criteria if each of them is based on a different column of the selected data source. For example, you can apply the following subset criteria on a variable: **Service Category Code = Voice** and **Event Direct Code = Outgoing**.

Aggregation
: defines the type of aggregation the behavioral variable computes.

Table 7.3 *Aggregation Types*

Type	Description
Average per time period	Indicates that the variable contains the average (based on number of time periods) of the selected measure, in the specified time period, in the selected data source. The average is computed based on the actual data that is available. For example, a variable (A_AVG_AGR_DUR_L3M) based on the **Duration of Event** measure can contain the average call duration in the past three months for a given customer. That is, this variable computes average call duration for a customer in the past three months. The average is computed based on the data that is available from the **Postpaid Usage** data source for each month as (Total call duration in the past three months)/3.

Type	Description
Average per record	Indicates that the variable contains the average (based on actual records) of the selected measure for all the records in the specified time period, in the selected data source. The average is computed based on the actual data that is available. It is recommended that you choose this method if your data source contains transactional data instead of aggregated data. For example, a variable (A_AVC_AGR_DUR_B3M) based on the **Duration of Event** measure can contain the average call duration in the past three months for a given customer. Let us assume that the data source contains transactional information about 30 outbound calls and 50 inbound calls in the past three months. In this case, the average is calculated for each call as (Total call duration in past three months / 80).
Count	Indicates that the variable contains the count of all the records in the selected data source, regardless of the measure that you have selected. For example, the variable based on the Number of Event measure can contain the count of all voice calls in the **Postpaid Usage** data source in the past three months. *Note:* • If you select the Count aggregation type, you cannot select a measure and other aggregation types. • If you select an aggregation type other than Count, you cannot select the Count aggregation type.
Maximum	Indicates that the variable contains the maximum value of the selected measure for all the records in the selected data source. For example, a variable based on the Number of Event measure can contain the maximum number of voice calls from the **Postpaid Usage** data source in the past three months.
Minimum	Indicates that the variable contains the minimum value of the selected measure for all the records in the selected data source. For example, a variable based on the Number of Event measure can contain the minimum number of voice calls in the **Postpaid Usage** data source in the past six months.

Type	Description
Total	Indicates that the variable contains the sum of the selected measure for all the records in the selected data source. For example, a variable based on the Number of Event measure contains the total number of voice calls in the **Postpaid Usage** data source in the past six months.

Time Period
: preconfigured values for time periods that are available for a behavioral, time-based, and direct variable. These values vary according to the level of the ABT (that is, whether you selected **Monthly**, **Weekly**, or **Daily** for the **Data aggregation** field while defining the ABT). Therefore, time periods are displayed depending on the data aggregation level of your ABT. For details about how to configure the time periods, see *SAS Customer Analytics for Communications: Administrator's Guide*.

For a behavioral variable, the value of the variable is aggregated over the time period that you select. For a time-based variable, the time period indicates the history period that is considered for computing the value for that variable. Similarly, for a direct variable, the time period enables you to populate the value for the date specified by the time period.

Table 7.4 *Examples of Preconfigured Time Periods*

Preconfigured Values	Behavioral Variable	Time-based Variable	Direct Variable
Specific single period • Daily ABT: Base 1 Day, Base 2 Day, and so on. In the variable name, these time periods are abbreviated as B1D, B2D, and so on. • Weekly ABT: Base 1 Week, Base 2 Week, and so on. In the variable name, these time periods are abbreviated as B1W, B2W, and so on. • Monthly ABT: Base 1 Month, Base 2 Month, and so on. In the variable name, these time periods are abbreviated as B1M, B2M, and so on.	You choose **Base 2 Month** as the time period. The ABT variable contains value of the selected measure that is aggregated over the second month before the ABT build date.	You choose **Base 2 Week** as the time period. The ABT variable contains the most recent value that is available in the second week before the ABT build date.	Not applicable

Preconfigured Values	Behavioral Variable	Time-based Variable	Direct Variable
Consecutive periods • Daily ABT: Last 2 Day, Last 3 Day, and so on. In the variable name, these time periods are abbreviated as L2D, L3D, and so on. • Weekly ABT: Last 2 Week, Last 3 Week, and so on. In the variable name, these time periods are abbreviated as L2W, L3W, and so on. • Monthly ABT: Last 2 Month, Last 3 Month, and so on. In the variable name, these time periods are abbreviated as L2M, L3M, and so on.	You choose the **Last 2 Month** time period. The ABT variable contains value of the selected measure that is aggregated over the past two months before the ABT build date.	You choose **Last 2 Month** as the time period. The ABT variable contains the most recent value that is available in the period of past two months before the ABT build date.	Not applicable
As of a particular date • Daily ABT: 1 Day Back, 2 Day Back, and so on. In the variable name, these time periods are abbreviated as 1DB, 2DB, and so on. • Weekly ABT: 1 Week Back, 2 Week Back, and so on. In the variable name, these time periods are abbreviated as 1WB, 2WB, and so on. • Monthly ABT: 1 Month Back, 2 Month Back, and so on. In the variable name, these time periods are abbreviated as 1MB, 2MB, and so on.	Not applicable	Not applicable	You choose 2 Month Back as the time period. The variable contains value as of the date that is two months before the ABT build date.
Range of periods • Daily ABT: Last 2–7 Day, Last 2–5 Day, and so on. • Weekly ABT: Last 2–7 Week, Last 2–5 Week, and so on. • Monthly ABT: Last 2–7 Month, Last 2–5 Month, and so on.	You choose the **Last 2–7 Week** time period. The ABT variable contains value of the selected measure that is aggregated over the period from second week to seventh week before the ABT build date.	You choose **Last 2–7 Month** time period. The ABT variable contains the most recent value that is available in the period from second week to seventh week before the ABT build date.	Not applicable

Preconfigured Values	Behavioral Variable	Time-based Variable	Direct Variable
Latest	Not applicable	Not applicable	Select this time period if you want the ABT variable to contain value as of the ABT build date.
Over entire history	Not applicable	Choose this time period if you want to consider the most recent value in the entire history period.	Not applicable

One variable is created for each time period that you select. In other words, a variable contains information pertaining to a single time period.

Date (order by)
: the date column by which you want to order the records of the selected data source. This rearrangement of records is required when the time-based variable stores the most recent information.

The following table summarizes the variable attributes that you need to specify for each type of basic variable.

Table 7.5 *Rules for Defining ABT Variables*

Attribute Name	Behavioral	Time-Based	Direct
Measures	Mandatory	Not applicable	Not applicable
Display Columns	Not applicable	Mandatory	Mandatory
Selection Criteria	Optional	Optional	Not applicable
Aggregation	Mandatory	Not applicable	Not applicable
Time Period	Mandatory	Mandatory	Mandatory
Date (Order by)	Not applicable	Mandatory	Not applicable

Note: In this document, the data source names, measure names, and variable attribute names are indicative names. Your administrator might configure these objects with different names.

For derived variables, you have to identify the variable with a unique name, select the source variables, and build the expression for the variables. For details, see “Create an Arithmetic Derived Variable” on page 79 and “Create a Logical Derived Variable” on page 97.

Create Behavioral Variables

When you build the ABT, the value for a behavioral variable is calculated as follows:

Note: For ease of understanding, the following query is presented in the form of an SQL statement. The actual code is different.

SELECT <aggregation> (<measure>)

FROM <data source>

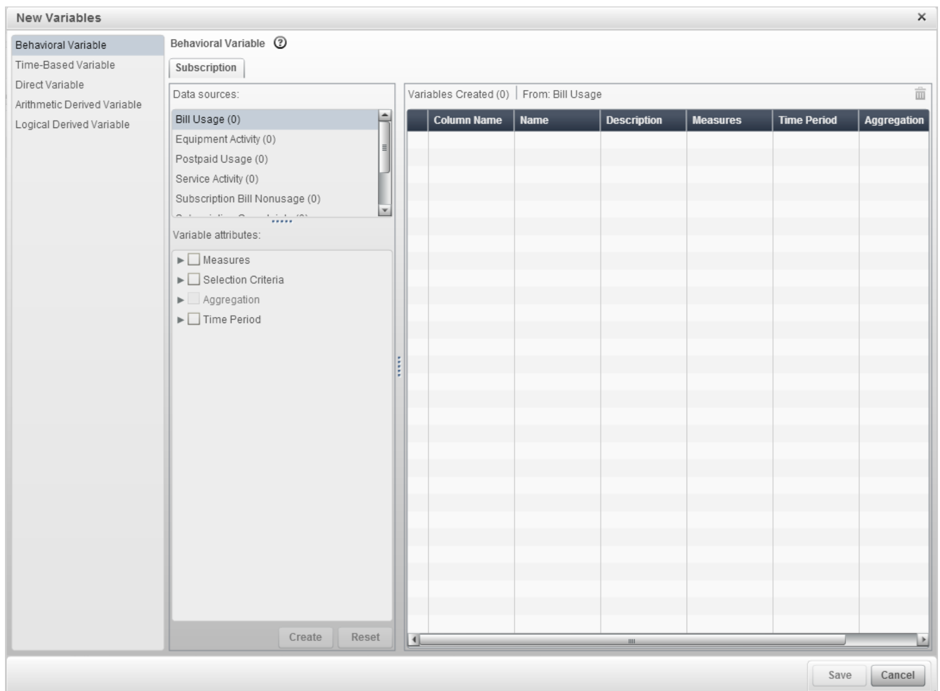
WHERE (<<selection criteria> = <value>>)

AND (<time period> = <value>)

To create behavioral variables, complete these steps:

1. In the New Variables window, click **Behavioral Variable** in the left navigation pane.

Display 7.5 *Behavioral Variable Tab*



2. From the **Data source** list, select a data source. The list of measures and selection criteria is displayed depending on the data source that you select.

3. From the **Variable attributes** list, select the rules by which you want to create the ABT variables.

   Note: You must select at least one measure, one aggregation type, and one time period. A selection criterion is optional.

   a. Click the arrow next to **Measures** to expand the list, and then select the required measures.

   b. (Optional) Click the arrow next to **Selection Criteria** to expand the list, and then select the required criteria. As a result, you can restrict the ABT to contain only those records that satisfy the selection criteria that you select here.

   c. Click the arrow next to **Aggregation** to expand the list, and then select the required aggregation types for the variables.

   d. Click the arrow next to **Time Period** to expand the list, and then select the required time periods. One variable is created for each time period that you select.

   TIP Click **Reset** if you want to clear all the selected variable attributes.

4. Click **Create**. Based on the variable attributes that you have selected one or more variables are created. These variables are displayed in the Variables created table in the right pane of the New Variables window.

You can view the details of the variables that are created. The table might have one additional column for each selection criteria that you selected. Also, you can perform certain additional tasks in this window. For details, see "Other Possible Tasks in the New Variables Window" on page 102.

TIP Repeat steps from 2 to 4 if you want to define variables for another data source.

5. (Optional) Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables Created table on the Analytical Base Table page.

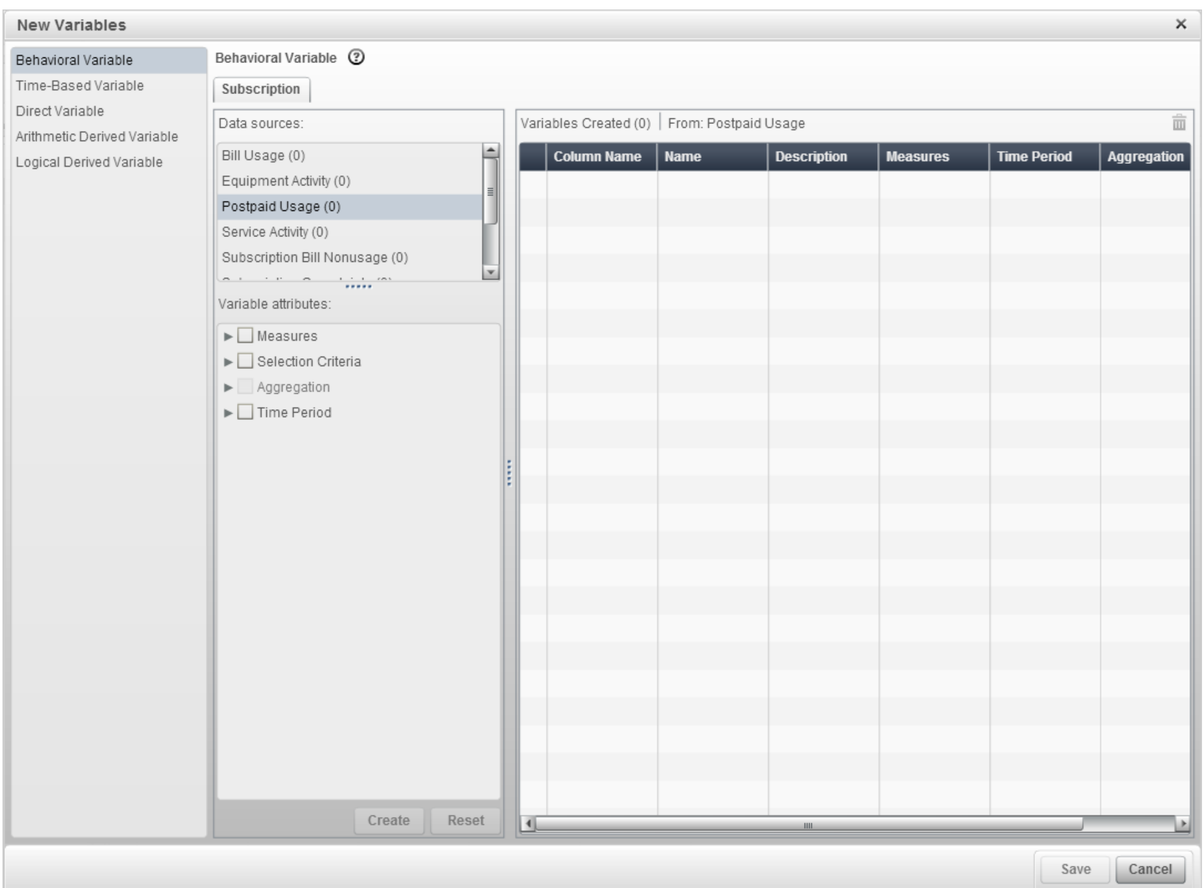
Example: Creating a Behavioral Variable

You want to define a variable that computes the total data volume that is downloaded during the peak hours in the past three months. To do so, you can define a behavioral variable.

To define this variable, complete these steps:

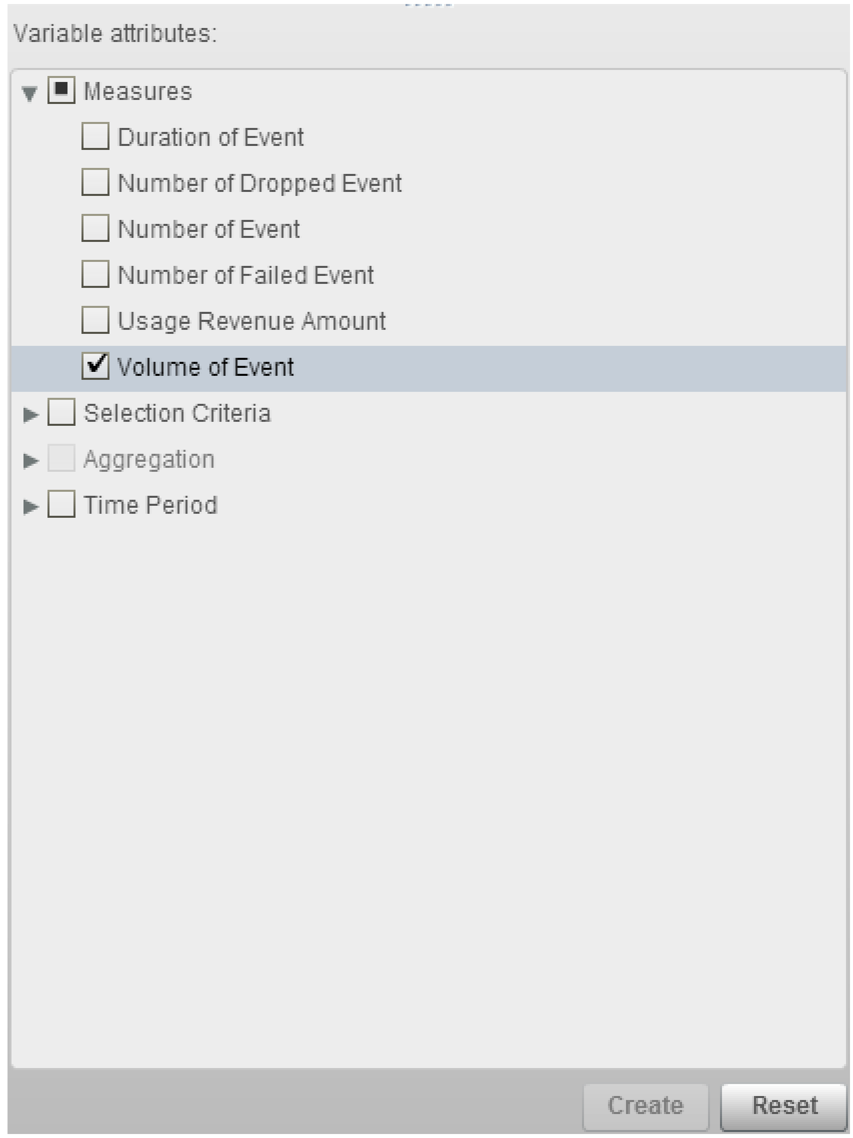
1. In the New Variables window, click **Behavioral Variable** in the left navigation pane.
2. From the **Data sources** list, select the **Postpaid Usage** data source.

Display 7.6 *Behavioral Variables: Data Source Selection*



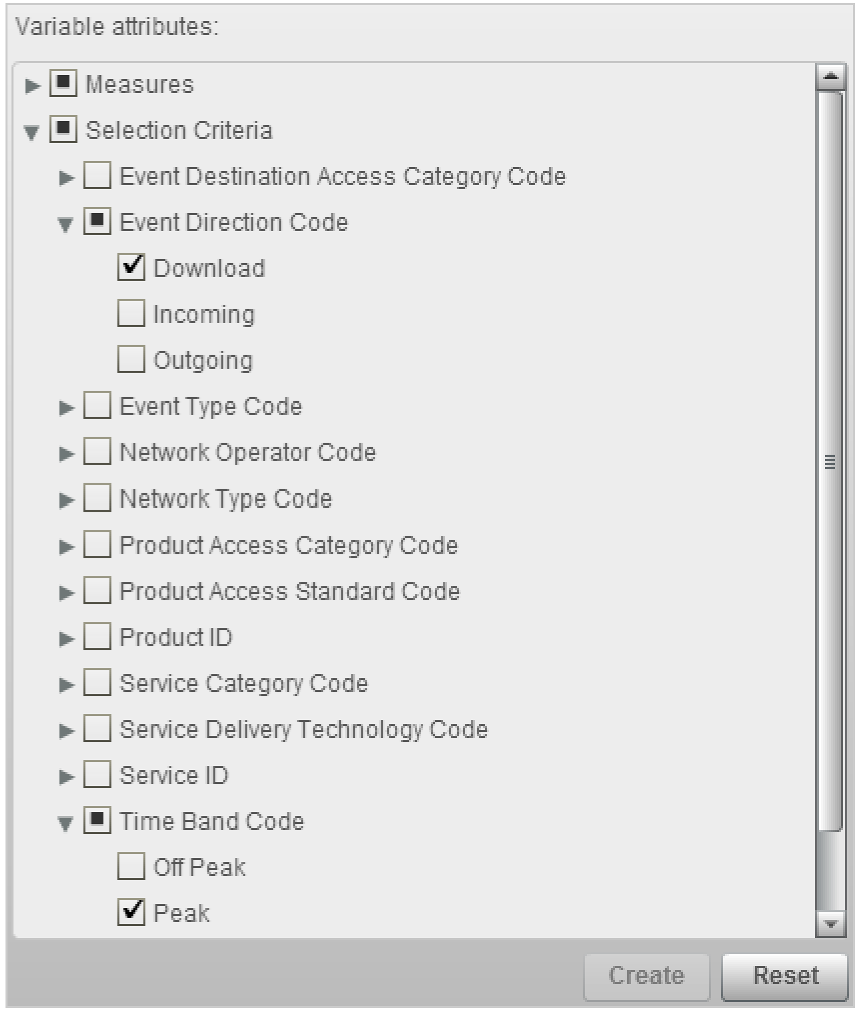
3. Select the following variable attributes:
   a. Click the arrow next to **Measures**, and then select **Volume of Event**.

Display 7.7 *Behavioral Variables: Measures Selection*



b. Click the arrow next to **Selection Criteria**.

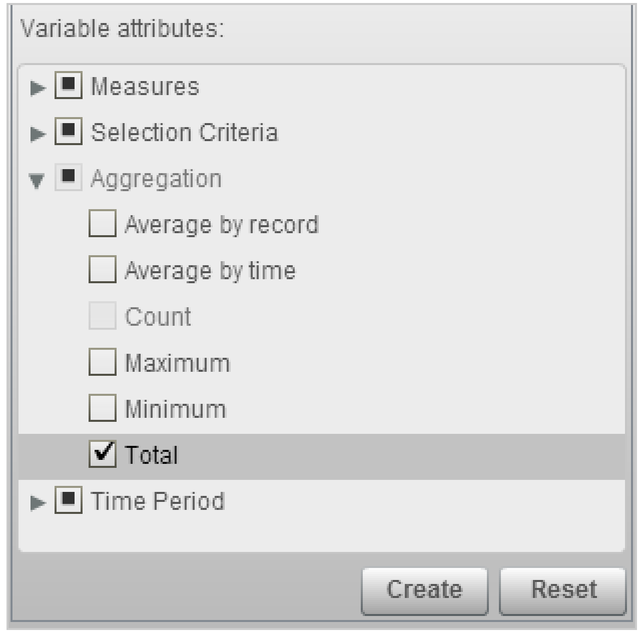
Display 7.8 *Behavioral Variables: Selection Criteria*



- Click the arrow next to **Event Direction Code**, and then select **Download**.
- Click the arrow next to **Time Band Code**, and then select **Peak**.

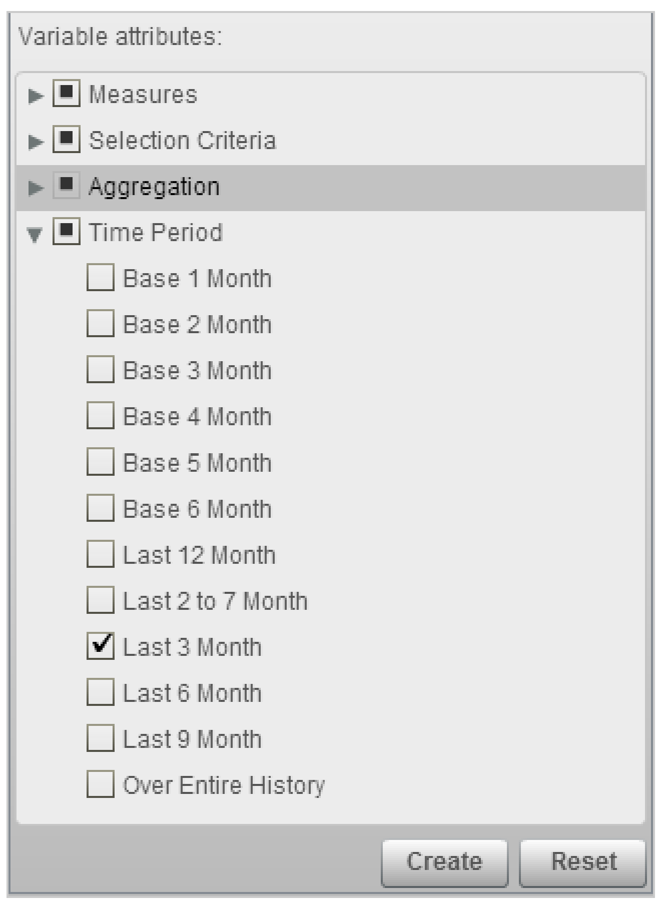
c. Click the arrow next to **Aggregation**, and then select **Total**.

Display 7.9 *Behavioral Variables: Aggregation Selection*



d. Click the arrow next to **Time period**, and then select **Last 3 Month**.

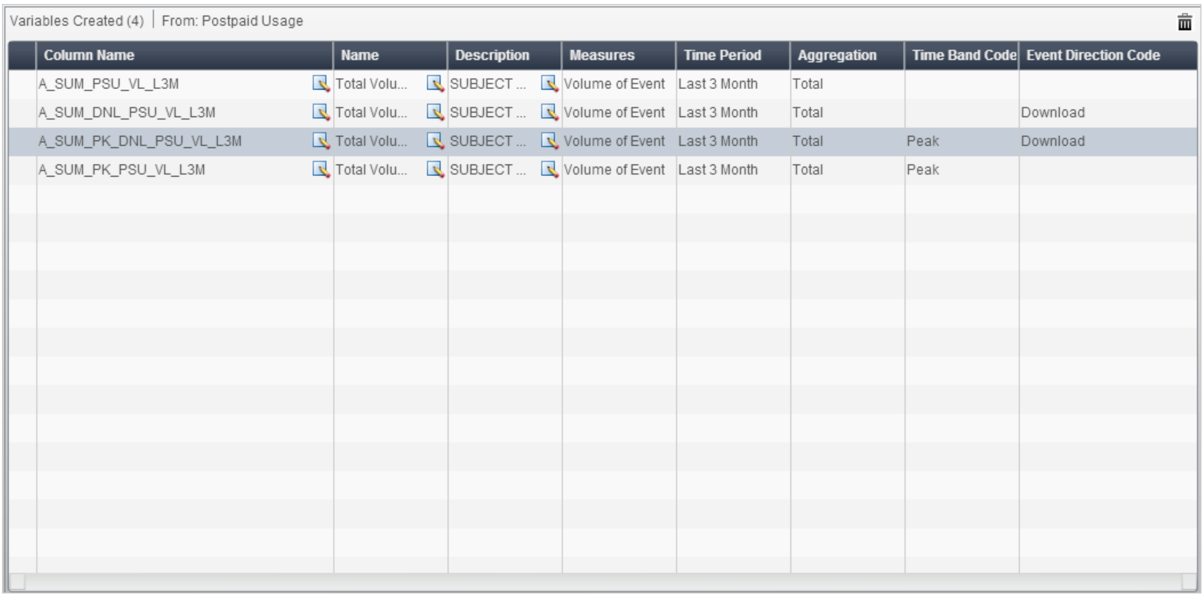
Display 7.10 *Behavioral Variables: Time Period Selection*



4. Click **Create**.

5. In the right pane, view the variables that are created in the Variables Created table. Four variables are created for each combination of variable attributes that you have defined.

Display 7.11 *Behavioral Variables*



Variables Created (4) | From: Postpaid Usage

Column Name	Name	Description	Measures	Time Period	Aggregation	Time Band Code	Event Direction Code
A_SUM_PSU_VL_L3M	Total Volu...	SUBJECT ...	Volume of Event	Last 3 Month	Total		
A_SUM_DNL_PSU_VL_L3M	Total Volu...	SUBJECT ...	Volume of Event	Last 3 Month	Total		Download
A_SUM_PK_DNL_PSU_VL_L3M	Total Volu...	SUBJECT ...	Volume of Event	Last 3 Month	Total	Peak	Download
A_SUM_PK_PSU_VL_L3M	Total Volu...	SUBJECT ...	Volume of Event	Last 3 Month	Total	Peak	

The variable for which the **Column Name** is generated as **A_SUM_PK_DNL_PSU_VL_L3M** is the variable of interest. The following table indicates the meaning of each string of the column name.

Table 7.6 *Column Name of a Variable*

String	Meaning
SUM	Indicates that aggregation type that you have selected is total.
PK	Indicates the code that is assigned to the dimensional attribute value (Peak) that you have selected.
DNL	Indicates the code that is configured for the dimensional attribute value (Download) that you have selected.
PSU	Indicates the code that is assigned to the data source (Postpaid usage) that you have selected.
VL	Indicates the code that is assigned to the measure (Volume of Event) that you have selected.
L3M	Indicates the code that is assigned to the time period frequency (Last 3 Months) that you have selected.

6. (Optional) Select the variables for which **Column Name** is generated as **A_SUM_PK_PSU_VL_L3M**, **A_SUM_PK_DNL_VL_L3M**, and **A_SUM_DNL_PSU_VL_L3M**, and then on the toolbar click .

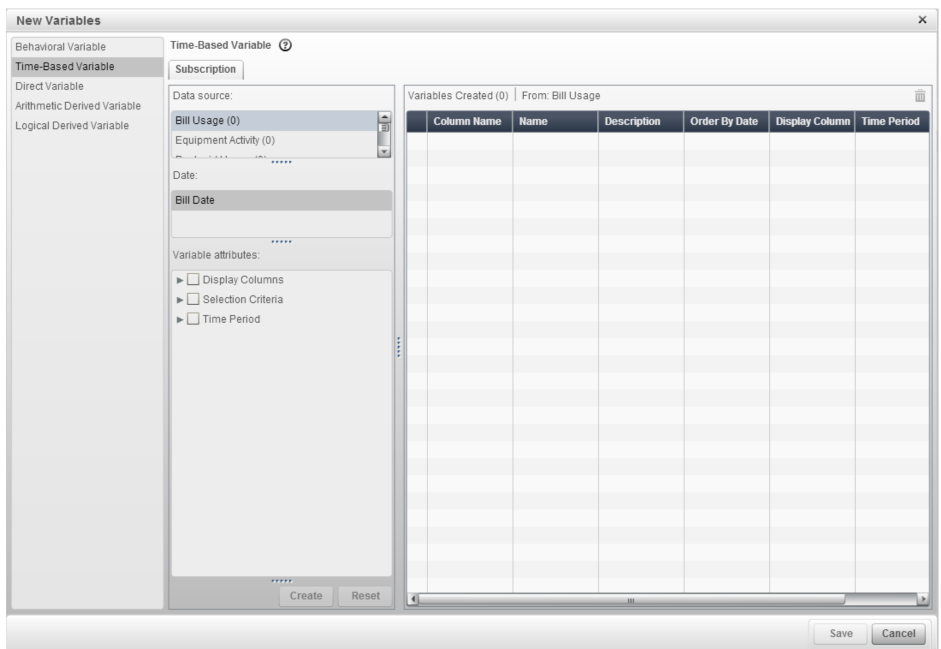
7. Click **Save**.

Create Time-Based Variables

To create time-based variables, complete these steps:

1. In the New Variables window, click **Time-Based Variable** in the left navigation pane.

Display 7.12 *Time-Based Variable Tab*



2. From the **Data source** list, select a data source. The date and the variable attributes lists display values depending on the data source that you select.

3. From the **Date** list, select a date. The list shows the date type columns of the selected data source that can be used to identify the most recent records while creating time-based variables. In other words, in order to retrieve the most recent record, the records of the data source are ordered by the date column that you select from the list.

4. From the **Variable attributes** list, select the display columns and the selection criteria that will constitute the variables. You must select at least one display column. A selection criterion is optional.

   a. Click the arrow next to **Display Columns** to expand the list, and then select the required display columns.

   b. (Optional) Click the arrow next to **Selection Criteria** to expand the list, and then select the required criteria.

   c. Click the arrow next to **Time Period** to expand the list, and then select the required time periods. One variable is created for each time period that you select.

TIP Choose the **Over Entire History** time period if you want to consider the most recent value in the entire history period.

TIP Click **Reset** if you want to clear all the selected variable attributes.

5. Click **Create**. Based on the variable attributes that you have selected, one or more variables are created. These variables are displayed in the Variables Created table in the right pane of the New Variables window.

   You can view the details of the variables that are created. You can perform certain additional tasks in this window. For details, see “Other Possible Tasks in the New Variables Window” on page 102.

   TIP Repeat steps from 2 to 5 if you want to define variables for another data source.

6. (Optional) Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables table on the Analytical Base Table page.

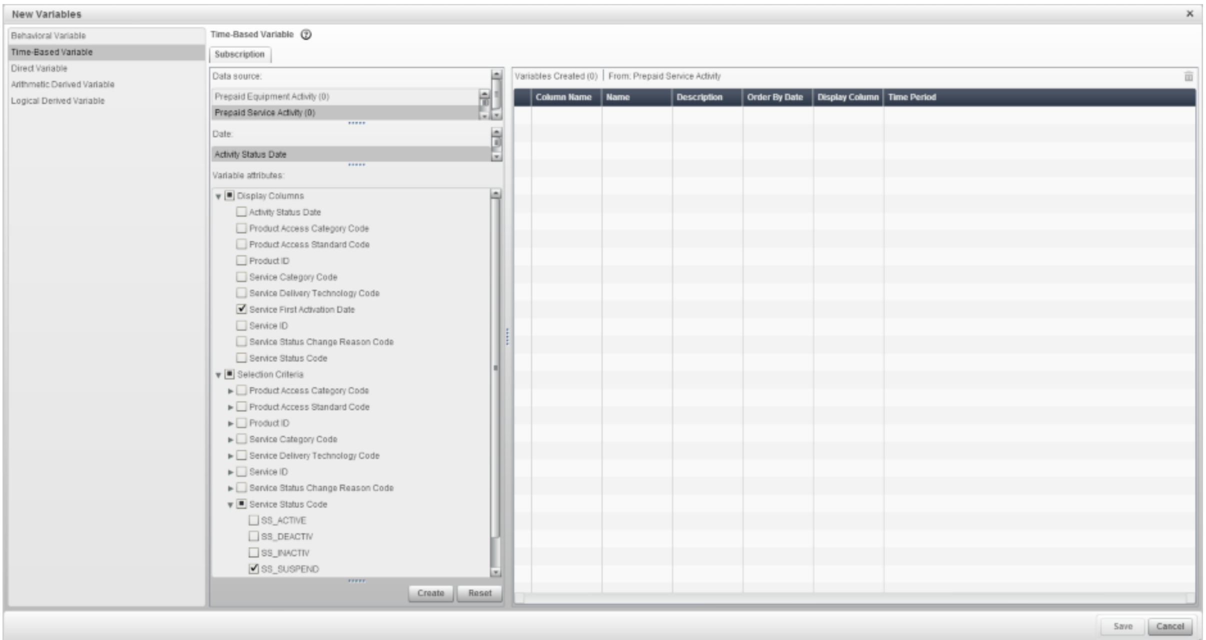
Example: Creating a Time-Based Variable

You want to define a variable that gives the most recent service activation date of a suspended service (whose Service Status Code is equal to SS_SUSPEND) from the Prepaid Service Activity base table. This table is ordered by activity status date. In addition, you want to consider the last occurrence of this event in the period of six weeks in the past. To do so, you can define a time-based variable.

To define this time-based variable, complete these steps:

1. In the New Variables window, click **Time-Based Variable** in the left navigation pane.
2. From the **Data source** list, select **Prepaid Service Activity**.
3. From the **Date** list, select **Activity Status Date**.
4. Select the following **Variable attributes**:
   a. Click the arrow next to **Display Columns** to expand the list, and then select **Service First Activation Date**.
   b. Click the arrow next to **Selection criteria** to expand the list. Further expand **Service Status Code**, and then select **SS_SUSPEND**.

Display 7.13 *Time-Based Variable: Attributes Selection*

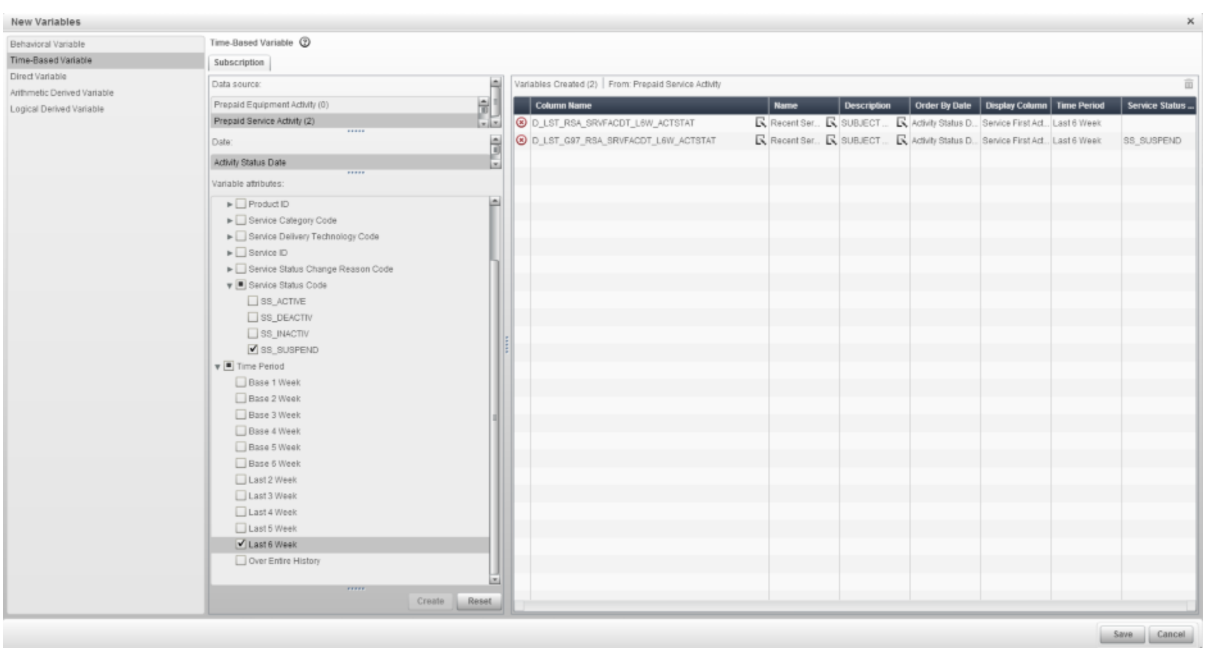


c. Click the arrow next to **Time Period** to expand the list, and then select the **Last 6 Week**.

5. Click **Create**.

6. (Optional) In the right pane, view the variables that are created in the Variables Created table.

Display 7.14 *Time-Based Variables*



The variable for which **Column Name** is generated as **D_LST_G97_RSA_SRVFACDT_L6W_ACTSTAT** is the variable of interest. The following table indicates the meaning of each string of the variable name.

TIP The icon ⊗ that appears beside the column name indicates that the column name exceeds the maximum permissible length. Therefore, change the column name to D_LST_G97_RSA_SRVFACDT_L6W.

Table 7.7 Column Name of a Time-Based Variable

String	Meaning
D_LST_G97	Is the code that is assigned to indicate a most recent variable in the specified time period.
RSA	Indicates the code that is assigned to the data source (Prepaid Service Activity) that you have selected.
SRVFACDT	Indicates the code that is assigned to the display column (Service First Activation Date) that you have selected.
L6W	Indicates the code that is assigned to the time period frequency (Last 6 Week) that you have selected.
ACTSTAT	Indicates the code that is assigned to the date column (Activity Status Date) that you selected to order the records of the data source.

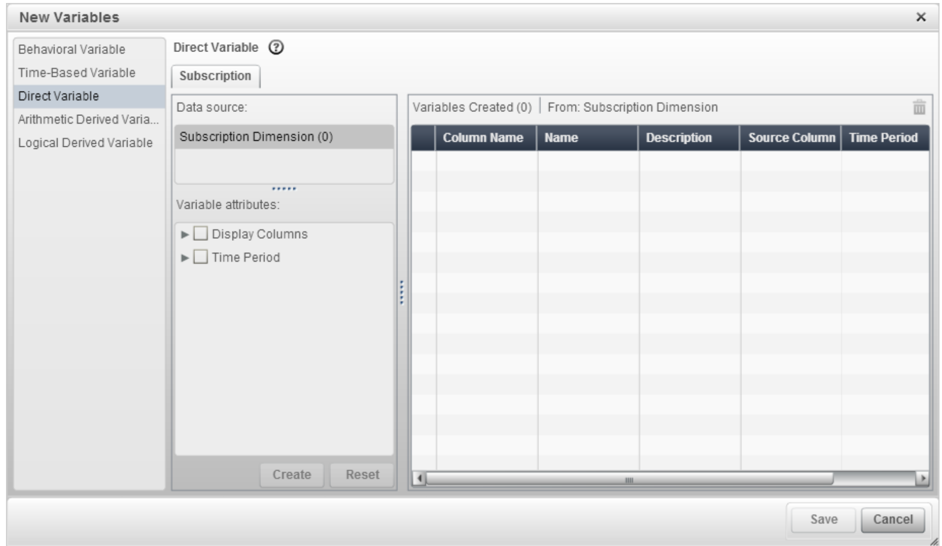
7. (Optional) In the Variables Created table, select the variable for which **Column Name** is generated as **D_LST_RSA_SRVFACDT_L6W_ACTSTAT**, and then click 🗑.
8. Click **Save**.

Create Direct Variables

To create direct variables, complete these steps:

1. In the New Variables window, click **Direct Variable** in the left navigation pane.

Display 7.15 *Direct Variable Tab*



2. From the **Data source** list, select a data source. For example, you want to create variables that store the demographic details of the prospective customer, such as age, city, marital status, gender, and so on. For this, you might select the **Prospective Customer Dimension** data source.

   Similarly, you want to create variables that store details about a subscription, such as the date on which the subscription was activated and the subscription type. For this, you might select the **Subscription Dimension** data source.

3. In the **Variable attributes** list, click the arrow next to **Display Columns** to expand the list, and then select the required display columns.

   Note: A direct variable stores a particular detail about a customer or a subscription as of the ABT build date. However, if the variable is marked as an outcome variable, the variable stores a particular detail about a customer or a subscription as of the outcome period end date.

   TIP Click **Reset** if you want to clear all the selected variable attributes.

4. Click the arrow next to **Time Period** to expand the list, and then select the appropriate time periods. One variable is created for each time period that you select. The variable will populate the value for the particular date of the time period.

   Note: Select the **Latest** option if you want the variable to store the value as of the ABT build date. Therefore, you must select the **Latest** option when you are defining a direct variable for the **Customer Acquisition** purpose.

5. Click **Create**. Based on the variable attributes that you have selected, one or more variables are created. These variables are displayed in the Variables Created table in the right pane of the New Variables window.

   You can view the details of the variables that are created. Also, you can perform certain additional tasks in this window. For details, see "Other Possible Tasks in the New Variables Window" on page 102.

   TIP Repeat steps from 2 to 4 if you want to define variables for another data source.

6. (Optional) Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables Created table on the Analytical Base Table page.

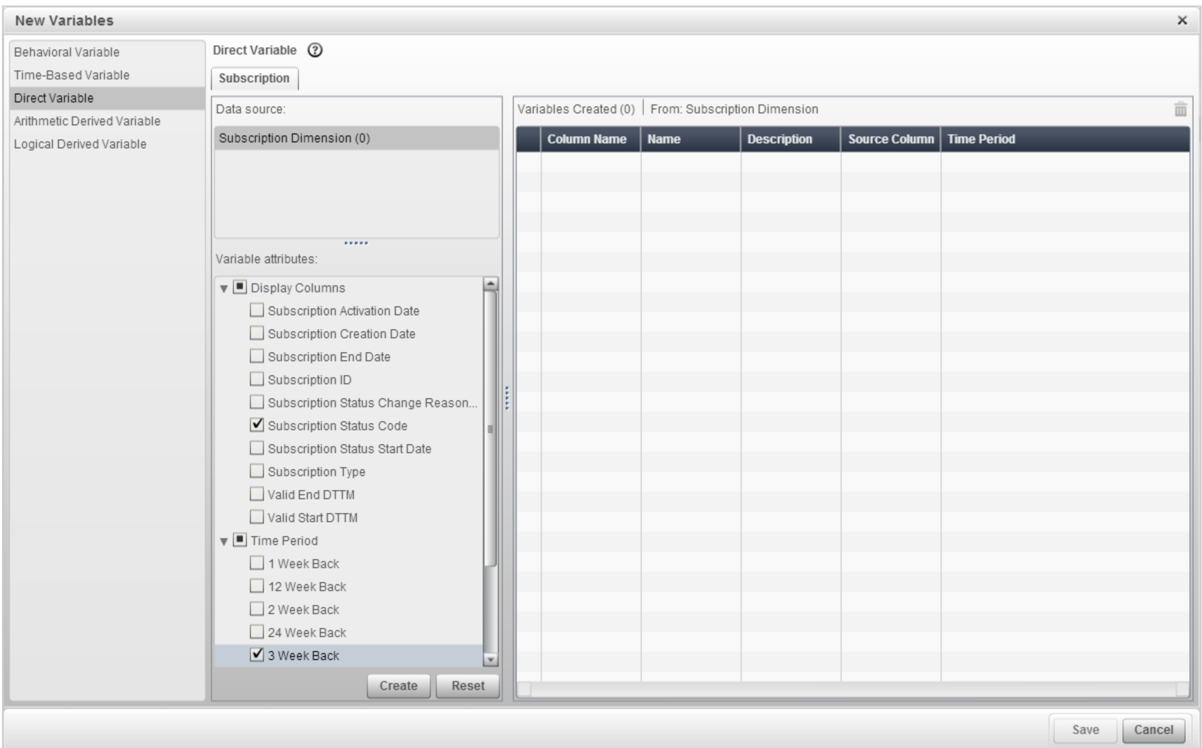
Example: Creating a Direct Variable

In your ABT, you want to define a variable that gives the subscription status from the Subscription dimension table as of the date, which is three weeks in the past. To do so, you can define a direct variable.

To define this direct variable, complete these steps:

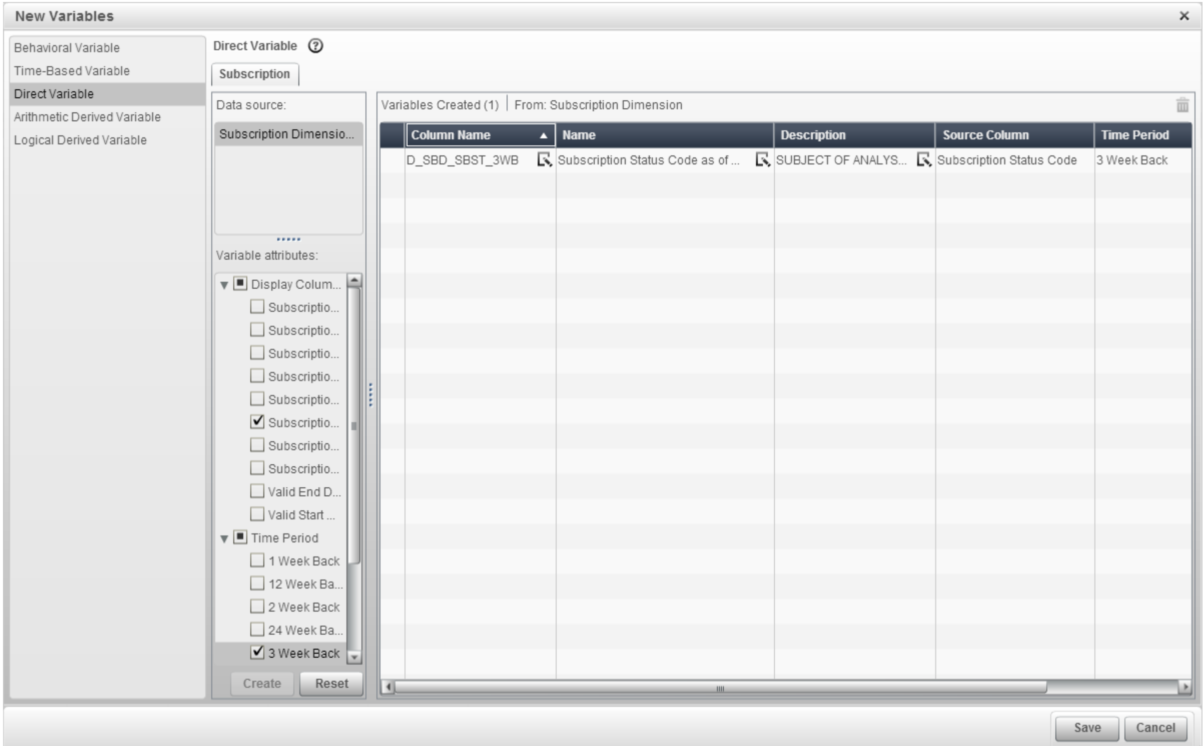
1. In the New Variables window, click **Direct Variable** in the left navigation pane.

Display 7.16 *Direct Variable Tab*



2. From the **Data source** list, select **Subscription Dimension**.
3. Click the arrow next to **Display columns** to expand the list, and then select **Subscription Status Code**.
4. Click the arrow next to **Time Period** to expand the list, and then select the 3 Week Back.
5. Click **Create**.

Display 7.17 *Direct Variable*



6. (Optional) In the right pane, view the variable that is created in the Variables Created table. The variable name is generated as **D_SBD_SBST_3WB**. The following table indicates the meaning of each string of the variable name.

Table 7.8 *Column Name of a Variable*

String	Meaning
D_SBD	Is the code that is assigned to the Subscription Dimension data source that you have selected.
SBST	Indicates the code that is assigned to the display column (Subscription Status Code) that you have selected.
3WB	Indicates the code that is assigned to the time period (3 Week Back) that you have selected.

7. (Optional) Click **Save**.

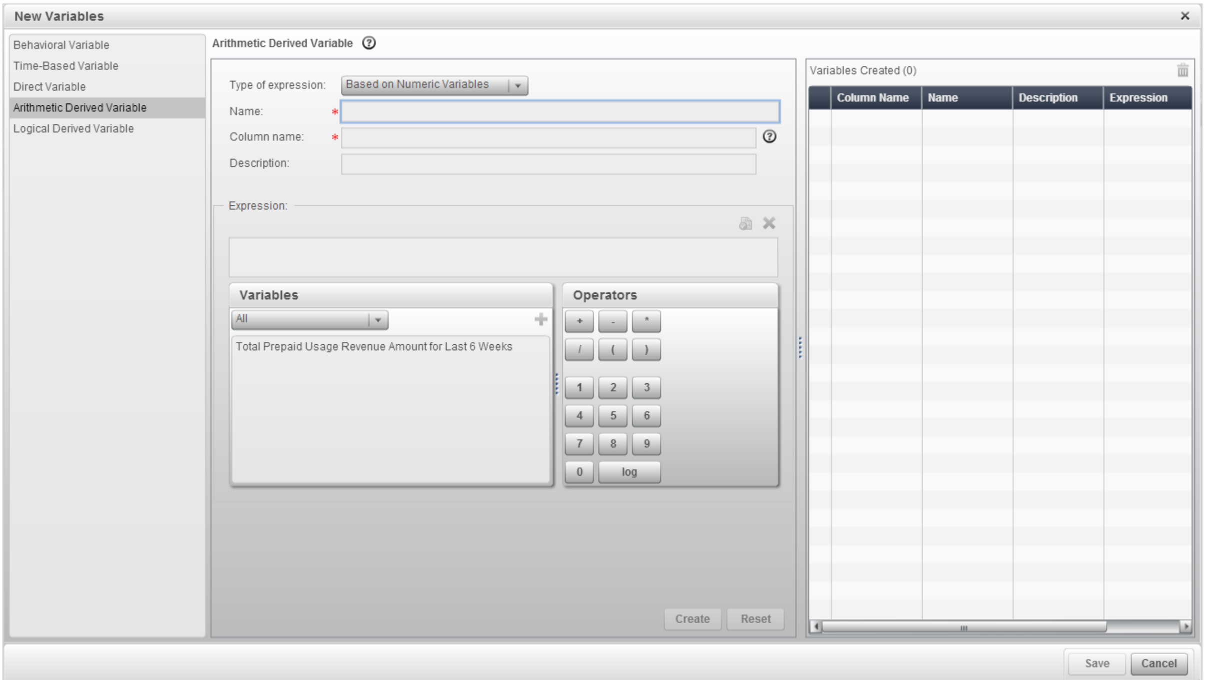
Create an Arithmetic Derived Variable

Common Steps

To create an arithmetic derived variable, complete these steps:

1. In the New Variables window, click **Arithmetic Derived Variable** in the left navigation pane.

***Display 7.18** Arithmetic Derived Variable*



2. In the central pane of the New Variables window, provide information for the following fields:

   Type of expression
   Select the type of expression that you want to define for the derived variable.

   ***Table 7.9** Types of Expression*

Option	Description
Based on Numeric Variables	This option enables you to define an expression by using numeric type of variables as an input. For example, you can use behavioral variables that compute an aggregated value of a measure for a certain period. For this variable, define an expression by using one or more correct combinations of a numeric variable that you have already defined and a mathematical operator.

Option	Description
Based on Date Difference	This option enables you to define an expression that computes the difference between two date variables. Also, the output of the expression that you define is a numeric value. For example, you can use time-based variables or direct variables of date type to compute the difference between two dates. For this variable, define an expression by selecting the two date type of variables whose difference you want to compute. These date variables can be time-based variables that you have defined or a predefined standard reference date with respect to the ABT build date.
Based on Date Operations	This option enables you to define an expression that computes a date by performing addition and subtraction operations on a date variable. Also, the output of the expression that you define is a date value. For example, you can define an expression such as Last_Usage_Date – 30. For this variable, define an expression that computes an output of date type by adding a fixed time period to an existing date variable or subtracting a fixed time period from an existing date variable. The fixed time period that you specify can be in days, weeks, or months.
Based on Prebuilt Formula	This option enables you to define a variable based on a prebuilt formula, which is automatically generated based on the type for analysis that you want to perform.

Type of analysis

This list is applicable only if you choose the **Based on Prebuilt Formula** option from the **Type of expression** list. Each option enables you to analyze the data from a different perspective such as trend in data, the spread of data, or the discontinuity in data. Depending on the type of analysis that you choose, the prebuilt formula for the derived variable differs.

Name

Enter a name for the variable. The variable is identified with this name in the SAS Customer Analytics for Communications interface. The name of a variable must be unique within an ABT.

Column Name

Enter a name for the corresponding column in the ABT. This is the actual name of the variable (column) as displayed in the ABT. A column name must be a valid name and must not exceed the maximum permissible length. In SAS, the maximum length for the column name is 28 characters. In Teradata, the maximum length for the column name is 26 characters.

Description
Enter a description for the variable. The description must not exceed 200 characters, including spaces.

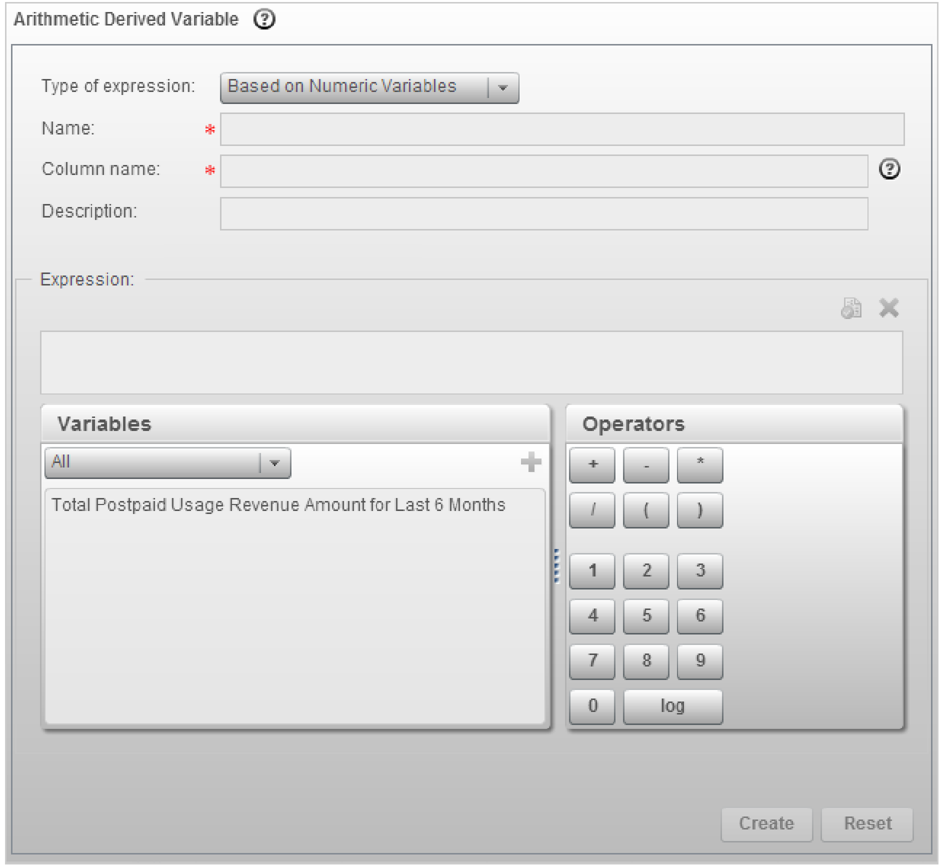
3. Depending on the type of expression that you choose, perform the relevant steps.
   - For details, see "Create an Arithmetic Derived Variable Based on Numeric Variables" on page 82.
   - For details, see "Create an Arithmetic Derived Variable Based on Date Difference" on page 84.
   - For details, see "Create an Arithmetic Derived Variable Based on Date Operations" on page 85.
   - For details, see "Create an Arithmetic Derived Variable Based on Prebuilt Formula" on page 87.
4. You can perform certain additional tasks in this window. For details, see "Other Possible Tasks in the New Variables Window" on page 102.
5. Click **Save**. The New Variables window closes, and the saved variables are displayed in the Variables table on the Analytical Base Table page.

   TIP Click **Cancel** if you want to discard the created variables.

Create an Arithmetic Derived Variable Based on Numeric Variables

1. From the **Type of expression** list, select **Based on Numeric Variables**.
2. From the **Variables** list, select the variable that you want to use as an input variable. By default, the **Variables** list displays a list of all the existing behavioral, time-based, and direct variables. However, you can filter the variables by a particular variable type.

Display 7.19 *Arithmetic Derived Variable: Numeric Variables*



3. Click to add the variable to the **Expression** field.

4. Select the required operator, and then add another variable from the **Variables** list to the **Expression** field.

   TIP Repeat steps from 1 to 4 to create the required expression for the derived variable.

   Note: If you are using variables in an expression, it is recommended that you use the **Null if Zero** and **Zero if Null** operators. For details, see "Using Null If Zero and Zero If Null Operators" on page 83.

5. Click to check whether the syntax of the expression is valid.

6. Click **Create** to create the derived variable. The variable is added to the Variables Created table in the right pane.

   TIP Click **Reset** if you want to clear the defined expression.

Using Null If Zero and Zero If Null Operators

Null if Zero operator

When processing a query, if SAS encounters a mathematical expression in which the denominator is zero, it treats zero as NULL and returns NULL as the result. However, Teradata cannot handle such an expression. Therefore, the query is passed on to SAS for processing, which significantly increases the processing time.

For example, suppose you create an arithmetic variable (V3) with an expression that uses variables V1 and V2:

V3 = V1/V2

In a SAS deployment (the Foundation data mart is in SAS), during the ABT building process, if V2 evaluates to zero, the value of V3 is returned as NULL. However, in a Teradata deployment (the Foundation data mart is in Teradata), it takes longer to process this expression. This is because Teradata cannot handle a division by zero. Therefore, it passes the query to SAS, which significantly increases the processing time.

Therefore, to support in-database processing of queries during the ABT building process in a deployment using Teradata, you must use the **Null if Zero** operator in the expression. When you use this operator, the expression looks like as mentioned below:

V1/(%dabt_null_if_zero(V2 +V3))

Zero if Null operator

In both SAS and Teradata, when NULL is added to or subtracted from a number, the result is NULL. For example, suppose you create a variable with an expression as follows:

V3 = V1+V2

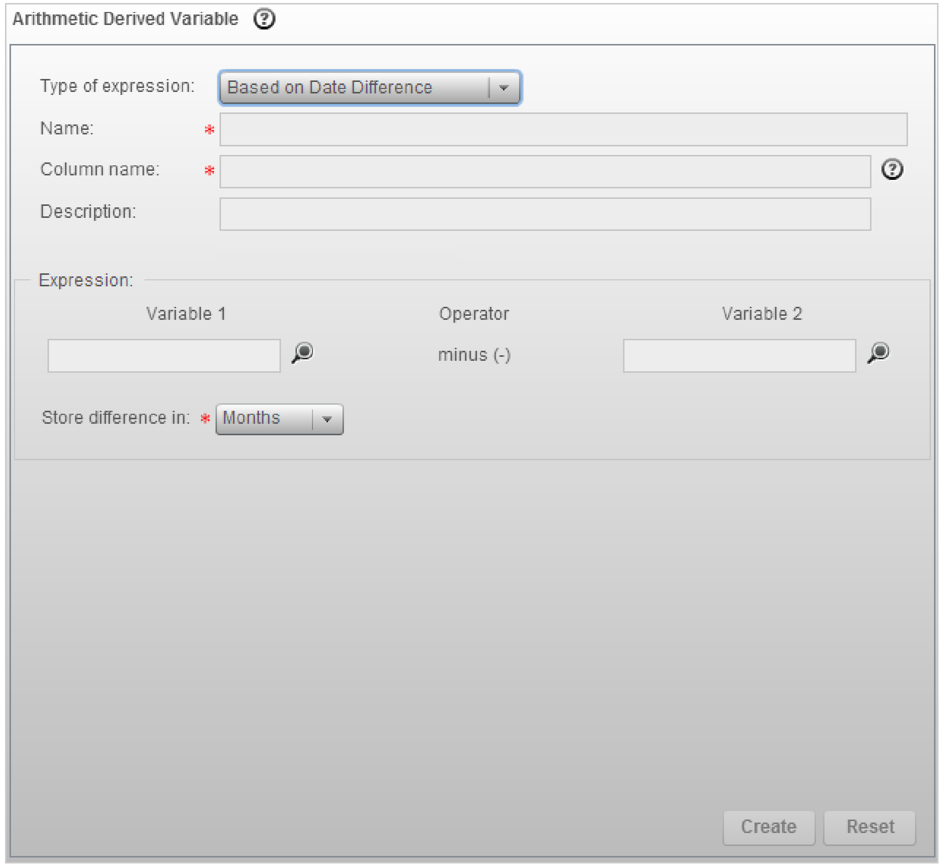
If V1 or V2 evaluates to NULL during the ABT building process, the value of V3 is returned as NULL. To prevent this, you must use the **Zero if Null** in the expression. When you use this operator, the expression looks like as mentioned below:

%dabt_zero_if_null(V1) + %dabt_zero_if_null(V2)

Create an Arithmetic Derived Variable Based on Date Difference

1. From the **Type of expression** list, select **Based on Date Difference**.
2. To select the first date variable, click that is displayed next to **Variable 1**. The Search for Variable window appears.

Display 7.20 *Arithmetic Derived Variable: Based on Date Difference*



3. Select the required variable and click **OK**.
4. Repeat steps 2 and 3 for **Variable 2**.

   Note: **Variable 1** and **Variable 2** must be of the same data type—Date or Datetime.

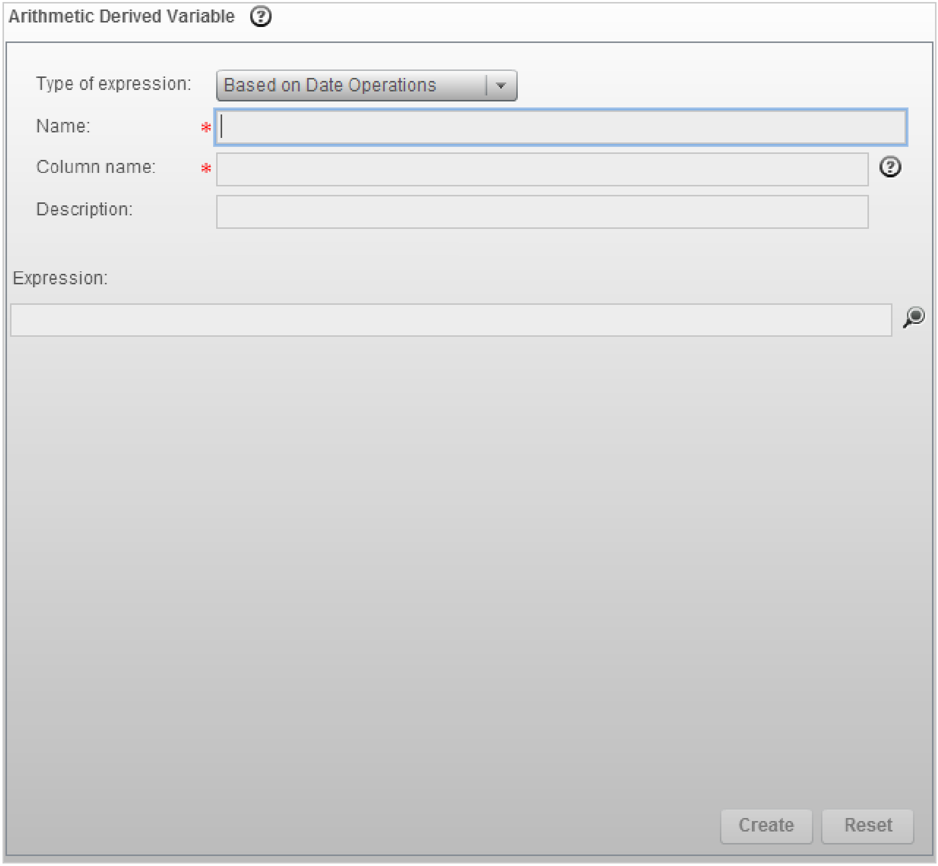
5. Select a format in which you want to store the difference. Depending on the option that you select, the derived variable stores the difference between the two dates (**Variable 1** and **Variable 2**) in days, weeks, or months.
6. Click **Create** to create the derived variable. The variable is added to the Variables Created table in the right pane.

   TIP Click **Reset** if you want to clear the defined expression.

Create an Arithmetic Derived Variable Based on Date Operations

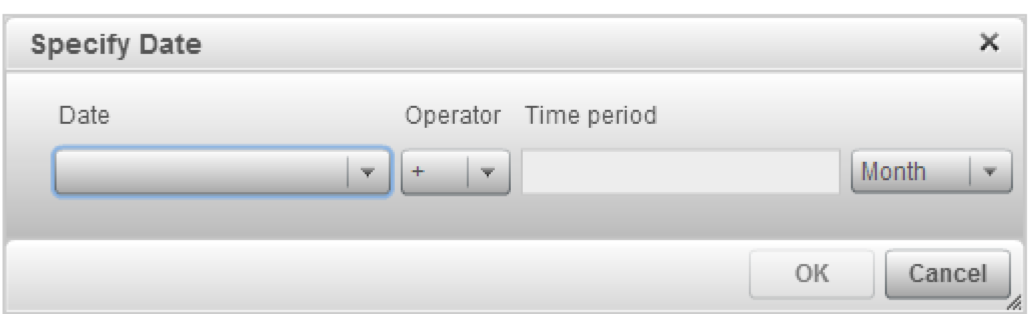
1. From the **Type of expression** list, select **Based on Date Operations**.

Display 7.21 *Arithmetic Derived Variable: Date Operations*



2. To select the date variable, click that is displayed. The Select Date window appears.

Display 7.22 *Specify Date Window*



3. Select the required variable and click **OK**.
4. From the **Operator** list, select the + (addition) or — (subtraction) operator.
5. In the **Time period** field, enter the fixed period that you want to add to or subtract from the variable that you have selected.
6. From the list, select **Days**, **Weeks**, or **Months** to indicate the unit of the fixed period that you have specified.
7. Click **OK** to create the expression for the derived variable.
8. Click **Create**. The variable is added to the Variables Created table in the right pane.

   TIP Click **Reset** if you want to clear the defined expression.

Create an Arithmetic Derived Variable Based on Prebuilt Formula

These types of arithmetic derived variables require a continuous data series as an input. The input variables are behavioral variables that are defined for single daily time periods (for example, 1 Day Back, 2 Day Back, and so on), single weekly time periods (for example, 1 Week Back, 2 Week Back, and so on), or single monthly time periods (for example, 1 Month Back, 2 Month Back, and so on). For details, see "Create Behavioral Variables" on page 66. The prebuilt formula is generated by using these input variables. Also, the prebuilt formula that is generated differs depending on the type of analysis that you choose.

Note: Before you define any of these variables, make sure that you have defined the required input variables. For example, you want to analyze the trend of outbound calls in the past six months. In this case, you should first define the following six behavioral variables: D_SUM_I35_PSU_CN_B1M,D_SUM_I35_PSU_CN_B2M,D_SUM_I35_PSU_CN_B3M,D_SUM_I35_PSU_CN_B4M,D_SUM_I35_PSU_CN_B5M, and D_SUM_I35_PSU_CN_B6M.

SAS Customer Analytics for Communications supports the following types of analysis:

Trend in data

This type of analysis indicates the behavioral pattern of the series of input variables. For example, there are six historical values of a customer's outbound usage in the past six months. In this case, the trend in data analysis indicates whether the customer's outbound usage is increasing, decreasing, or remaining constant. The trend in data is computed based on the following linear regression equation:

$$Y_i = a + bX_i$$

Here, i is the number of time periods on which behavioral variables are defined, Y_i is the input variable, X_i is the day, week, or month number in the series, b is the trend of the data, and a is the intersection of regression line of Y_i on X_i.

For example, you want to compute the trend of billing amounts in the past six months. In this case, in the above equation, Y is the behavioral variable that computes the monthly bill amount and X is the month number. Therefore, in order to compute the trend in the billing amounts, you have to define six behavioral variables, say A_SUM_SCB_BLNTPAM_B1M, A_SUM_SCB_BLNTPAM_B2M, and so on, until A_SUM_SCB_BLNTPAM_B6M.

Spread of data

This analysis indicates how the data points in the input data series are spread from the average of the series. The spread of data is computed by using the following formula:

$$\sqrt{\frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N}}$$

Here, $\bar{x}$ is the average of the input data series and N is the number of time periods that are considered in the data series.

For example, you want to compute the spread of duration of monthly outbound calls in the past six months. In this case, in the above equation, $X_{(i)}$ indicates the behavioral variable that computes the total call duration in the i^{th} month. Therefore, in order to compute the spread, you have to define six behavioral variables, say A_SUM_VOC_OUT_PSU_VL_B1M, A_SUM_VOC_OUT_PSU_VL_B2M, and so on, until A_SUM_VOC_OUT_PSU_VL_B6M.

Discontinuity in data

This analysis indicates how the data points in the input data series are spread from the mean value. In other words, the discontinuity analysis determines the fluctuation level of variable values, which are expressed by the number of months, days, or weeks for which the variable value exceeds its average value. The discontinuity in data is computed by using the following formula:

$$\sum_{i=1}^{n} t\_cnt_i$$

Here, t_cnt_i indicates whether the consecutive variables in the data series are widely spread from the mean of the input data series. This value is computed by using the following formula:

$$t\_cnt_i = 1 \; if \; abs\left(\frac{input\_\mathrm{var}_i - input\_\mathrm{var}_{i+1}}{mean\,(input\_\mathrm{var}_1, \ldots, input\_\mathrm{var}_n)}\right) > Cutoff \; value \; else \; 0$$

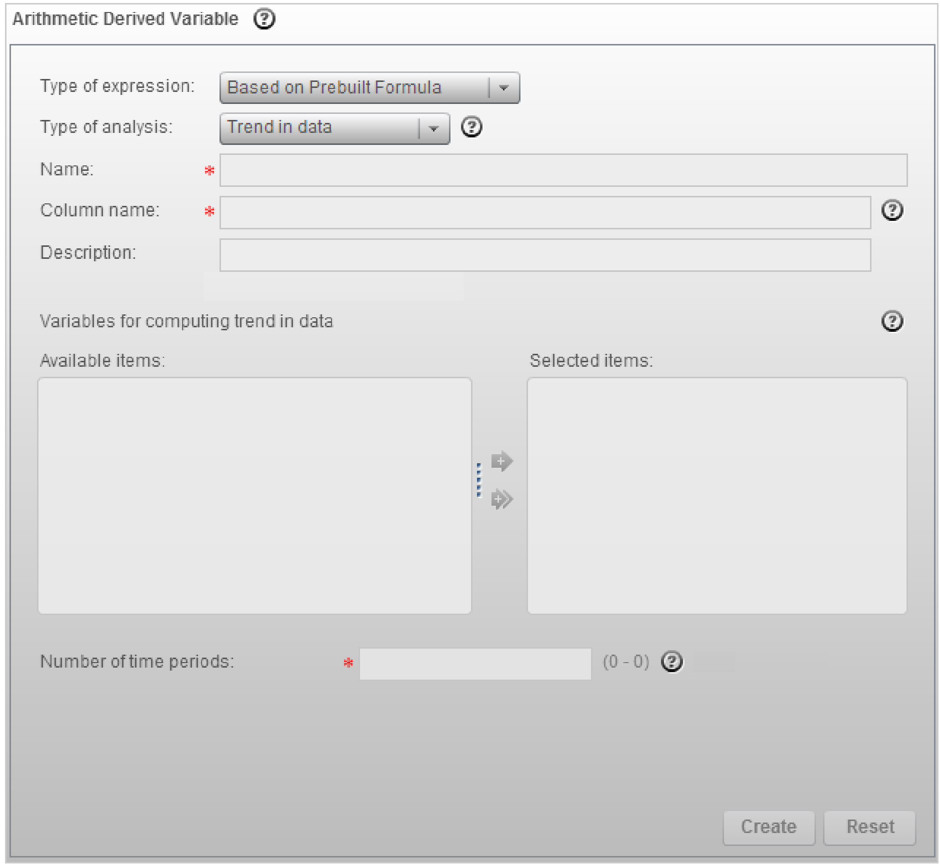
In both these formulas, n is the number of the time periods that are considered in the data series.

For example, you want to measure the discontinuity of bill amounts in the past six months. In this case, in the above equation, $input\_var_{(i)}$ is the behavioral variable that compute the monthly bill amount for each month. Let us assume that the cutoff value is 0.3. Therefore, in order to compute the discontinuity, you have to define six behavioral variables, say A_SUM_SCB_BLNTPAM_B1M, A_SUM_SCB_BLNTPAM_B1M, and so on, until A_SUM_SCB_BLNTPAM_B6M.

To define an arithmetic derived variable based on a prebuilt formula, complete these steps:

1. From the **Type of expression** list, select **Based on Prebuilt Formula**.

Display 7.23 *Arithmetic Derived Variable: Prebuilt Formula*



2. Select the appropriate option from the **Type of analysis** list.

   - Select **Trend in Data** to analyze the behavioral pattern of the series of input variables. The output value measures the trend in the data series. A positive value indicates an increasing trend. A negative value indicates a decreasing trend, and a zero value indicates a consistent trend.

   - Select **Spread of Data** to analyze how each data point in the input data series varies from the average value. The lower the value of the spread, the less is the variation from the mean value. As a result, the higher is the homogeneity in data series.

   - Select **Discontinuity in Data** to analyze how the data points in the series are spread from the mean. The higher the value of the discontinuity, the higher the spread and the lower the model performance that is computed based on the input variables.

3. From the **Available items** list, select the first variable of the input data series.

4. Click to add the selected variable to the **Selected items** list.

5. In the **Number of time periods** field, enter the total number of variables in the input data series. This value should be inclusive of the first variable that you have selected. The **Create** button is enabled only if sufficient number of input variables are available.

   Note:

   - After you enter the time period, the subsequent variables in the data series are automatically entered to the **Selected items** list as a continuous series. For example, you want to analyze the trend in the usage of a customer's outbound calls in the past three months. The list of variables might include behavioral variables such as D_SUM_PRU_DR_B1M, D_SUM_PRU_DR_B2M, and so on, until D_SUM_PRU_DR_B6M. You select the D_SUM_PRU_DR_B1M variable, which indicates the total number of outbound calls in the latest month, and type 3 in the number of time periods. In this case, the analysis would be based on the three input variables: D_SUM_PRU_DR_B1M, D_SUM_PRU_DR_B2M, and D_SUM_PRU_DR_B3M. However, consider that you now select the D_SUM_PRU_DR_B3M variable, which indicates the total number of outbound calls in the third month. In this case, the analysis would be based on the three input variables: D_SUM_PRU_DR_B3M, D_SUM_PRU_DR_B4M, and D_SUM_PRU_DR_B5M.

- If you want to change the data series, remove all the variables from the **Selected items** list, and then select the first variable of the new data series again. Also enter the number of time periods.

6. (Optional) If you have selected the **Discontinuity in data** option from the **Type of analysis** list, enter the cutoff value. This value indicates the maximum limit within which discontinuity between the consecutive data points is acceptable. For example, you enter 0.5 as the cutoff value. Assume that the discontinuity between the consecutive data points is 0.7. In this case, the discontinuity indicator is marked as 1 for the specific pair of input variables.

Example: Creating Arithmetic Derived Variables

Example: Creating Arithmetic Derived Variable Based on Numeric Variables

Assume that you have defined the two behavioral variables. The first variable computes the total number of voice calls in the past six months. The second variable computes the total number of all types of calls in the past six months. You want to define a numeric variable that computes the proportion of voice calls in the total number of calls. You want to compute this value for a period of past six months. To do so, you have to define an arithmetic derived variable, whose expression is built based on numeric variables.

Note: This example assumes that the ABT is created in SAS database.

To define this arithmetic derived variable, complete these steps:

1. In the New Variable window, select **Arithmetic Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:
   a. From the **Type of expression** list, select **Based on Numeric Variables**.
   b. In the **Name** field, you can enter *Proportion of Voice Calls*.
   c. In the **Column name** field, you can enter *PROPN_VOICE_CALLS_LAST_6M*.
   d. In the **Description** field, you can enter the *Formula that computes the proportion of voice calls in the last four months.*
3. Create the expression to define the formula.
   a. Filter on **Behavioral Variables**.
   b. From the list, select the variable that indicates the total number of voice calls in the past six months. For example, this variable can be **Total Number of Event for Last 6 Month by ‘Service Category Code’ = VOC**.

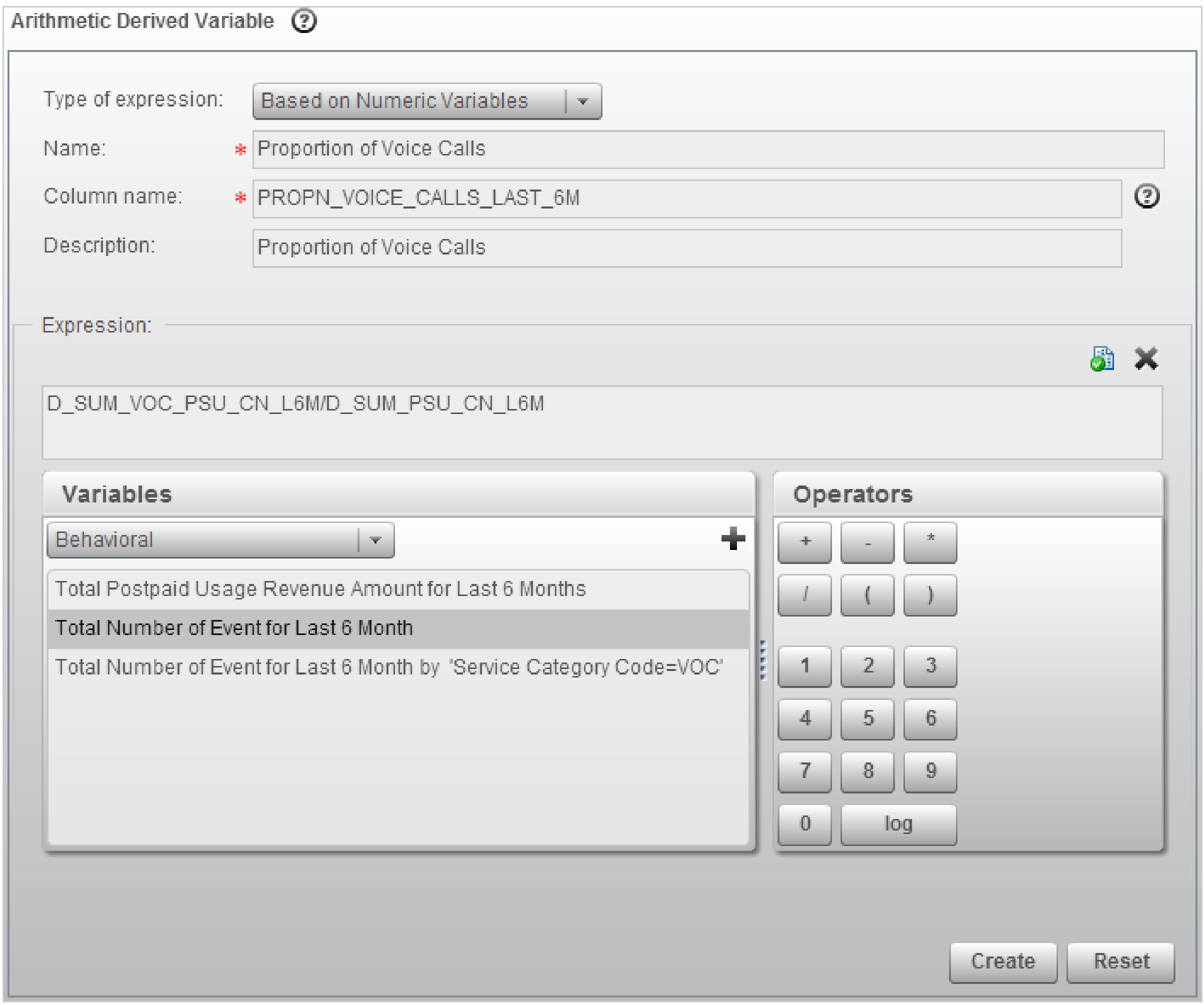
c. Click ➕ to add the selected variable.

d. From the **Operator**, click /.

e. From the list, select the behavioral variable that indicates the total number of calls in the past six months. For example, this variable can be **Total Number of Event for Last 6 Month**.

f. Click ➕ to add the selected variable.

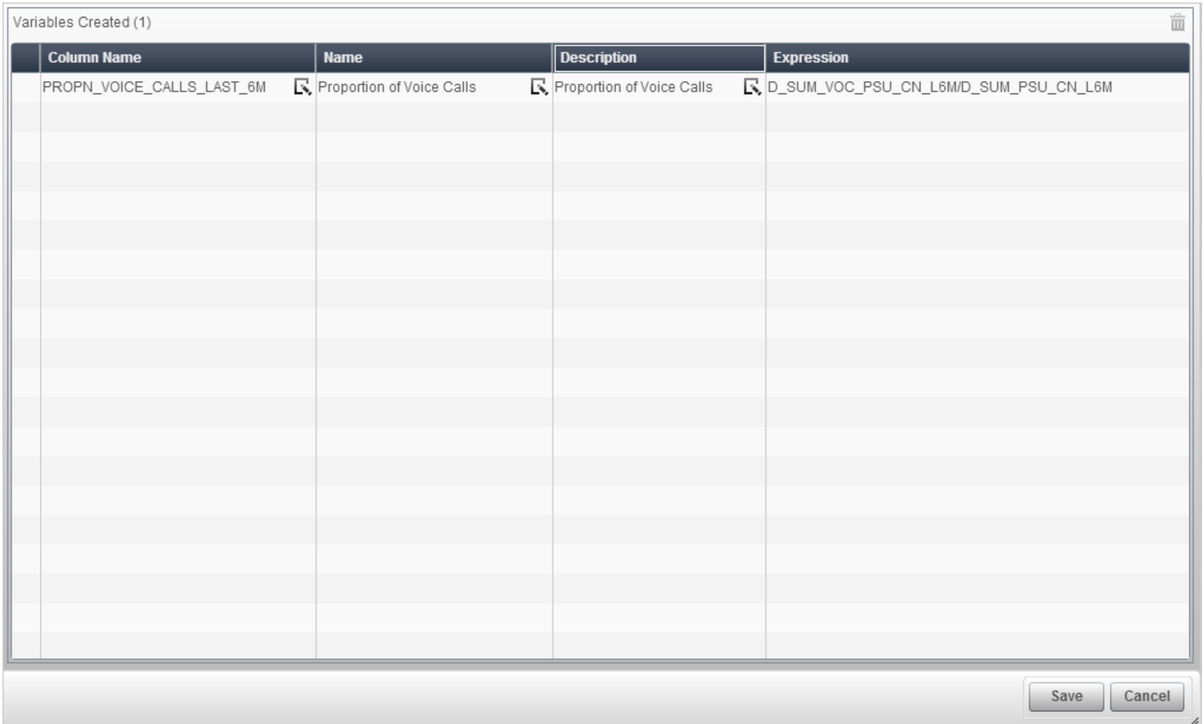
Display 7.24 *Arithmetic Derived Variable: Expression*



g. Click the validate icon to make sure that the expression, **D_SUM_VOC_PSU_CN_L6M/D_SUM_PSU_CN_L6M** is valid.

h. Click **Create**. The derived variable that is created is displayed in the right pane.

Display 7.25 *Arithmetic Derived Variable: Numeric Variables*



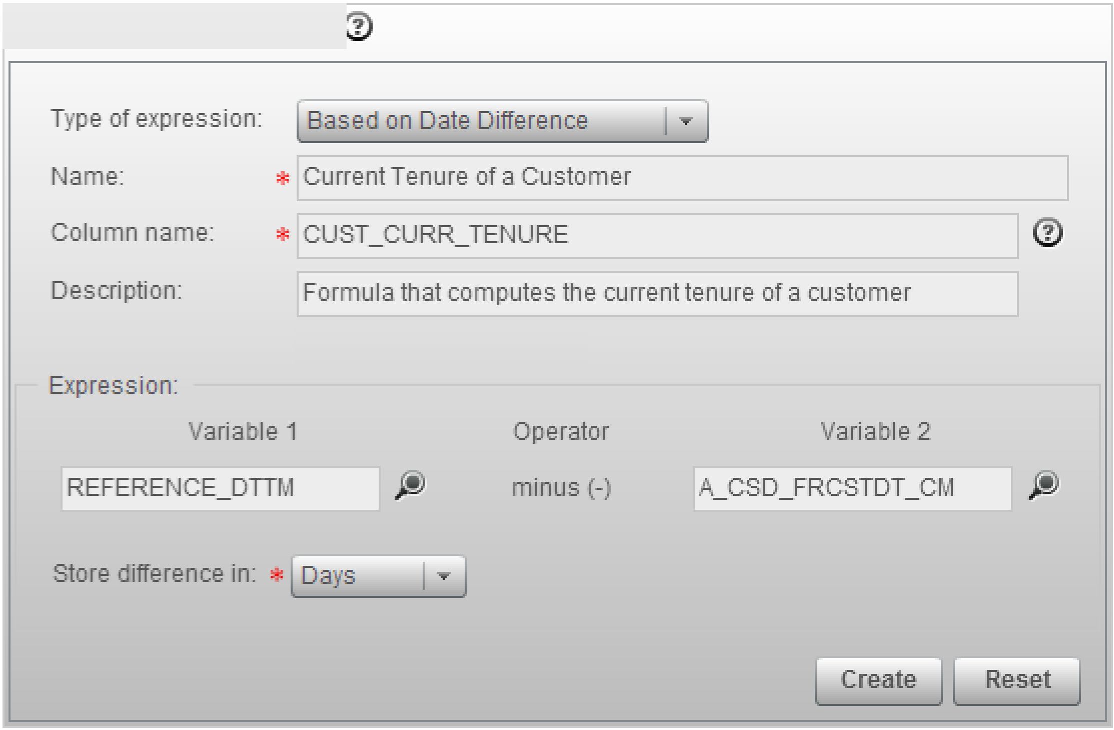
Example: Creating Arithmetic Derived Variable Based on Date Difference

You want to define an ABT variable for a customer segmentation project. This variable computes the tenure (in days) of a customer as of today's date. To do so, you have to define an arithmetic derived variable. The expression of this variable can be built based on the input of date variables (reference date and a direct variable that gives the date on which the customer activated the subscription).

To define this arithmetic derived variable, complete these steps:

1. In the New Variable window, select **Arithmetic Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:

Display 7.26 *Arithmetic Derived Variable: Date Difference*



a. From the **Type of expression** list, select **Based on Date Variables**.

b. In the **Name** field, you can enter *Current Tenure of a Customer*.

c. In the **Column name** field, you can enter *CUST_CURR_TENURE*.

d. In the **Description** field, you can enter *Formula that computes the current tenure of a customer*.

3. Create the expression to define the formula.

a. Select **Date Input Variable**.

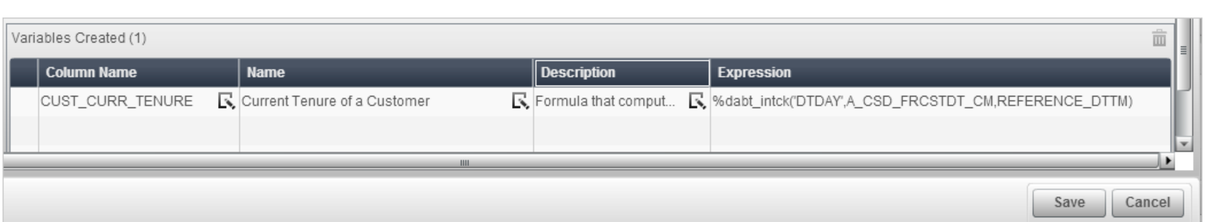
b. In the **Variable 1** field, select **REFERENCE_DTTM**.

c. In the **Variable 2** field, select **A_CSD_FRCSTDT_CM**.

d. From the **Store difference in** list, select **Days**.

e. Click **Create**. In the right pane, view the expression that is created for the derived variable.

Display 7.27 *Arithmetic Derived Variable: Date Difference*



Example: Creating Arithmetic Derived Variable Based on Date Operations

You want to define a date variable that computes a date based on the expression, which is computed by adding a fixed period in days to a time-based variable. The formula for this expression is as mentioned below:

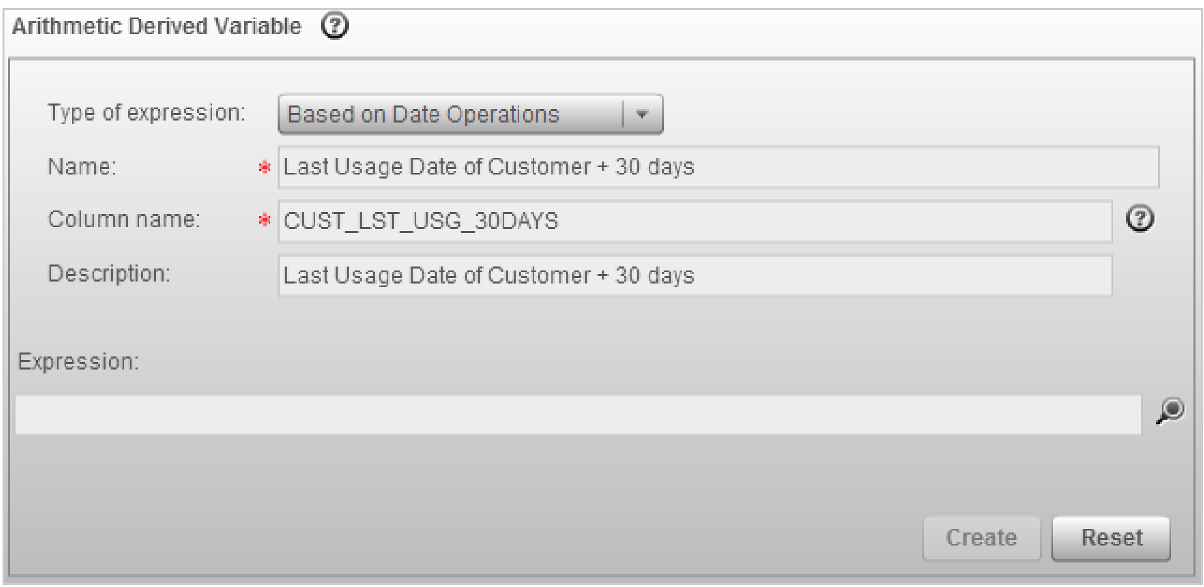
Last_Usage_Dt + 30 days

To do so, you have to define an arithmetic derived variable, whose expression is built by using the addition operator on a date variable.

To define this arithmetic derived variable, complete these steps:

1. In the New Variable window, select **Arithmetic Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:

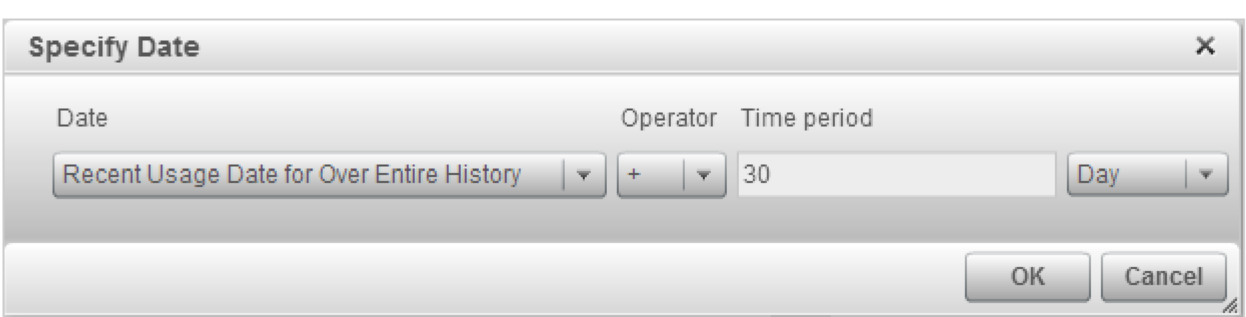
Display 7.28 *Arithmetic Derived Variable: Date Operations*



   a. From the **Type of expression** list, select **Based on Date Operations**.
   b. In the **Name** field, you can enter *Last Usage Date of Customer + 30 days*.
   c. In the **Column name** field, you can enter *CUST_LST_USG_30DAYS*.
   d. In the **Description** field, you can enter *Formula that adds 30 days to customer's last usage date*.

3. In the Specify Date window, create the expression to define the formula.

Display 7.29 *Specify Date Window*



a. From the **Date** list, select the **Recent Usage Date for Over Entire History** time-based variable.

b. From the **Operator** list, select +.

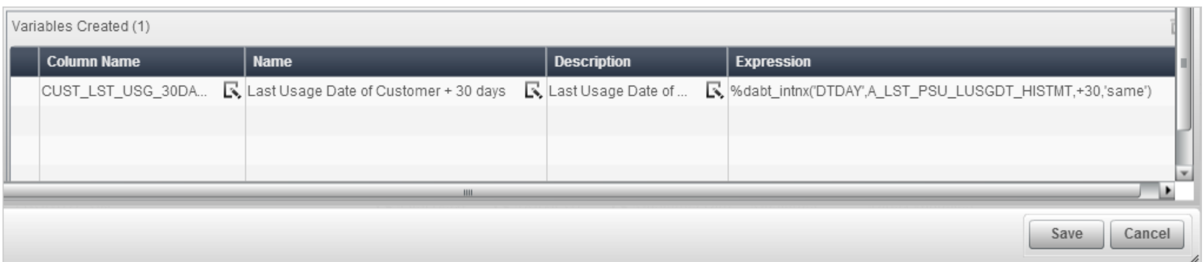
c. In the **Time period** field, type *30*.

d. From the list, select **Day**.

e. Click **OK**. View the expression that is created for the derived variable.

f. Click **Create**. The variable is created in the Variables Created table.

Display 7.30 *Variable: Date Operations*



g. Click **Save**.

Example: Create an Arithmetic Derived Variable Based on a Prebuilt Formula

Assume that you have defined a series of four behavioral variables that indicates the customer's total duration of outbound voice calls for each month. You want to define an expression that computes the discontinuity in the series of duration of outbound voice calls in the past four months. To do so, you have to define an arithmetic derived variable whose expression is generated based on a prebuilt formula.

To define this variable, complete these steps:

1. In the New Variable window, select **Arithmetic Derived Variable** in the left navigation pane.
2. Specify the following details for the variable:

   a. From the **Type of expression** list, select **Based on Prebuilt Formula**.

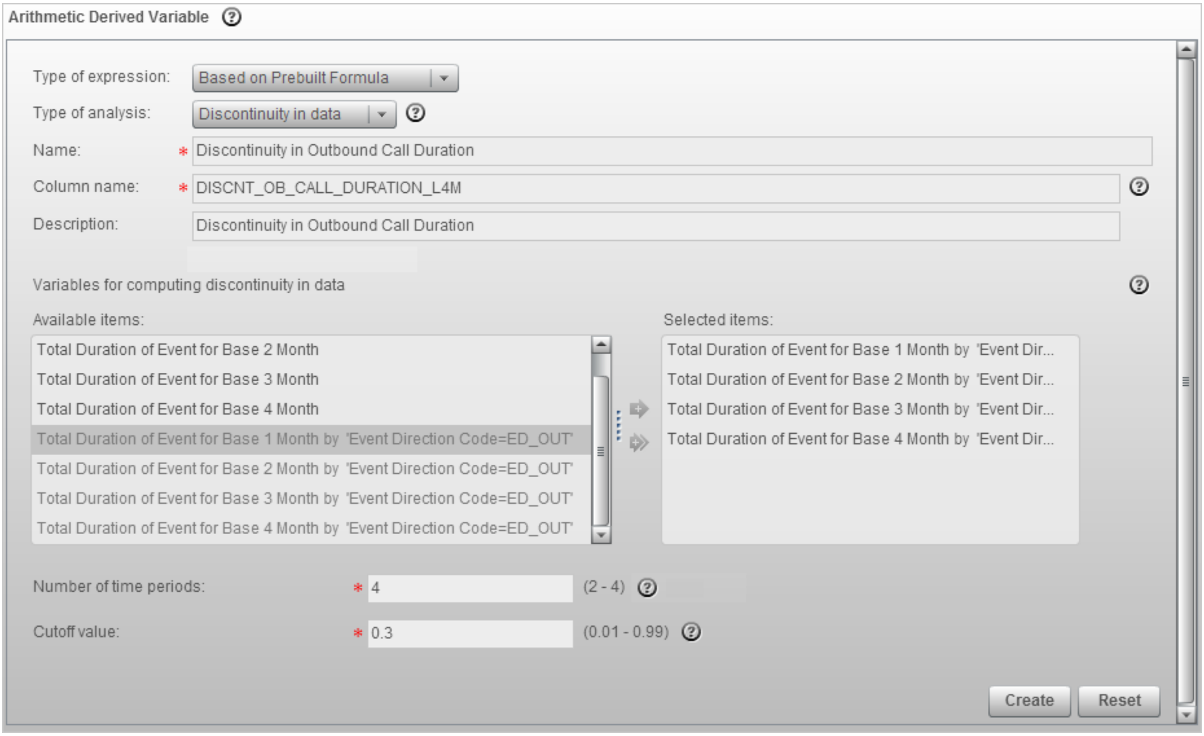
   b. From the **Type of analysis** list, select **Discontinuity in data**.

   c. In the **Name** field, you can enter *Discontinuity in Outbound Call Duration*.

   d. In the **Column name** field, you can enter *DISCNT_OB_VOC_CALLS_L4M*.

   e. In the **Description** field, you can enter *Formula that computes the discontinuity in the outbound call duration of a customer in the past four months*.
3. Generate the prebuilt formula.

Display 7.31 *Arithmetic Derived Variable: Prebuilt Formula*



a. From the **Available items** list, select the variable that indicates the total duration of outbound voice calls in the Base 1 month. For example, this variable can be a behavioral variable with the name, **Total Duration of Event for Base 1 Month by 'Event Direction Code=ED_OUT'**.

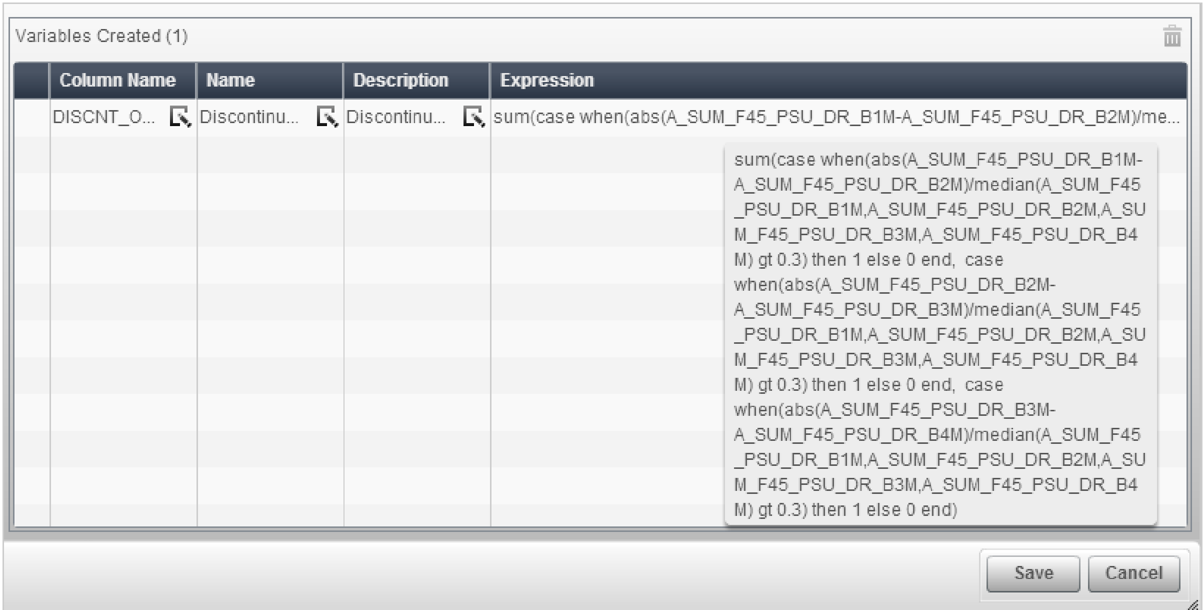
b. Click to add the selected variable to the **Selected items** list.

4. In the **Number of time periods** field, type 4. All the remaining three variables from the series are added to the **Selected items** list.

5. In the **Cutoff value** field, type **0.3**.

6. Click **Create**. In the right pane, view the expression that is created for the derived variable.

Display 7.32 *Arithmetic Derived Variable: Prebuilt Formula*



Create a Logical Derived Variable

When you define an expression for a logical variable, by default, the expression returns a binary value (either 1 or 0). If the expression evaluates to TRUE, it returns 1 and 0 otherwise. However, certain variables require an expression that returns values other than 0 and 1. In this case, SAS Customer Analytics for Communications enables you to configure the results that the expression returns.

For example, for a logical derived variable, you might need to define an expression as mentioned below:

```
CASE WHEN (DIFF > 30 THEN CUST_TERM_DT =LAST_USAGE_DT_30_DAYS)
```

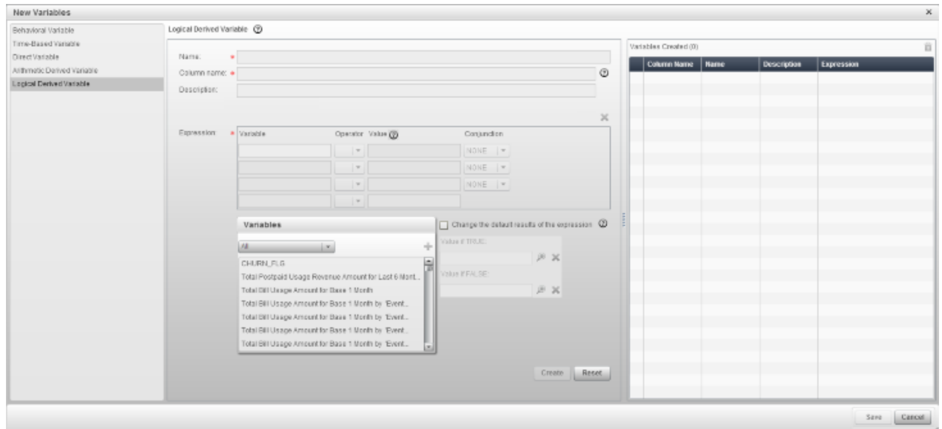
In this expression:

- DIFF is an arithmetic derived variable that you compute based on a date difference (Reference Date — A_LST_PSU_LUSGDT).
- LAST_USAGE_DT_30_DAYS is the result that you can configure if the expression evaluates to TRUE. This can be an arithmetic derived variable that you can define based on date operations (LAST_USAGE_DT +30).
- If the expression evaluates to FALSE, then the expression would return a NULL value.

To create a logical derived variable, complete these steps:

1. In the New Variables window, click **Logical Derived Variable** in the left navigation pane.

Display 7.33 *Logical Derived Variable*



2. In the right pane of the New Variables window, provide information for the following fields:

Name
Enter a name for the variable. The variable is identified with this name in the application interface. The name of a variable must be unique within an ABT and must not exceed 40 characters.

Column name
Enter a name for the corresponding column in the ABT. This is the actual name of the ABT variable (column) as displayed in the ABT. A column name must be a valid name and must not exceed the maximum permissible length. In SAS, the maximum length for the column name is 28 characters. In Teradata, the maximum length for the column name is 26 characters.

Description
Enter a description for the variable. The description must not exceed 200 characters, including spaces.

3. Create an expression for the derived variable.

   a. From the **Variables** list, select a variable. By default, the **Variables** list displays a list of all the existing behavioral, time-based, direct, and arithmetic derived variables. However, you can filter the variables by a particular variable type.

   b. Click + to add the variable to the **Expression** field.

   c. Select the required operator, and then specify one or more values for the variable to form a valid logical condition.

   The value, exactly as you enter it, is used to calculate the value of the variable during the ABT building process. Therefore, you must ensure the syntactical accuracy of the value. Follow these guidelines:

   - For a numeric variable, you must enter a number in the field.
   - For a character variable, you must enter a character or a text string. You must enclose the character or the text string within single quotation marks. 'Y', 'ACTIVE', and 'Wilkes-Barre' are examples of valid character and text strings.

     If a text string contains an apostrophe, you must enclose the text string within double quotation marks. For example, "Coeur d'Alene" is a valid text string.

- You can enter multiple values only if you are using the **IN** or **NOT IN** operator. You must separate each value with a comma. For example, you can enter 'ACTIVE', 'INACTIVE' or 25, 50, 100.
- The values that you enter are case sensitive. You must enter the values in the same case in which they are present in the data source.

Note: If you select the **Is Null** or the **Is Not Null** operator, you cannot specify a value for the variable.

d. If you want to add another logical condition to the variable expression, select the conjunction operator **AND** or **OR**, and then repeat steps a through c.

If you want a record to satisfy the current condition along with the previous condition, select **AND**. If you want a record to satisfy either of the two conditions, select **OR**.

You can add a maximum of four logical conditions in a variable expression. The conditions are resolved in the same order in which they are specified.

e. (Optional) Select the **Change the default result** check box if you want to define the values that the expression returns.

Note: If you do not select the **Change the default result** check box, then 1 is returned if the expression evaluates to TRUE and 0 if the expression evaluates to FALSE.

- Click that is displayed beside **Value if TRUE**. In the Select Value window, select the variable that you want the expression to return if it evaluates to TRUE. You must select a variable for this field. Otherwise, you will not be able to create the variable.

  TIP Click if you want to remove the value that you have selected.

- (Optional) Click that is displayed beside**Value if FALSE**. In the Select Value window, select the variable that you want the expression to return if it evaluates to FALSE.

  TIP Click if you want to remove the value that you have selected.

TIP If the expression returns a NULL value when the expression evaluates to FALSE, then do not specify any value in the **Value if FALSE** field.

f. Click **Create** to create the derived variable. The variable is displayed in the Variables Created table in the New Variables window.

TIP Click **Reset** if you want to discard the values that you have specified so far.

Note: The **Expression** column in the Variables Created table shows the expressions of the logical derived variables. For details, see "Expressions in Logical Derived Variables" on page 100.

4. Repeat steps 2 and 3 to create the required number of variables, and then click **Save**. The New Variables window closes and the saved variables are displayed in the Variables table on the Analytical Base Table page.

TIP Click **Cancel** if you want to discard the created variables.

Expressions in Logical Derived Variables

If the expression of a logical derived variable has multiple conditions joined by AND or OR conjunctions, the expression is generated in a format similar to the following:

```
(CASE WHEN (<variable 1> <operator> <value> AND
<variable 2> <operator> <value> OR
<variable 3> <operator> <value>...) THEN <Value if TRUE> ELSE <VALUE if FALSE> END)
```

For example, you want to define a variable that determines the churn flag for a postpaid subscription based on either of the following conditions:

- The subscription status is DEACTIVATED, CLOSED, or SUSPENDED in the current month.
- There are no outbound and inbound calls in the past three months.

For this variable, you can build the expression as follows:

```
CASE WHEN(SUBS_STATUS_CD IN('DEACTIVATED','CLOSED','SUSPENDED') OR
TOT_PSU_L3M =0) THEN 1 ELSE 0
```

In this expression, SUBS_STATUS_CD is a time-based variable and TOT_PSU_L3M is a behavioral variable.

Example: Creating a Logical Derived Variable

You want to define a target variable for the ABT that you want to build for your customer lifetime project. For this project, the deactivation indicator of a customer can be defined as the target variable. To do so, you can define a logical derived variable. The value of the logical derived variable is 1 if the customer churns before the reference date. The value of the variable is 0 if the customer does not churn before the reference date. In this case, you can build the appropriate expression for your logical derived variable (DEACT_IND) as mentioned below:

```
(CASE WHEN (DIFF >=0 ) THEN 1 ELSE 0 END )
```

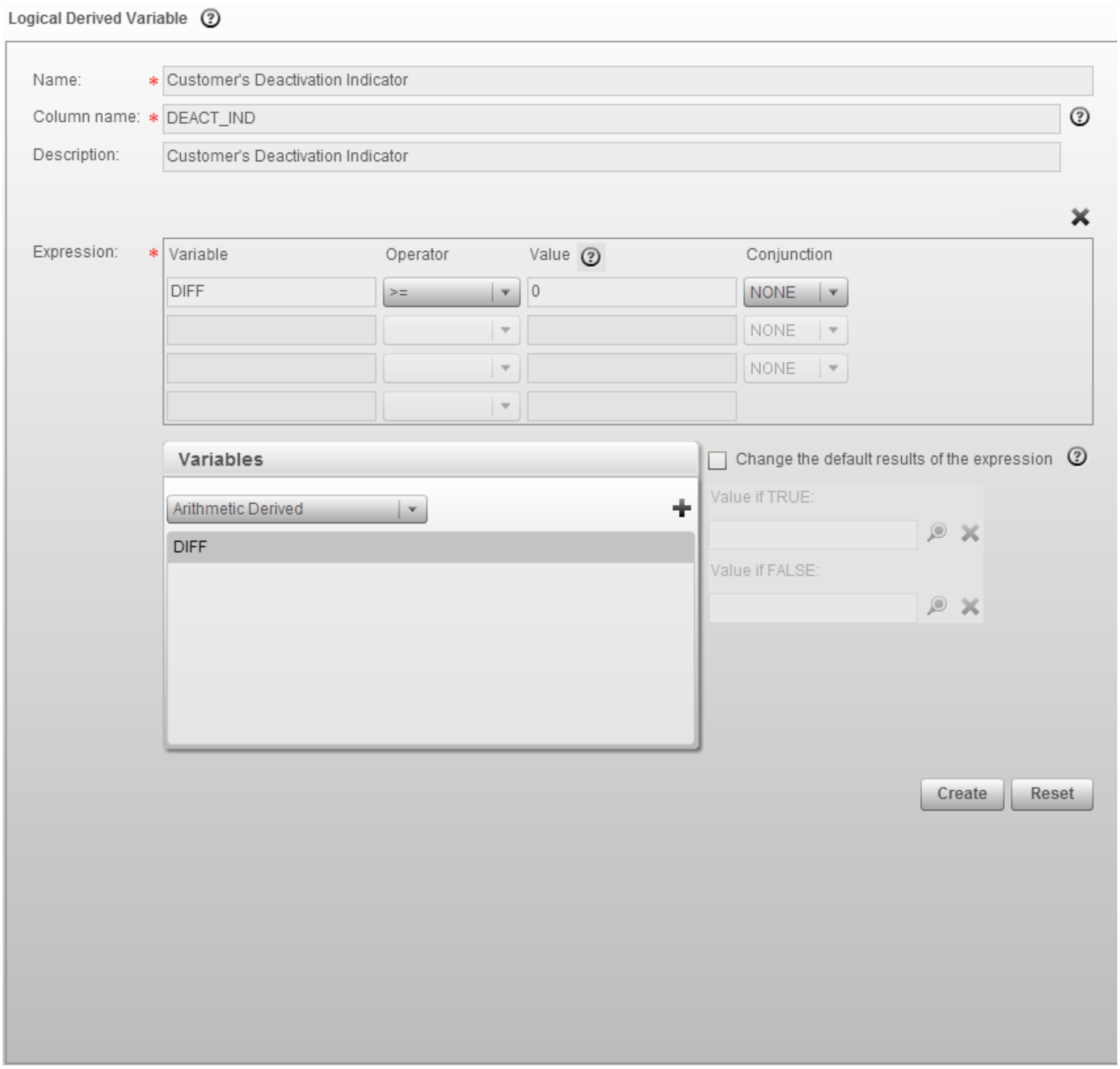
In this expression, DIFF is an arithmetic derived variable that determines the difference between the reference date and the customer’s termination date. The expression indicates that if the difference is greater than or equal to zero, then the customer has churned before the end of the history window. Therefore, the value of DEACT_IND is 1. However, if the customer does not churn before the end of the history window, the value of DEACT_IND is 0.

To do so, you have to define a logical derived variable.

To define this variable, complete these steps:

1. In the New Variables window, select **Logical Derived Variable** in the navigation pane.
2. Enter the following details for the variables:

Display 7.34 *Logical Derived Variable Definition*



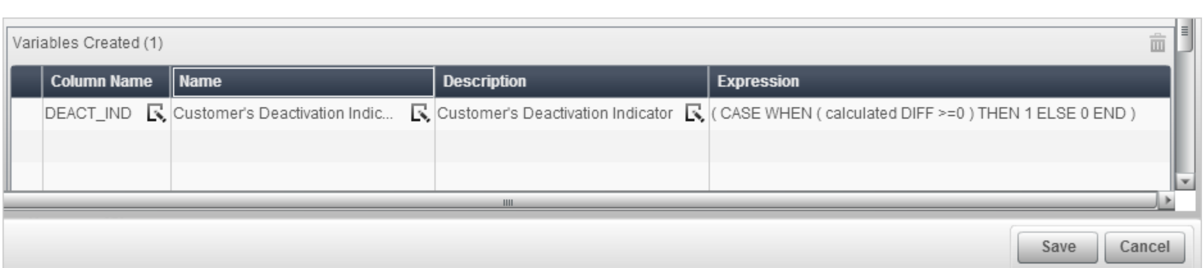
a. In the **Name** field, you can enter *Customer's Deactivation Indicator*.

b. In the **Column name** field, you can enter *DEACT_IND*.

c. In the **Description** field, you can enter *Customer's Deactivation Indicator*.

3. Define the expression.

Display 7.35 *Logical Derived Variable: Expression*



a. From the **Variables** list, filter on the **Arithmetic Derived** variables. Select the variable that indicates the difference between the reference date and customer's deactivation date. For example, this variable can be **DIFF**.

b. Click to add the selected variable.

c. From the **Operator** list, select >=.

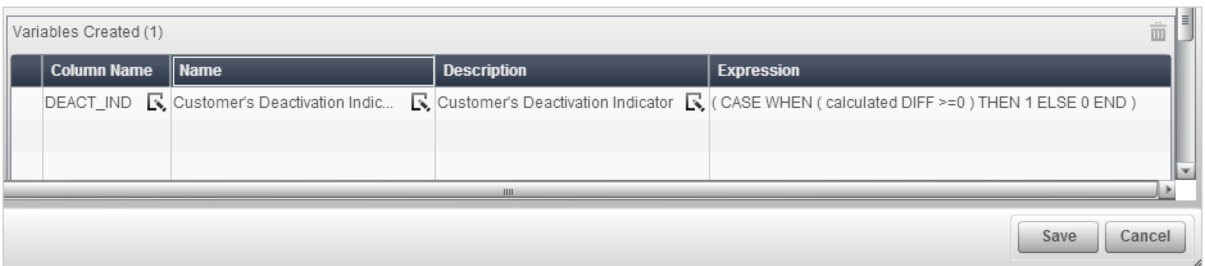
d. In the **Value** field, type *0*.

4. Click **Create**.

5. Click **Save**. The variable is added in the Variables Created table.

6. (Optional) View the expression that is built in the **Expression** column:

Display 7.36 *Logical Derived Variable: Expression*




```
( CASE WHEN ( DIFFF >=0 ) THEN 1 ELSE 0 END )
```

Other Possible Tasks in the New Variables Window

Viewing the Properties of a Variable

For each data source, SAS Customer Analytics for Communications creates a variable for each possible combination of the variable attributes that you have selected. You can view the properties of a variable in the Variables Created table. The details that are displayed in this table differ depending on which type of variable you choose and the data source that you select. The **From** field that is displayed above the Variables Created table indicates the data source for which the variables are created.

Editing the Name, Column Name, and Description of a Variable

Variables are automatically generated based on the specified measures and variable attributes. As a result, there might be duplicate variable column names (that is, two or more variables with the same column name). Also, the names and column names might exceed their maximum length. The maximum length for names is 250 characters. On SAS, the maximum length for column names is 28 characters. On Teradata, the maximum length for column names is 26 characters. Such variables are marked with indicating that properties of these variables contain errors. Before you can save these variables, you must resolve the indicated errors. You can change the default values according to your requirement.

Click to change the name, column name, or the description.

Note: If you rename the column name of a behavioral variable, make sure that it is not the same as the column name of the measure that is used to derive that variable.

Deleting Variables

Based on the variable attributes you specify, SAS Customer Analytics for Communications creates variables for each unique combination of these attributes. However, you might not need all the variables that are created in the Variables Created table. You can delete such variables. Select the variable that you want to delete and click .

Edit Variable Properties

On the Analytical Base Table page, the Variables table displays a list of all the variables that are available in the selected ABT. You can filter the variables by a particular variable type.

In the Variables table, you can edit a variable's name, column name, and description. To do so, click .

The icon beside a variable indicates that the variable is a linked variable (that is, the variable is used in one or more derived variables). When you edit the column name of a linked variable, the expression of the derived variables that contain this linked variable are automatically updated to use the changed column name.

Importing Variables

Overview

In addition to creating new variables for your ABT, you can import variables from an existing ABT that is in a project that you have created. If you want to import variables from an ABT that is in a project that was created by another user, that ABT must be shared.

You can import variables from a source ABT based on the following conditions:

- The level at which the ABT is built (such as customer or subscription) is the same for both the source and the target ABT.
- The level of data aggregation is the same for both the ABTs. For example, the level of data aggregation for the source ABT is Monthly. In this case, you can import variables from this ABT only if the target ABT has a Monthly level of data aggregation.

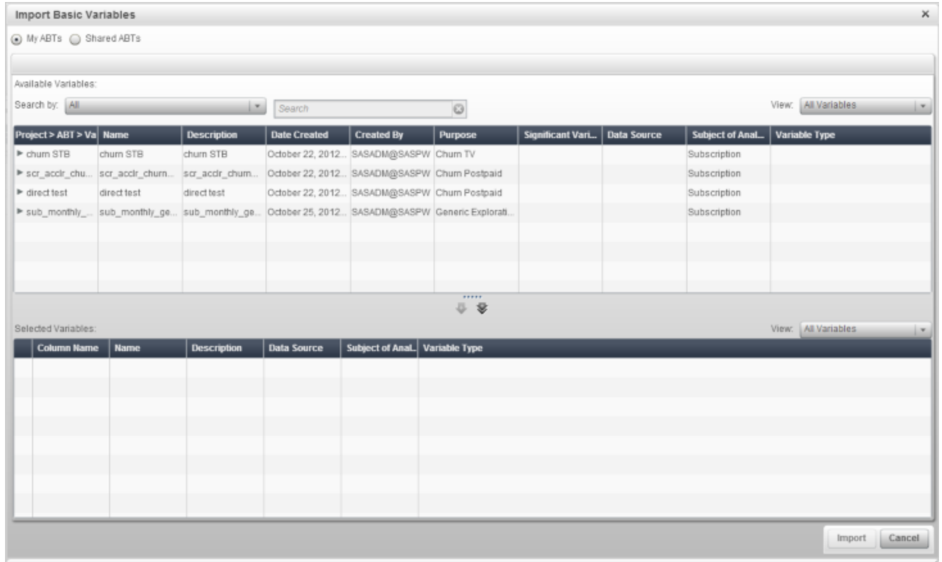
When you import a derived variable, all the variables that constitute the derived variable are also imported.

Import Basic Variables

To import basic variables from an ABT, complete these steps:

1. Select the Analytical Base Table page.
2. On the toolbar, click , and then select **Import Basic Variables**. Alternatively, on the toolbar, select **Menu** ⇨ **Import** ⇨ **Basic Variables**. The Import Basic Variables window appears.

Display 7.37 *Import Basic Variables Window*



Using the Import Basic Variables window, you can import the basic variables, which include behavioral variables, time-based variables, and direct variables, from an ABT.

3. Select **My ABTs** if you want to import variables from the projects that you have created. Select **Shared ABTs** if you want to import variables from the projects that other users have created and shared.

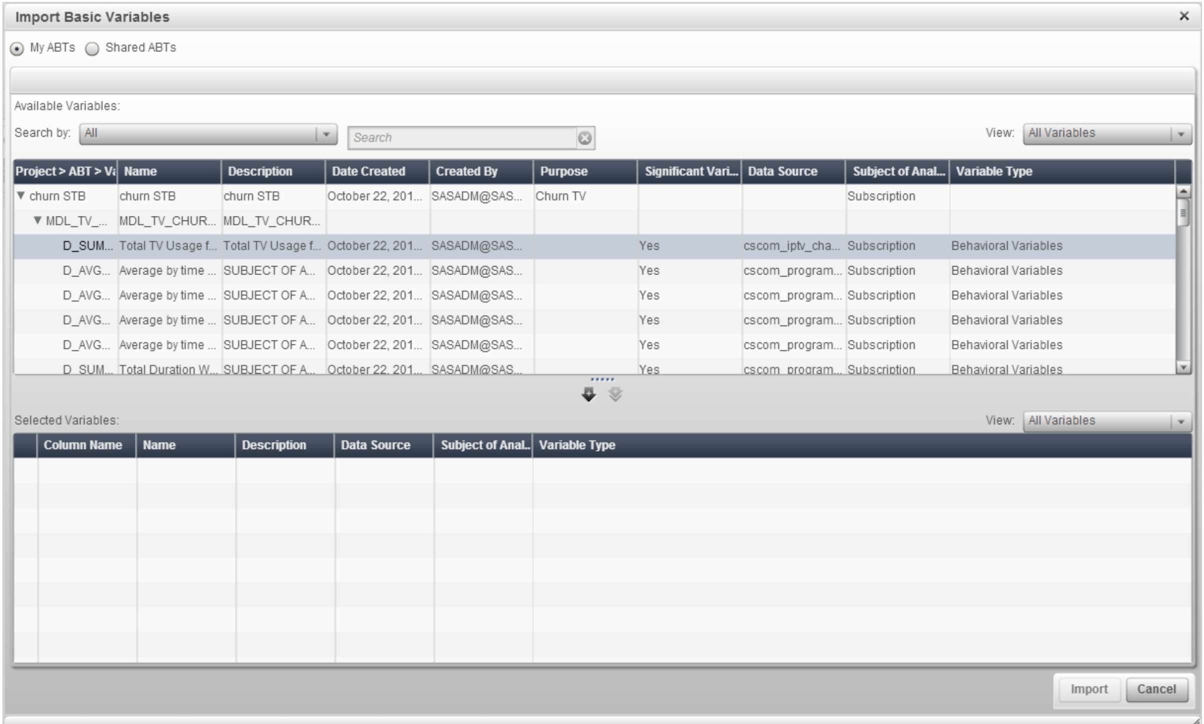
   - If you select **My ABTs**, the Available Variables table displays a list of all the projects that you have created. You can import variables from any of the projects.
   - If you select **Shared ABTs**, the Available Variables table displays a list of all the projects that have been created by other users and that have their ABTs shared. You can import variables from any of the projects.

   Note: The first column of the Available Variables table shows information at three levels: project, ABT, and variables. You can click ▶ to expand a level and view the values at the next level. Other columns show information with respect to the information in the first column. For example, for a project, the **Date Created** column shows the date when the project was created. However, for an ABT, the **Date Created** column shows the date when the ABT was created.

4. In the Available Variables table, expand a project to view the ABT in that project. Further expand the ABT to view the list of behavioral, time-based, and direct variables in that ABT. By default, the table displays all three types of variables that the ABT contains. However, you can filter the variables by a particular variable type by selecting that variable type from the **View** list.

   You can also use the **Search by** feature to search for a variable.

Display 7.38 *Import Basic Variables Window*



Note: A dimmed variable in the Available Variables table indicates that a variable with the same definition already exists in your current ABT.

5. Select the variables that you want to import, and then click to add the selected variables to the Selected Variables table.

   After you add a variable to the Selected Variables table, the variable appears dimmed in the Available Variables table.

   TIP

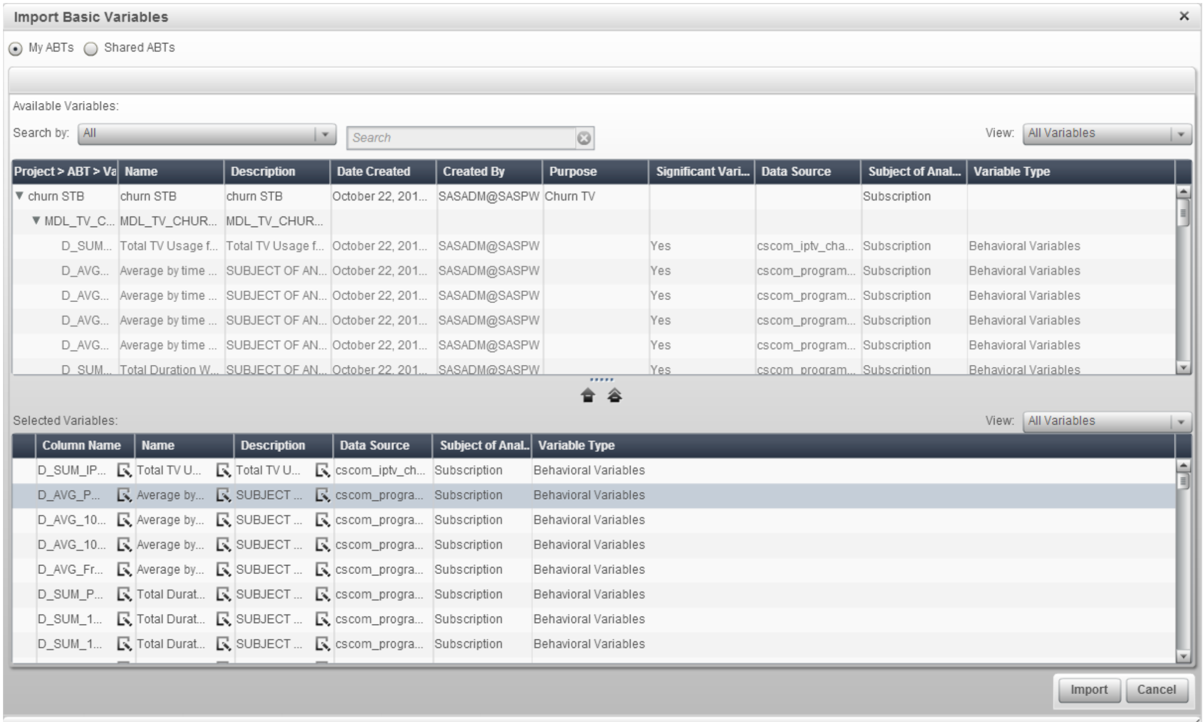
   - To select multiple adjacent variables, select a variable, hold down the Shift key, and then use the down arrow key to select the variables.
   - To select multiple nonadjacent variables, select a variable, and then hold down the Ctrl key while you click other variables that you want to select.
   - Click if you want to add all the variables that are currently displayed in the Available Variables table to the Selected Variables table.
   - If you want to remove a variable from the Selected Variables table, select the variable, and then click .
   - If you want to remove all the variables from the Selected Variables table, click .

6. Repeat steps from 2 to 5 to select variables from other ABTs.

   If a selected variable has the same column name as that of an existing variable in the ABT, an error icon is displayed next to the variable in the Selected Variables table. Change the column name of the variable before you import the variable.

7. After you have added the desired variables to the Selected Variables table, click **Import**.

Display 7.39 *Import Basic Variables Window*



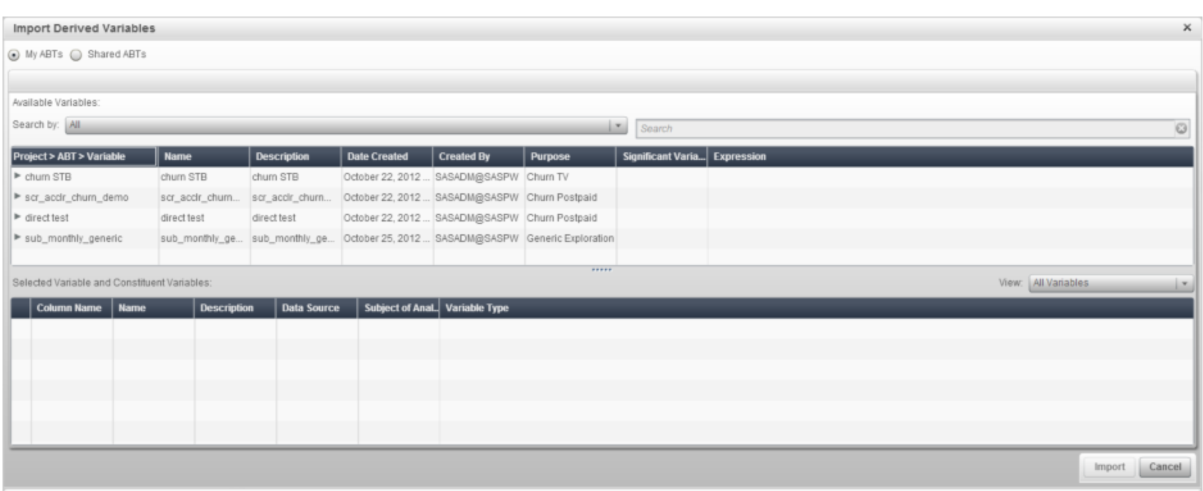
The Import Basic Variables window closes, and the imported variables are displayed in the Variables table in the Analytical Base Table page.

Import Derived Variables

To import derived variables from an ABT, complete these steps:

1. Select the Analytical Base Table page.
2. On the toolbar, click , and then select **Import Derived Variables**. Alternatively, on the toolbar, select **Menu** ⇨ **Import** ⇨ **Derived Variables**. The Import Derived Variables window appears.

Display 7.40 *Import Derived Variables Window*



Using the Import Derived Variables window, you can import the derived variables, which include arithmetic derived variables and logical derived variables, from an ABT.

3. Select **My ABTs** if you want to import variables from the projects that you have created. Select **Shared ABTs** if you want to import variables from the projects that other users have created.

   - If you select **My ABTs**, the Available Variables table displays a list of all the projects that you have created. You can import variables from any of the projects.
   - If you select **Shared ABTs**, the Available Variables table displays a list of all the projects that have been created by other users and that have their ABTs shared. You can import variables from any of the projects.

   Note: The first column of the Available Variables table shows information at three levels: project, ABT, and variables. You can click ▶ to expand a level and view the values at the next level. Other columns show information with respect to the information in the first column. For example, for a project, the **Date Created** column shows the date when the project was created. However, for an ABT, the **Date Created** column shows the date when the ABT was created.

4. In the Available Variables table, expand a project to view the ABT in that project. Further expand the ABT to view the list of arithmetic derived variables and logical derived variables in that ABT.

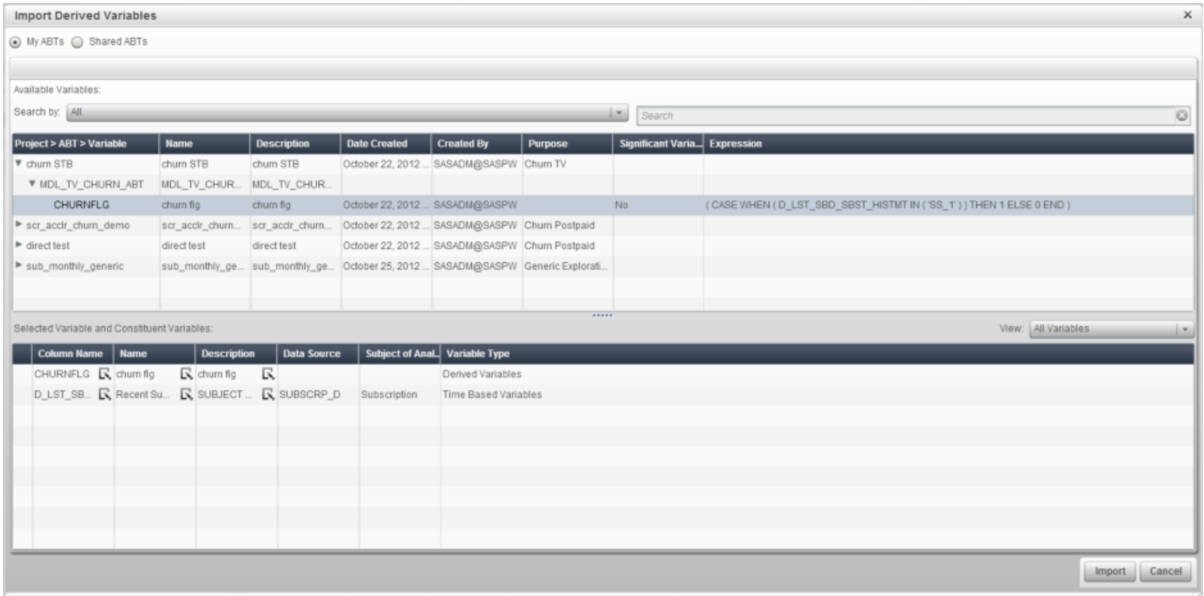
5. In the Available Variables table, select the variable that you want to import. The Selected Variable and Constituent Variables table displays the selected derived variable and the variables that constitute that derived variable.

   Note: In the Available Variables table, you can select only one variable at a time.

   If a constituent variable has the same column name as that of an existing variable in the ABT, an error icon is displayed next to the constituent variable in the Selected Variable and Constituent Variables table. Change the column name of the constituent variable, and then import the derived variable.

   If a constituent variable has the same definition as that of an existing variable in the ABT, the constituent variable is not displayed in the Selected Variable and Constituent Variables table. Also, it is not imported into the ABT. The expression of the derived variable is automatically updated to use the existing variable.

Display 7.41 *Import Derived Variables Window*



6. Click **Import**.

   Note: When you import a derived variable, the variables that compose that derived variable are also imported in the ABT. You cannot delete these variables. If you do not want to use these variables to build the model, you must mark them **Rejected** in SAS Enterprise Miner.

7. (Optional) Repeat steps from 3 to 6 to import variables from other ABTs.

Share ABT

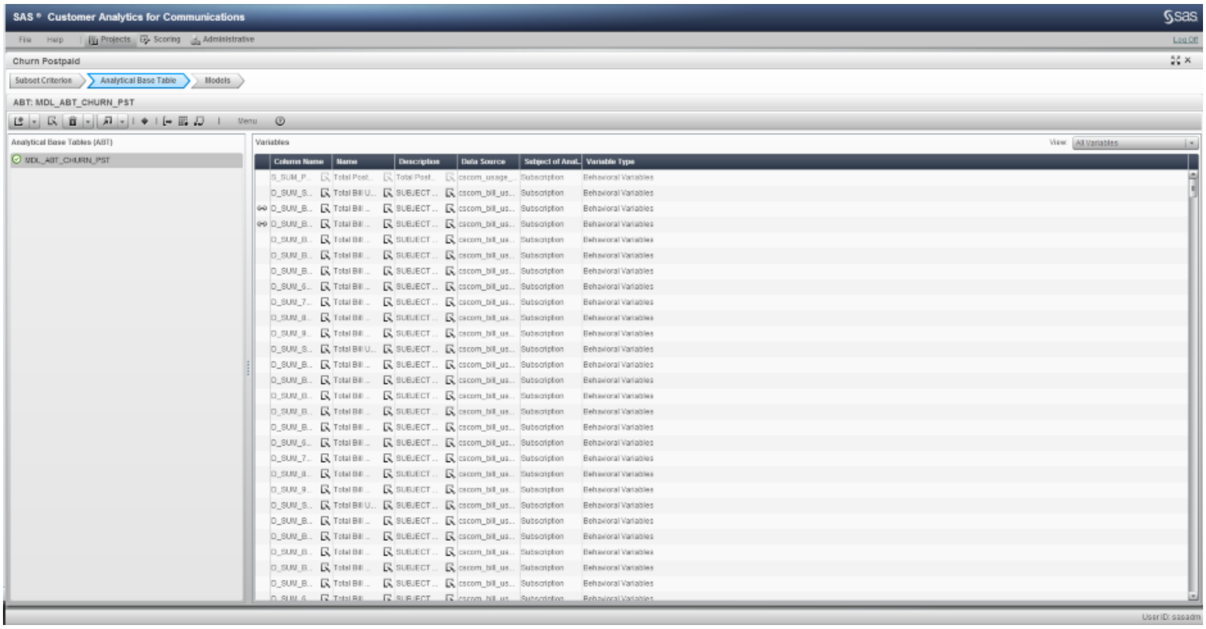
The variables that you create for an ABT in a project are available across all your projects. That is, you can import and use those variables in any of your projects. However, if you want those variables to be available to other users' projects as well, you must share the ABT that contains those variables.

You can share your ABT any time after you have defined it. This feature enables other users to import all the variables that you have already created for your ABT and the variables that you might create in the future.

To share an ABT, complete these steps:

1. Select the Analytical Base Table page.

Display 7.42 *Analytical Base Table Page: Share ABT*



2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Share ABT**.

Note: When you share an ABT, all the variables in that ABT are shared. It is not possible to share variables selectively.

Stop Sharing an ABT

To stop other users from importing variables from your ABT, on the toolbar of the **Analytical Base Table** page, click . Alternatively, on the toolbar, select **Menu** ⇨ **Stop Sharing**.

Defining an Outcome Variable

Overview of an Outcome Variable

Typically, an outcome variable (also known as a dependent variable or target variable) defines the event of interest. For example, in a customer retention project, the event that is under consideration is customer churn.

An outcome variable indicates whether the associated event occurred within the specified period. For example, in a customer retention project, the outcome variable (CHURN) has a value of 1 (one) for a customer who churned within the specified outcome period. For a customer who did not churn during the specified outcome period, the outcome variable has a value of 0 (zero).

In a customer retention project, during the scoring process, the model generates the probability of the outcome variable having a value of 1. This value gives the probability that customer churns.

An outcome variable is mandatory for a project that is created to predict a certain event such as cross-sell, up-sell, or customer retention. That is, a project that is created to predict a certain event must have an outcome variable in its ABT in addition to other variables (input variables). An outcome variable is not required for a customer segmentation project.

An outcome variable can be a basic variable (behavioral, time-based, or direct) or a derived variable (arithmetic derived variable or logical derived variable). Typically, an outcome variable is a logical derived variable that stores values in the form of 0 or 1. These values indicate the occurrence of the event that is under consideration. For details, see "Recommended Purpose-Specific Outcome Variables" on page 190.

Define an Outcome Variable

To mark a variable as an outcome variable, complete these steps:

1. On the Analytical Base Table page, select the variable that you want to mark as an outcome variable.
2. On the toolbar, click, . Alternatively, on the toolbar, select **Menu** ⇨ **Mark as Outcome Variable**.

You can have only one outcome variable in an ABT. The Variables table displays beside an outcome variable.

If you want a different outcome variable, select that variable, and click on the toolbar.

Delete Variables

To delete the variables in an ABT, complete these steps:

1. On the Analytical Base Table page, select the variable that you want to delete.

   TIP

   - To select multiple adjacent variables, select a variable, hold down the Shift key, and then use the down arrow key to select the variables.
   - To select multiple nonadjacent variables, select a variable, and then hold down the Ctrl key while you click other variables that you want to select.
2. On the toolbar, click , and then select **Delete Variable**. Alternatively, on the toolbar, select **Menu** ⇨ **Delete** ⇨ **Variable**.
3. In the confirmation message box that appears, click **Yes**.

Deploying a Modeling ABT

When you define an ABT and define its variables, SAS Customer Analytics for Communications provides you the capability to deploy the ABT. When you deploy the ABT, the information that is required to build the ABT is made available at the following location: . This information is in the form of objects such as certain staging tables and query files. Your administrator can build the ABT at any time later based on this information.

Note: If you change any details of the ABT or its variables, you have to deploy the ABT again. Otherwise, the ABT will not be built based on the latest information.

To deploy a modeling ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that you want to deploy.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Deploy ABT**.

   A message is displayed to indicate whether the ABT is successfully deployed.

SAS Customer Analytics for Communications provides a SAS macro to build the ABT. Your administrator can call this macro in a suitable environment such as SAS Data Integration Studio and build the ABT at any point of time. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Building an ABT

About the ABT Building Process

After you have defined an ABT and its variables (columns) and marked one of the variables as outcome variable (if required), you can build the ABT. When you build an ABT, it is created, and its variables are populated with data. After an ABT is built, it can be used as an input to a model.

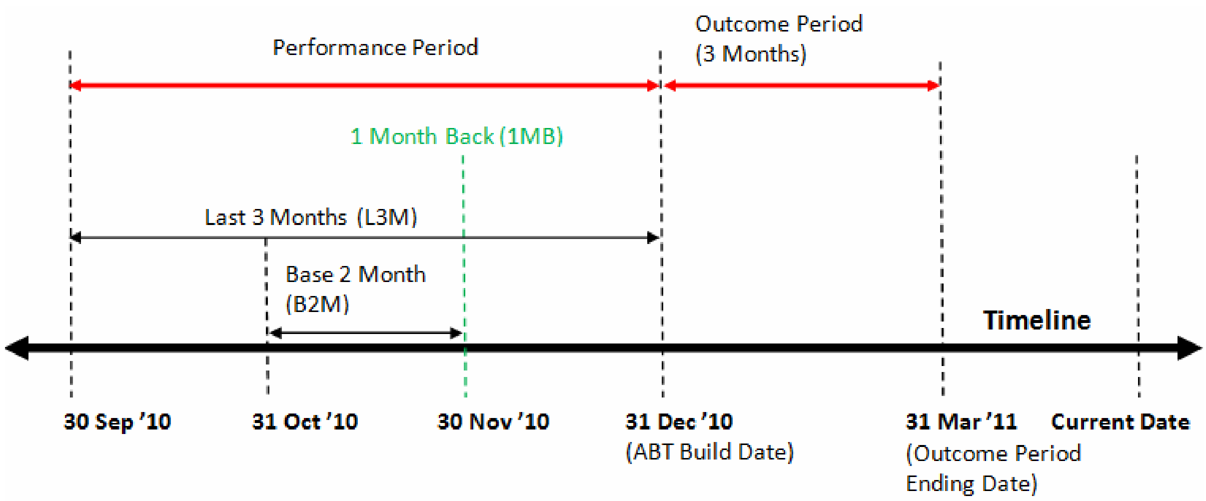
The values for the variables of an ABT are calculated with reference to the ABT build date—that is, the date that you specify when you build the ABT. However, value for the outcome variable of the ABT is calculated with reference to the outcome period end date —that is, the last day of the outcome period. Calculate the outcome period end date by adding the outcome period (a specified number of days, weeks, or months) to the ABT build date.

For example, let us consider that you have an ABT that has the following variables:

- behavioral variable, D_CNT_SPI_L3M, which computes the number of customer interactions in the past three months
- time-based variable, D_LST_SPI_INTCAT_B2M_INTDT, which computes the interaction category for the most recent interaction in the second month before the ABT build date
- direct variable, D_SBD_SBST_1MB, which indicates the subscription status as of the date, which is 1 month before the ABT build date
- logical derived variable, CHURN_FLG, with the following expression:

```
(CASE WHEN (D_CNT_SPI_L3M < 3) AND (D_LST_SPI_INTCAT_B2M_INTDT = 'BILLING')
AND D_SBD_SBST_1MB IN ('DEACTIVATED','SUSPENDED','CLOSED') THEN 1 ELSE 0
```

***Figure 7.1** Time Window*



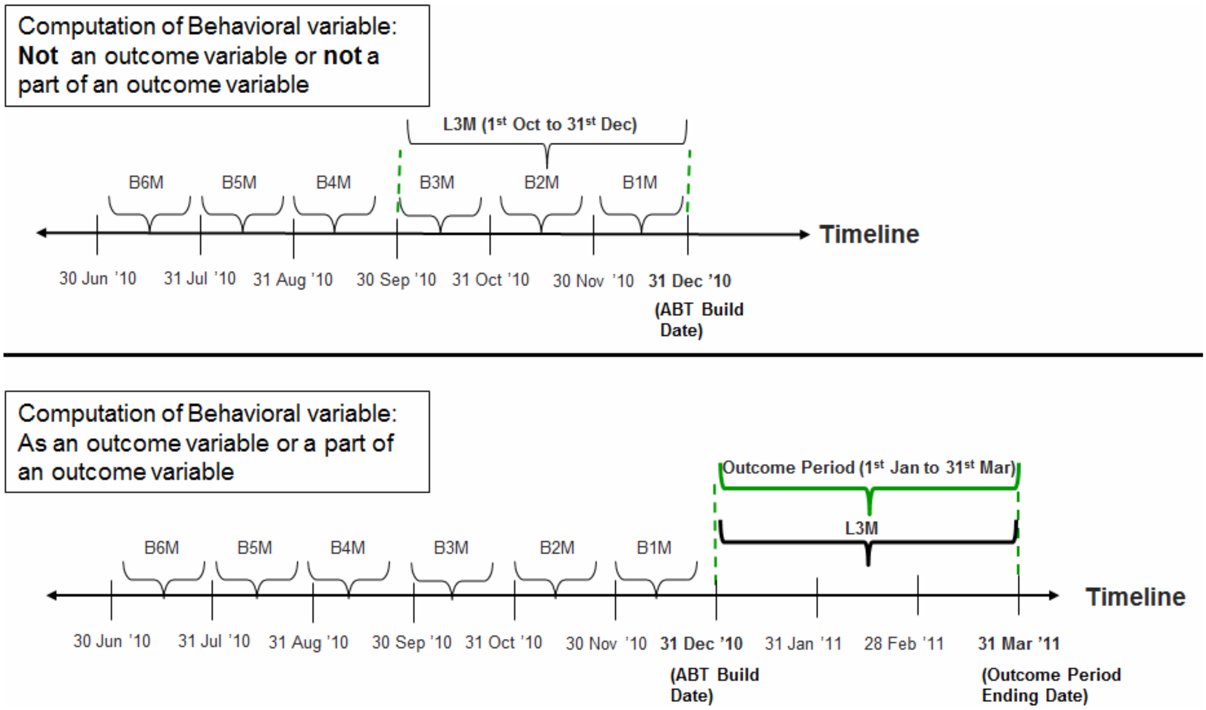
CHURN_FLG is marked as outcome variable. When you build your ABT with reference to the ABT build date (that is, **31 Dec 2010** as shown in Figure 7.1, the values for these variables are calculated as follows:

- D_CNT_SPI_L3M is the total number of interactions (for the given subscription) that were initiated during **1 Oct 2010 - 31 Dec 2010**.
- D_LST_SPI_INTCAT_B2M_INTDT contains the category of the customer's last interaction in the period from **1 Nov 2010 - 30 Nov 2010**.
- D_SBD_SBST_1MB shows the status of the subscription as on **1 Dec '2010**

CHURN_FLG is marked as outcome variable. Therefore, the value for this variable is calculated with reference to the outcome period end date—that is, **31 Mar 2011**. Because CHURN_FLG is based on three other variables, the values for these variables are calculated again with reference to the outcome period end date. However, these values are calculated temporarily and are not stored in the ABT.

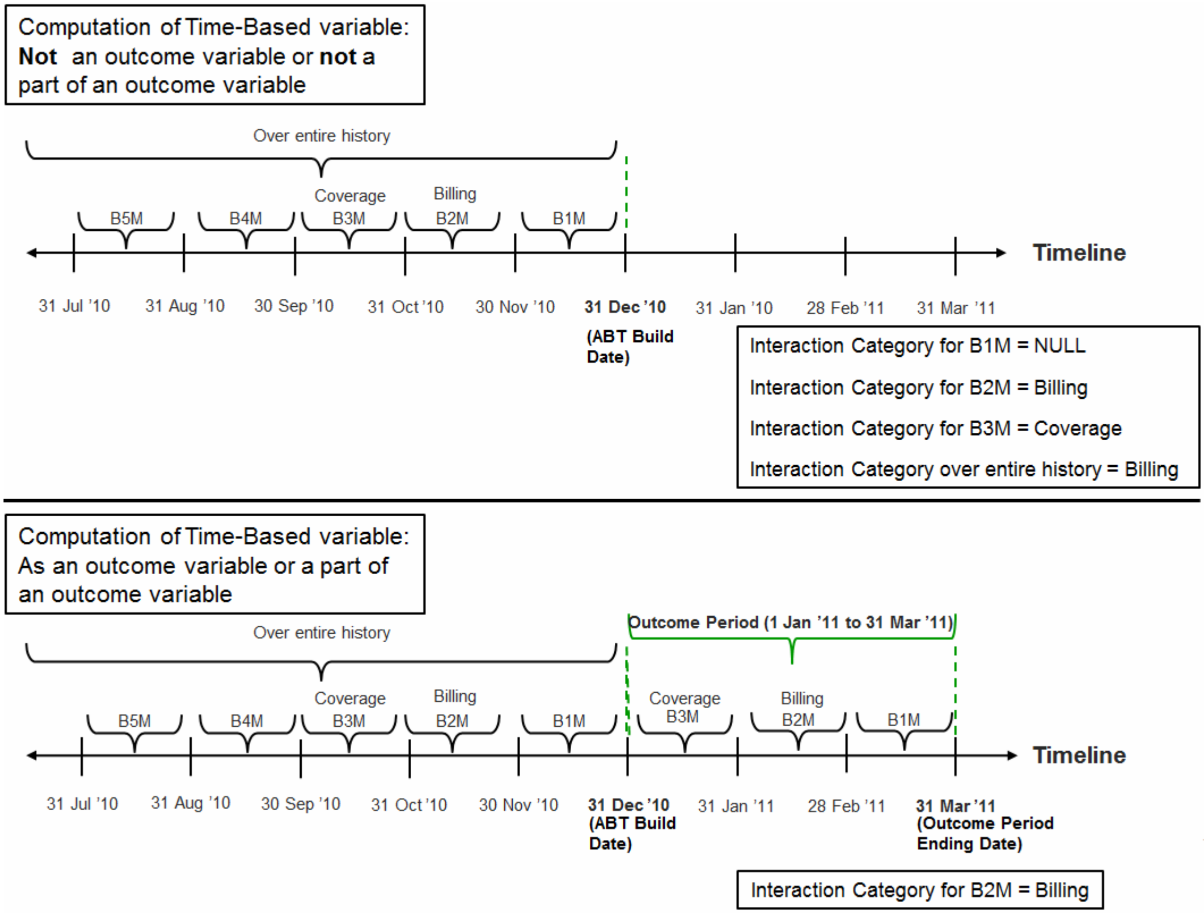
- D_CNT_SPI_L3M contains the total number of transactions (for the given subscription) that were performed during **1 January 2011 - 31 Mar 2011**.

Figure 7.2 *Computing Value for Behavioral Variable*



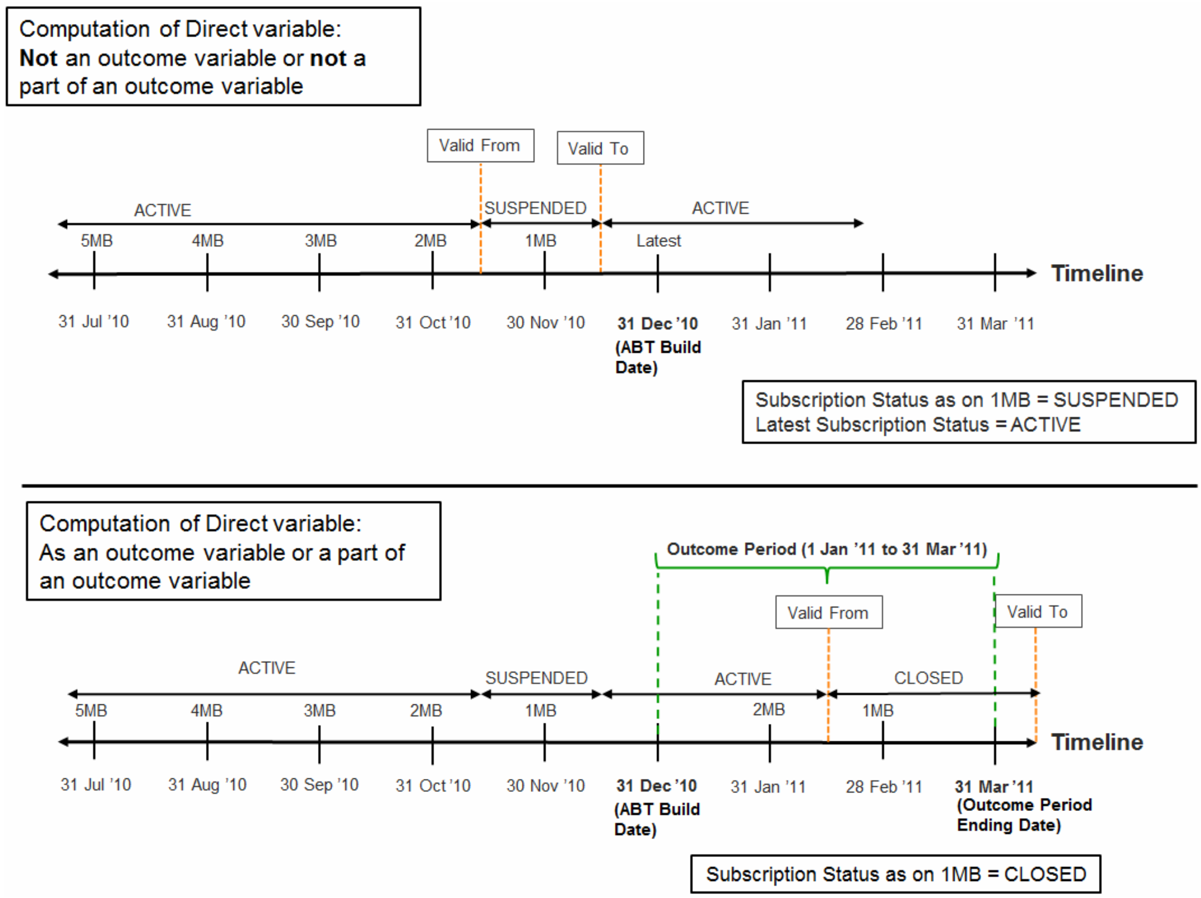
- D_LST_SPI_INTCAT_B2M_INTDT contains the category of the customer's most recent interaction that occurred in the period **1 Feb 2011 – 28 Feb 2011**.

Figure 7.3 *Computing Value for Time-Based Variable*



- D_SBD_SBST_1MB shows the status of the subscription as on **28 Feb '2011**.

Figure 7.4 *Computing Value of Direct Variable*



- If the total number of customer interactions during **1 Jan 2011 - 31 Mar 2011** is less than 3, the category of the most recent interaction in the period **1 Feb 2011- 28 Feb 2011**is BILLING, and the subscription status as on **28 Feb 2011** is either DEACTIVATED, SUSPENDED, or CLOSED, CHURN_FLG contains a value of 1. This value indicates that the subscription churned during the outcome period.

In the final ABT, D_CNT_SPI_L3M, D_LST_PCI_INTCAT_B2M_INTDT, and D_SBD_SBST_1MB contain values with reference to the ABT build date (**31 Dec 2010**). However, CHURN_FLG contains a value with reference to the outcome period end date (**31 Mar 2011**).

Outcome-Based Filtering

When an ABT is built, it contains one record for each subject (customer or account) that meets the following conditions as of the ABT build date:

- subset criterion defined in the project
- implicit filter criteria, if applicable
- filter conditions in the subject group of the project

According to the default configuration, SAS Customer Analytics for Communications applies an outcome-based filter on modeling and scoring ABTs. That is, during the modeling ABT building process or the scoring process, the subjects such as customers or subscriptions that meet the event under consideration during the performance period are not included in the final ABT. For example, in a retention project, the subscriptions that churn during the performance period are not included in the final ABT.

The records are filtered based on the definition of the outcome variable in the ABT. The value for the outcome variable is temporarily calculated with reference to the ABT build date. The final ABT contains only those records for which the value of the outcome variable (as of the ABT build date) is 0—that is, the records that do not meet the event under consideration during the performance period. The final ABT does not contain the records for which the value of the outcome variable (as of the ABT build date) is 1.

For example, consider that you have an ABT that has the following variables:

- LST_SUB_STATUS (a time-based variable that gives the current status code of a subscription)
- CHURN = IF LST_SUB_STATUS IN (‘CLOSED’, ‘DEACTIVATED’, ‘SUSPENDED') THEN 1 ELSE 0

CHURN is marked as an outcome variable. Let us consider that you build your ABT with reference to 31 Dec 2010 (as shown in Figure 7.1) for a given subscription. The value of the LST_SUB_STATUS variable with reference to the ABT build date (performance period) is ‘CLOSED’. In this case, the expression for the CHURN variable would return a value 1. Therefore, the final ABT will not contain the record for this subscription.

For more information about how to change the default configuration, see *SAS Customer Analytics for Communications: Administrator’s Guide*.

Build-Date Cap

According to the default configuration, SAS Customer Analytics for Communications applies a build-date cap when calculating the value of an outcome variable for a modeling ABT. That is, if the variables involved in the calculation of the outcome variable refer to a period that spans beyond the outcome period, then only the data pertaining to the outcome period is considered for the calculation.

For example, let us consider that you have an outcome variable (CHURN_FLG) with the following definition:

(CASE WHEN(D_CNT_SPI_INTCNT_L6M < 3) AND (BD_SUM_SBU_BLUA_B3M < 100) AND D_SBD_SBST IN('DEACTIVATED','SUSPENDED','CLOSED') THEN 1 ELSE 0

Out of the three variables on which the outcome variable CHURN_FLG is based, the D_CNT_SPI_INTCNT_L6M variable contains the total number of customer interactions in the past six months. However, let us consider that you have specified an outcome period of three months (as shown in Figure 7.1).

When the value of CHURN_FLG is calculated (with reference to the outcome period end date), the values of the three variables on which CHURN_FLG is based are also temporarily calculated. However, according to the default configuration, the D_CNT_SPI_INTCNT_L6M will contain data pertaining to only three months—that is, it will contain the total number of transactions that were performed during **31 Dec 2010 - 31 Mar 2011**. The number of transactions that were performed during **30 Sep 2010 - 31 Dec 2010** will be ignored.

For more information about build-date cap and to change the default configuration, see *SAS Customer Analytics for Communications: Administrator’s Guide*.

About Stacked ABT

Generally, an ABT contains data with reference to a single date (ABT build date). This ABT can be referred to as a standard ABT. A standard ABT contains one record (with reference to the ABT build date) for each subject of analysis that satisfies the specified subset criterion as of the ABT build date.

However, if you want to have data in your ABT with reference to multiple dates, you must create a stacked ABT. When you create a stacked ABT, you specify multiple dates. For each date that you specify, a temporary ABT is created. Each temporary ABT contains one record (with reference to the corresponding date) for each subject that satisfies the specified subset criterion as of the corresponding date. The final ABT (stacked ABT) contains records from all of these temporary ABTs. Thus, the final ABT contains multiple records (each with reference to one of the specified dates) for each subject.

Note: If there is no data available for a subject with reference to a specified date, the corresponding temporary ABT will not contain a record for that subject. Therefore, for a given subject, a stacked ABT might not always contain records with reference to all the dates that you specify.

A stacked ABT might contain duplicate records for a subject. To uniquely identify each record, a stacked ABT contains an extra column (BUILD_DTTM) in addition to its defined variables. This column contains the date on which the record was retrieved.

Build an ABT

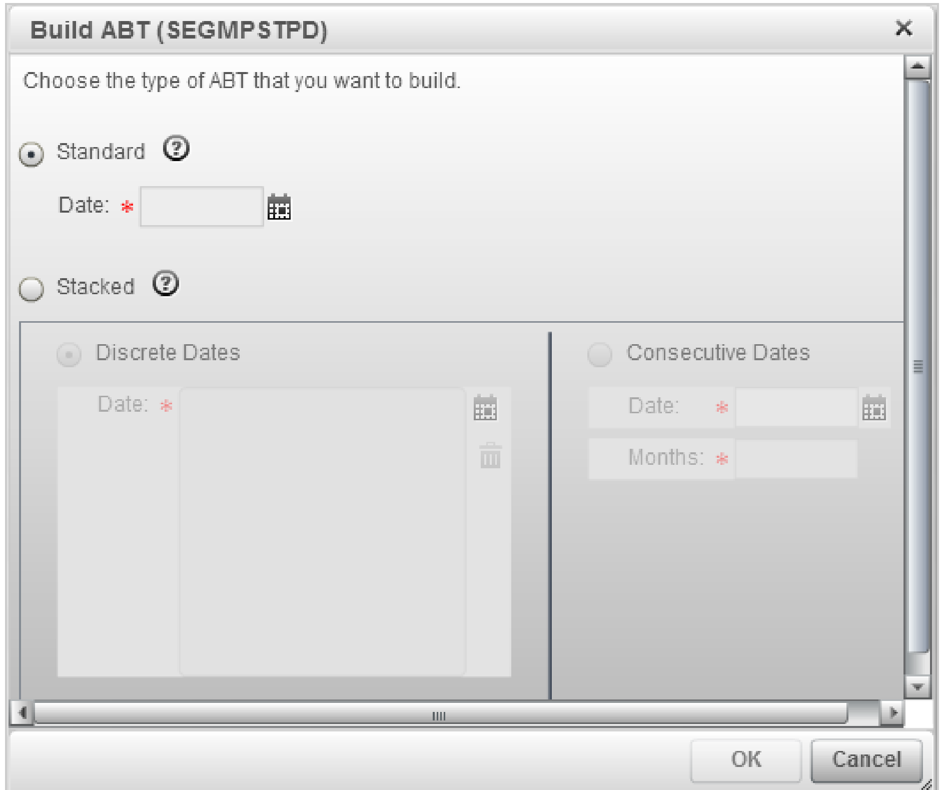
To build an ABT, complete these steps:

1. On the Analytical Base Table page, select the ABT that you want to build.

   Note: Currently, SAS Customer Analytics for Communications supports only one ABT per project.

2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Build ABT**. The Build ABT window appears.

Display 7.43 *Build ABT Window*



3. Depending on whether you want to build a standard ABT or a stacked ABT, select **Standard** or **Stacked**.

   - Standard ABT

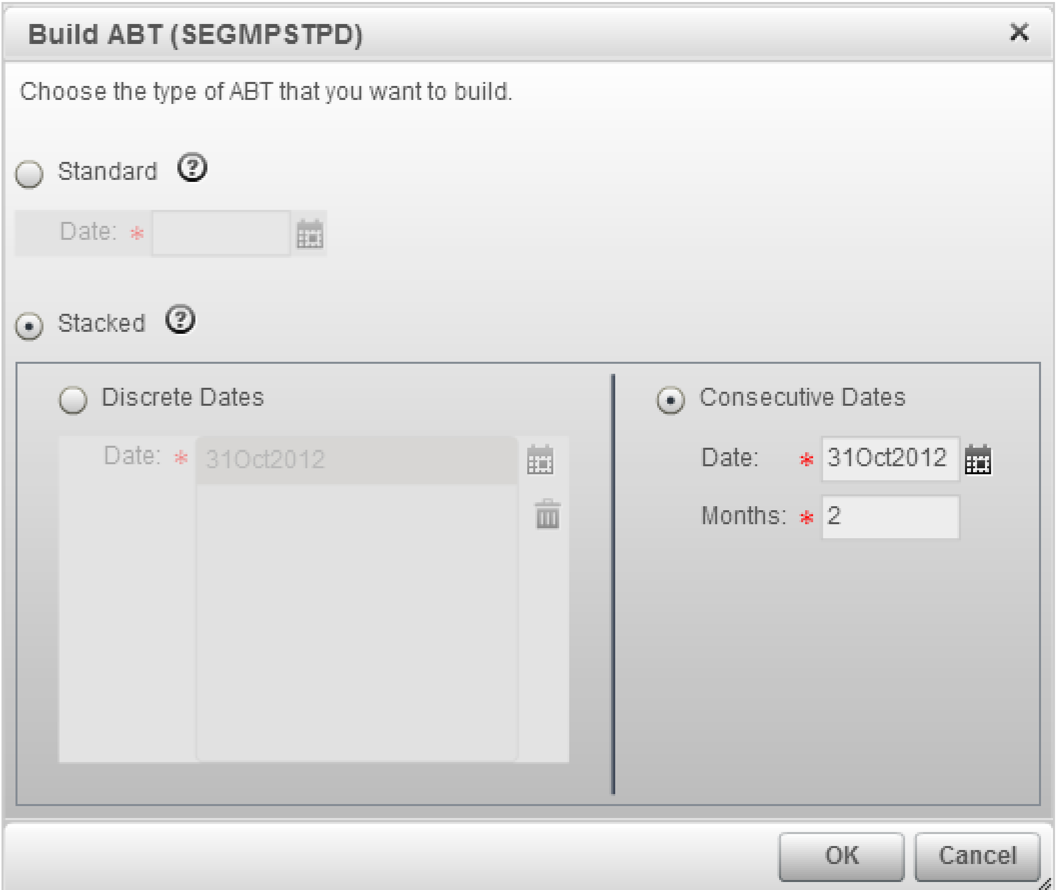
     In the **Date** field, specify a build date for the ABT. To do so, click , and then select a date from the calendar.

     Note:

     - For a monthly ABT (that is, an ABT for which you specified **Monthly** for the **Data aggregation** field while defining the ABT), you can select only the last day of a month from the calendar.
     - For weekly ABT (that is, an ABT for which you specified **Weekly** for the **Data aggregation** field while defining the ABT), you can select only the last day of a week from the calendar. The last day of a week is defined as a parameter. The value of this parameter is defined in the PARAMETER_VALUE_DTL table. For details, see the *SAS Customer Analytics for Communications: Administrator's Guide*. Therefore, only the corresponding dates of the last day of week will be available for selection. For example, your administrator has defined Saturday as the last day of week. Therefore, in the month of August 2012, the following dates will be available for selection: **4 August 2012**, **11 August 2012**, **18 August 2012**, and **24 August 2012**.
     - For a daily (that is, an ABT for which you specified **Daily** for the **Data aggregation** field while defining the ABT) ABT, you can select any date of a month.

   - Stacked ABT

Display 7.44 *Options of Stacked ABT*



- Discrete Dates

  Select this option if you want your ABT to contain data with reference to discrete dates. For example, for a monthly ABT, you can select the following dates: **31 March 2009**, **30 June 2009**, and **30 April 2010**. Similarly, for a weekly ABT, if Saturday is defined as the last day of week, you can select the following dates: **4 August 2012**, **8 September 2012**, and **21 July 2012**.

  In the **Date** field, , and select a date. Repeat this operation to select the desired number of dates. If you want to remove a date from the list, click .

- Consecutive Dates

  Select this option if you want your ABT to contain data with reference to consecutive dates. For example, you can build a daily or monthly ABT for consecutive three months starting from **January 2009** to **March 2009**. Similarly, you can build a weekly ABT for consecutive three weeks starting from **4 August 2012** to **18 August 2012**.

1. In the **Date** field, specify a start date. To do so, click , and then select a date. This date is selected as the start date of the consecutive period. For a monthly ABT, this date can be **31 January 2009**. For a weekly ABT, assuming that Saturday is defined as the last day of week, this date can be **4 August 2012**.

2. In the **Months or Weeks** field, specify the number of consecutive months or weeks depending on the data aggregation level of the ABT. For daily and monthly ABT, specify the number of consecutive months that you want to

consider. For a weekly ABT, specify the number of consecutive weeks that you want to consider. The number that you enter is inclusive of the start date. For example, for a weekly ABT, you select the **Date** as **4 August 2012** and specify the **Consecutive period** as 3 weeks. In this case, if Saturday is defined as the last day of week, then a temporary ABT will be built for each of the following three dates: **4 August 2012**, **11 August 2012**, and **18 August 2012**. The temporary ABTs are merged and the final ABT is populated with data from 4 August 2012 to 18 August 2012.

4. Click **OK**. Depending on the number of variables in the ABT and the selected ABT build date, the ABT building process might take several minutes to complete. beside the ABT name indicates that the ABT building process is in progress. While the ABT building process is in progress, you can proceed with other tasks that are allowed during the ABT building process. For example, you might work on another project. The ABT building process runs in an asynchronous mode. This means that the process continues to run even if you log off from the application. On the next logon, you see the updated status of the ABT building process.

The Analytical Base Table page does not automatically refresh to show the updated status of the ABT building process. You must manually refresh the page to see whether the ABT building process has completed successfully or failed. To refresh the page, you can do one of the following:

- Click the Subset Criterion, Analytical Base Table, or the Models page and then return to the Analytical Base Table page.
- Close the project and open it again.
- Log off from the application and log on again.

On the Analytical Base Table page, beside the ABT name indicates that the ABT building process completed successfully. indicates that the ABT building process failed.

Note: If the ABT building process fails, contact your administrator. For details, see the Troubleshooting section in *SAS Customer Analytics for Communications: Administrator's Guide*.

Rebuilding an ABT

In a project, whenever you make changes that make the ABT inconsistent with the latest ABT definition, you must rebuild your ABT. These changes include the following:

- defining a subset criterion (if no subset criterion was defined earlier)
- adding, modifying, or deleting filter conditions in the existing subset criterion
- deleting the subset criterion
- adding or deleting variables from the ABT or changing the outcome variable
- modifying the column name of a variable
- modifying the outcome period of the ABT

Rebuilding the ABT ensures that the ABT contains the latest changes that you made in the subset criterion or the ABT definition.

Note: Changes in the names or descriptions of the subset criterion, ABT, or variables do not require you to rebuild your ABT.

Register an ABT with the SAS Metadata Server

After you have built an ABT, you must register it with the SAS Metadata Server. Registering an ABT with the SAS Metadata Server makes the ABT available for building an analytical model in SAS Enterprise Miner.

Note: You can register an ABT with the SAS Metadata Server only after you have successfully built the ABT.

To register an ABT with the SAS Metadata Server:

1. On the Analytical Base Table page, select the ABT that you want to register with the SAS Metadata Server.

   Note: Currently, SAS Customer Analytics for Communications supports only one ABT per project.

2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Register ABT with SAS Metadata** .

In SAS Management Console, on the **Folders** tab, a registered ABT is available at the following location:

SAS Folders ⇨ **User Folders** ⇨ ***<User ID>*** ⇨ **My Folder** ⇨ **CAC** ⇨ ***<Project ID>***. Here user ID is the ID, such as sasadm, with which you log on to SAS Customer Analytics for Communications. The project ID is the unique ID of the project that is associated with the model.

While creating a model in SAS Enterprise Miner, you can navigate to this location and use the ABT as a data source for the model.

Note: Whenever you rebuild your ABT with any updates, you must register the ABT again. This ensures that the SAS metadata is updated with the latest changes in the ABT.

Chapter 8

Managing Models

About Analytical Models

After you define and register your ABT, the input that you require to build the analytical model is available. You have to build the analytical model in SAS Enterprise Miner. The type of analytical model that you build depends on the underlying business problem. For example, for analyzing customer churn, you can build a predictive model. However, for computing the expected customer lifetime value, you can build a survival model. Based on the output of these models, you can analyze your business problem. The output of each type of model can be different. For example, the output of a churn model is the churn score. This score gives you the probability that a customer will churn in the specified period. Similarly, the output of the customer lifetime value model can be the expected tenure of a customer in months or weeks.

Process Flow for Building Model

SAS Customer Analytics for Communications enables you to capture the model information and publish it for scoring. After you have built an ABT and registered it with the SAS Metadata Server, complete the following tasks:

1. Build a model in SAS Enterprise Miner and register it with the SAS Metadata Server. For details, see "Building and Registering a Model" on page 124.
2. Grant appropriate permissions on the model. For details, see "Grant Permissions on Models" on page 126.
3. Capture the model's information and link it to the modeling ABT that you created on the Analytical Base Table page. You perform this task on the Models page in the SAS Customer Analytics for Communications interface. For details, see "Capture a Model's Information" on page 127.
4. Publish the model if you want to create a scoring template. You perform this task on the Models page in the SAS Customer Analytics for Communications interface. For details, see "Publish a Model for Scoring" on page 140.

Building and Registering a Model

Overview

You can build and register an analytical model in SAS Enterprise Miner. For instructions on how to build and register a model in SAS Enterprise Miner, see the SAS Enterprise Miner Help.

Note: If your Foundation data mart is in Teradata, you can use SAS Scoring Accelerator for Teradata to score your model. Using SAS Scoring Accelerator for Teradata prevents data movement between SAS and Teradata during the scoring process. This, in turn, significantly reduces the time taken to complete the scoring process. Before you build the model, read the instructions given in "Using SAS Scoring Accelerator for Teradata for Scoring" on page 139.

Note:

- After you create a model in SAS Enterprise Miner, you create a model package for the model. When you register the model package, you have to specify the name with which you want to register the package. Make sure that the name that you specify here is less than 30 characters. Otherwise, the complete name will not be displayed in the Capture Model Information window of the SAS Customer Analytics for Communications interface.
- When you build a stacked ABT, in addition to its defined variables, it contains an extra column (BUILD_DTTM). Before you build a model on this ABT, make sure that you mark the BUILD_DTTM column as **Rejected** in SAS Enterprise Miner.

SAS Customer Analytics for Communications provides sample SAS Enterprise Miner models for the following business problems:

- customer acquisition
- customer segmentation
- cross-sell
- up-sell
- market basket analysis
- sequence analysis
- customer lifetime value
- customer churn

The purpose of these models is to demonstrate their analytical flow in SAS Enterprise Miner. For more details about how to import these sample models, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Assumptions for Building Association Rules Analysis Models

When you build a model in SAS Enterprise Miner by using the association node or market basket analysis (MBA) node, the output is a rule statistics table. When you build a model by using any one of these nodes, make sure that you set up the appropriate values for the following properties of the **Train** section:

The Number to Transpose Property
: Number of rules in the score code that the model generates might not be same as the number of rules in the rule statistics table. Therefore, while building rule association models by using the MBA or the association node, the **Number to Transpose** property should be used appropriately.

The Recommendation Property
: When you build an analytical model by using the MBA or the association node, the score code can be customized to serve two objectives:
  - If you want scoring to be run based on the left-hand side of the rule, then set the **Recommendation** property to **Yes**.
  - If you want scoring to be run for the entire bucket (left-hand side and right-hand side of a rule), then set the **Recommendation** property to **No**.

For more details about how to set these properties, see the SAS Enterprise Miner Help.

If you are building an MBA model by using the MBA node in SAS Enterprise Miner, make sure that you set the correct roles.

- Set the following roles for the table that is connected to the MBA node:
  - Assign the **Transaction** role to the table.
  - Assign the **ID** role to the ID variable, which can be SUBSCRP_ID or CUST_ID.
  - Assign the **Target** role to the other ID variable, which can be SERVICE_ID, OFFER_ID, or TELECAST_ITEM_ID.
- Set the following roles for the table that is connected to the Score node:
  - Assign the **Score** role to the table.
  - Assign the **ID** role to the ID variable, which can be SUBSCRP_ID or CUST_ID.
  - Assign the **Target** role to the other ID variable, which can be SERVICE_ID, OFFER_ID, or TELECAST_ITEM_ID.

If you are building a Sequence analysis model by using the Association node in SAS Enterprise Miner, make sure that you set the correct roles.

- Set the following roles for the table that is connected to the Association node:
  - Assign the **Transaction** role to the table.
  - Assign the **ID** role to the ID variable, which can be SUBSCRP_ID or CUST_ID.
  - Assign the **Target** role to the other ID variable, which can be SERVICE_ID, OFFER_ID, or TELECAST_ITEM_ID.
  - Assign the **Time ID** role for the _DT columns such as TELECAST_ITEM_ORDER_DT and SERVICE_ACTIVATION_DT.
- Set the following roles for the table that is connected to the Score node:
  - Assign the **Score** role to the table.
  - Assign the **ID** role to the ID variable, which can be SUBSCRP_ID or CUST_ID
  - Assign the **Target** role to the other ID variable, which can be SERVICE_ID, OFFER_ID, or TELECAST_ITEM_ID
  - Assign the **Time ID** role for the _DT columns such as TELECAST_ITEM_ORDER_DT and SERVICE_ACTIVATION_DT.

Assumptions for Building Customer Lifetime Value Model

In SAS Enterprise Miner, you build the customer lifetime value (CLTV) model by using the Survival Analysis node. When you build the model, make sure that you set the correct options for the following properties:

The Time Interval Property
: In the property table, the **Time Interval** property is available in the **Train** section.
  - For CLTV prepaid, select **Week** from the **Time Interval** list.
  - For CLTV postpaid, select **Month** from the **Time Interval** list.

The Mean Residual Life Property
: In the property table, the **Mean Residual Life** property is available in the **Score** section. By default, this property is set to **None**. Therefore, to compute the lifetime of a customer by using this node, make sure that you set this property to either **Constant Hazard Exploration** or to **Restricted Mean**.

For more details about how to set these properties, see the SAS Enterprise Miner Help.

Grant Permissions on Models

After you create and register models in SAS Enterprise Miner, you would need to capture the model's information in SAS Customer Analytics for Communications. However, the model is available in SAS Customer Analytics for Communications only after you grant certain permission on that model.

To grant permission on the model, complete these steps:

1. Start SAS Management Console, and then connect to the appropriate metadata server.

2. On the **Folders** tab, expand **User Folders**, and select **<user name> ⇨ My Folder** where <user name> is the user who created the models. The models and their mining results appear in the right pane.
3. Right-click the mining result of a model whose information you want to capture in SAS Customer Analytics for Communications, and select **Properties**.
4. In the Properties dialog box, select the **Authorization** tab.
5. Click **Add** to include the SAS General Servers group, and then grant the **ReadMetadata** permission to that group.
6. Click **OK**.

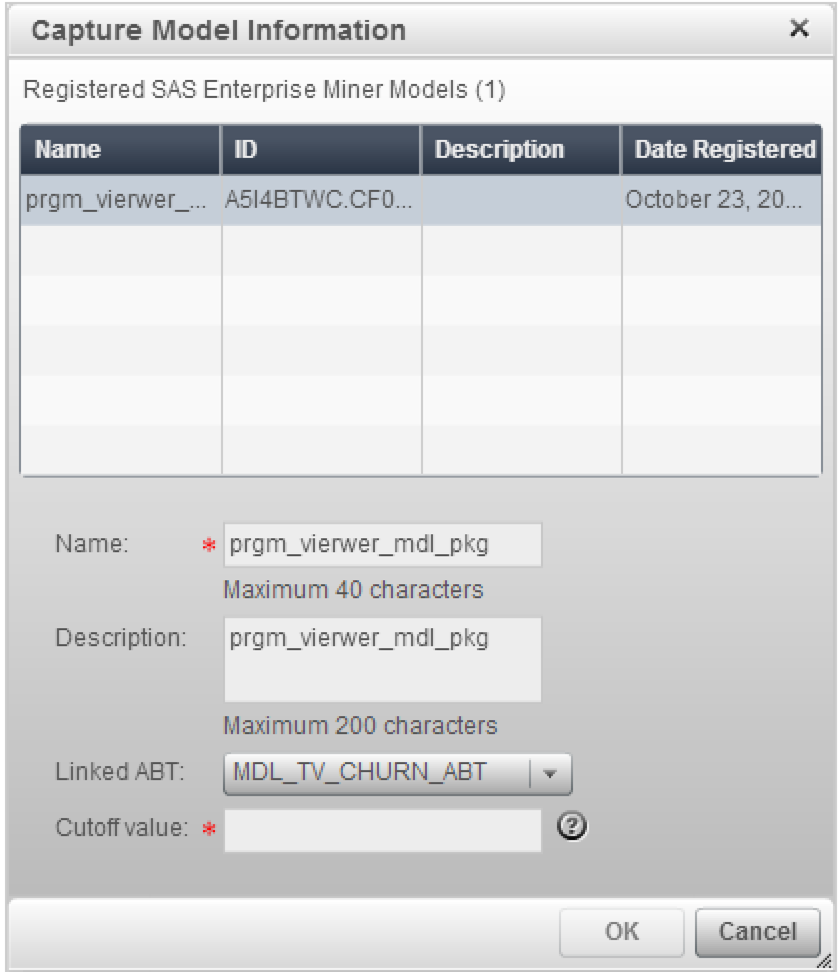
Capture a Model's Information

You build and register a model in SAS Enterprise Miner. To make the model's information available in SAS Customer Analytics for Communications, you must capture the information.

To capture a model's information, complete these steps:

1. Select the Models page.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu ⇨ Capture Model Information**. The Capture Model Information window appears.

Display 8.1 *Capture Model Information Window*



The Registered SAS Enterprise Miner Models table displays the models that satisfy the following criteria:

- The model's significant variables are a subset of the variables in the ABT in the current project.

  Note: MBA and association rules models do not contain significant variables. Therefore, for an MBA and an association rules project, this criterion is not considered for displaying models in the SAS Enterprise Miner table.

- The model is registered with the SAS Metadata Server. Also, the SAS General Servers user group has the ReadMetadata permission on that model.

- The model has not already been captured.

3. From the list of models, select the model that you created in SAS Enterprise Miner by using the ABT that you created for your current project. Enter the following information for the model:

   Name
   By default, this field is populated with the name with which the model was registered with the SAS Metadata Server. However, you can enter a meaningful name for the model. The name must not exceed 40 characters.

   Description
   Enter a brief description for the model. The description must not exceed 200 characters.

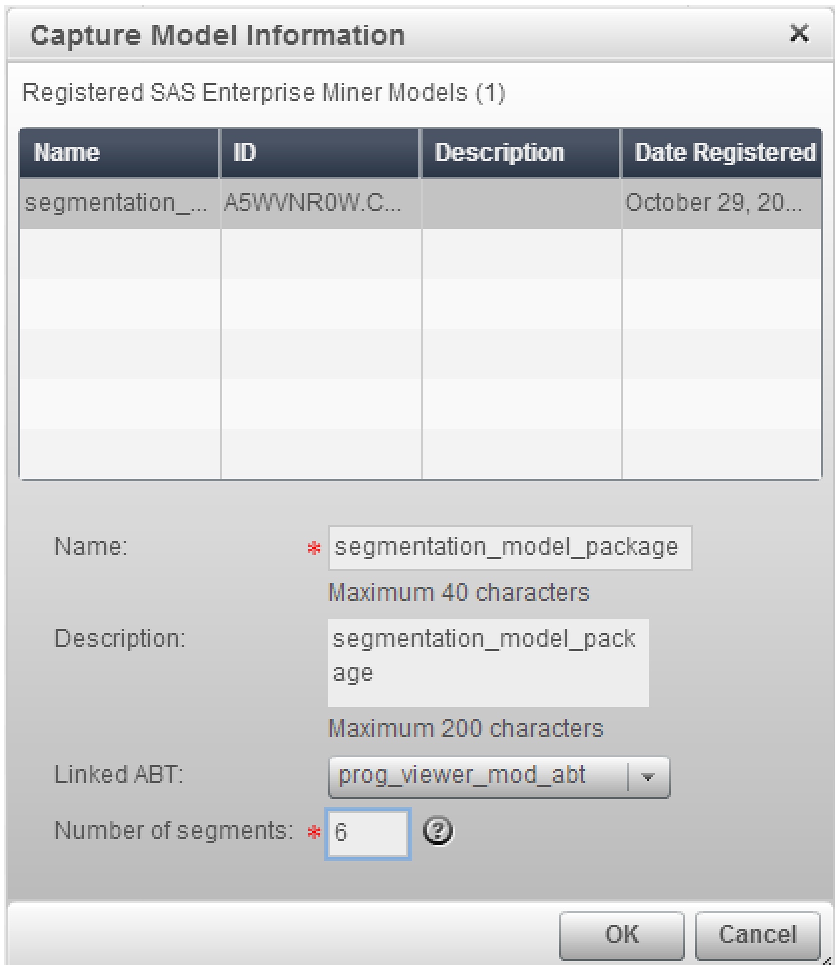
Linked ABT

Select the ABT that you used to build the model in SAS Enterprise Miner.

Note: Currently, SAS Customer Analytics for Communications supports only one ABT per project.

4. Depending on which type of model whose information you are capturing, a set of additional fields is displayed. Specify appropriate values for these fields.

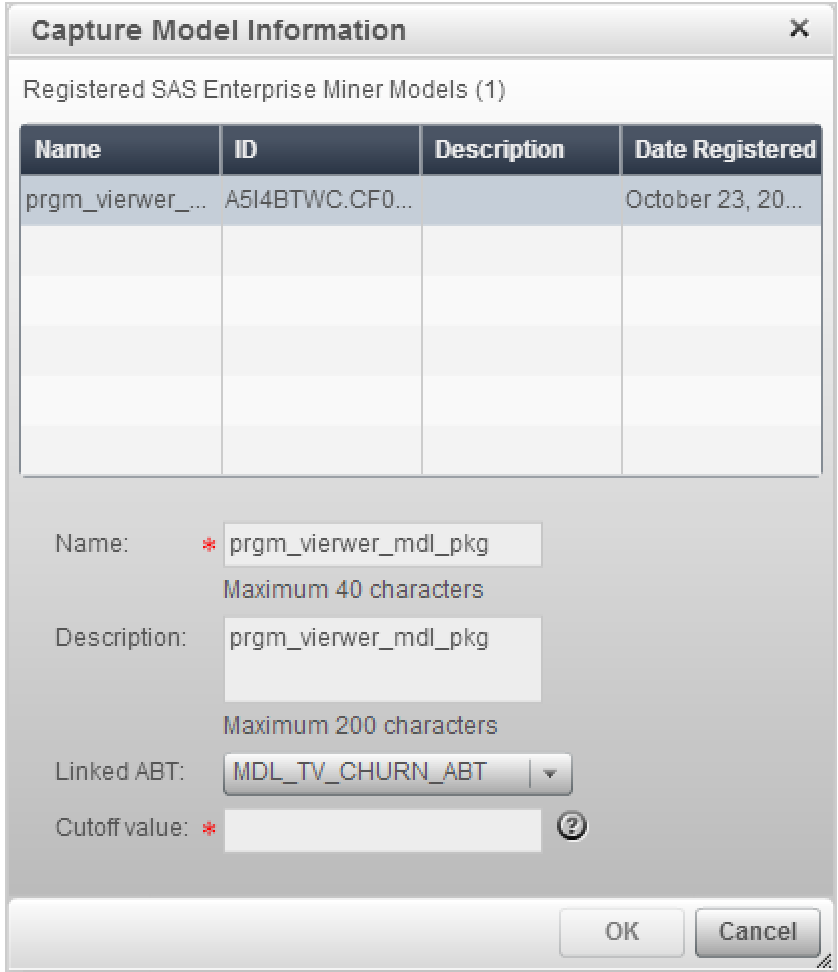
Display 8.2 *Capture Model Information: Segmentation*



Number of segments

Specify the number of segments that the model determined in SAS Enterprise Miner.

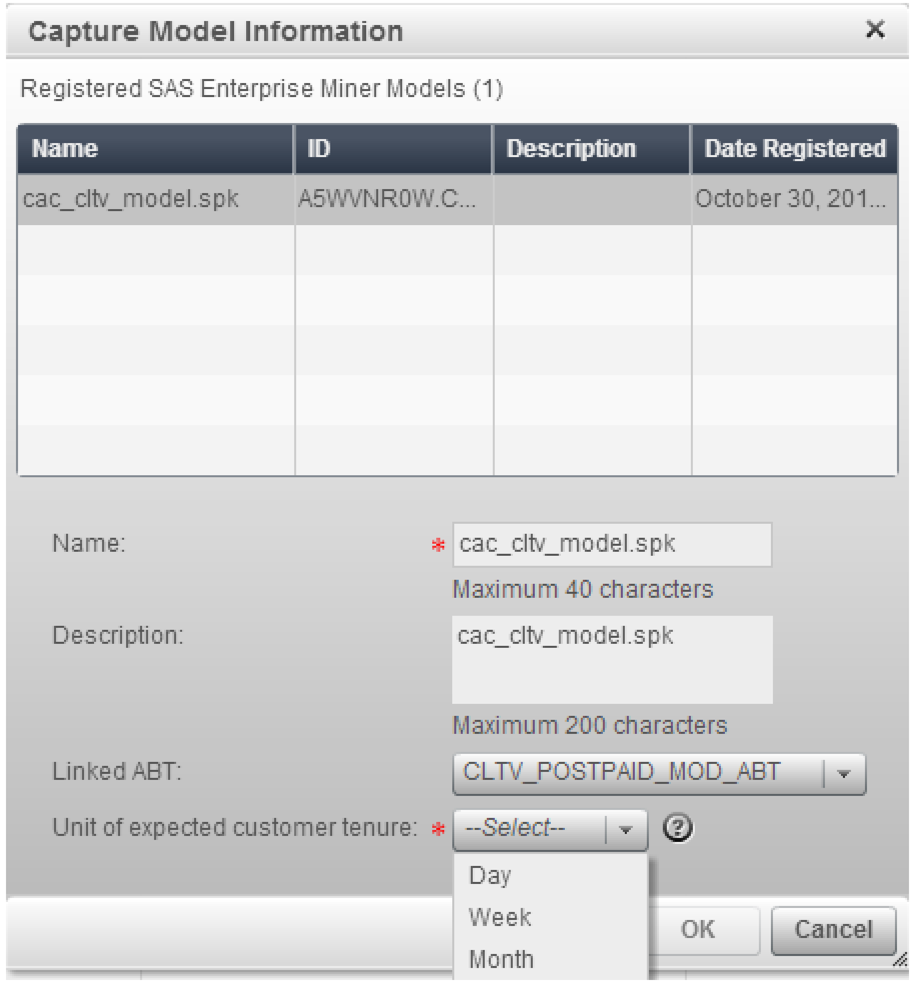
Display 8.3 *Capture Model Information: Churn*



Cutoff value

Specify a threshold value for the churn score that is generated by the model during the scoring process. The threshold value helps you conclude whether the event of interest will occur. That is, if the churn score is greater than or equal to the threshold value, you can say that the customer is likely to churn.

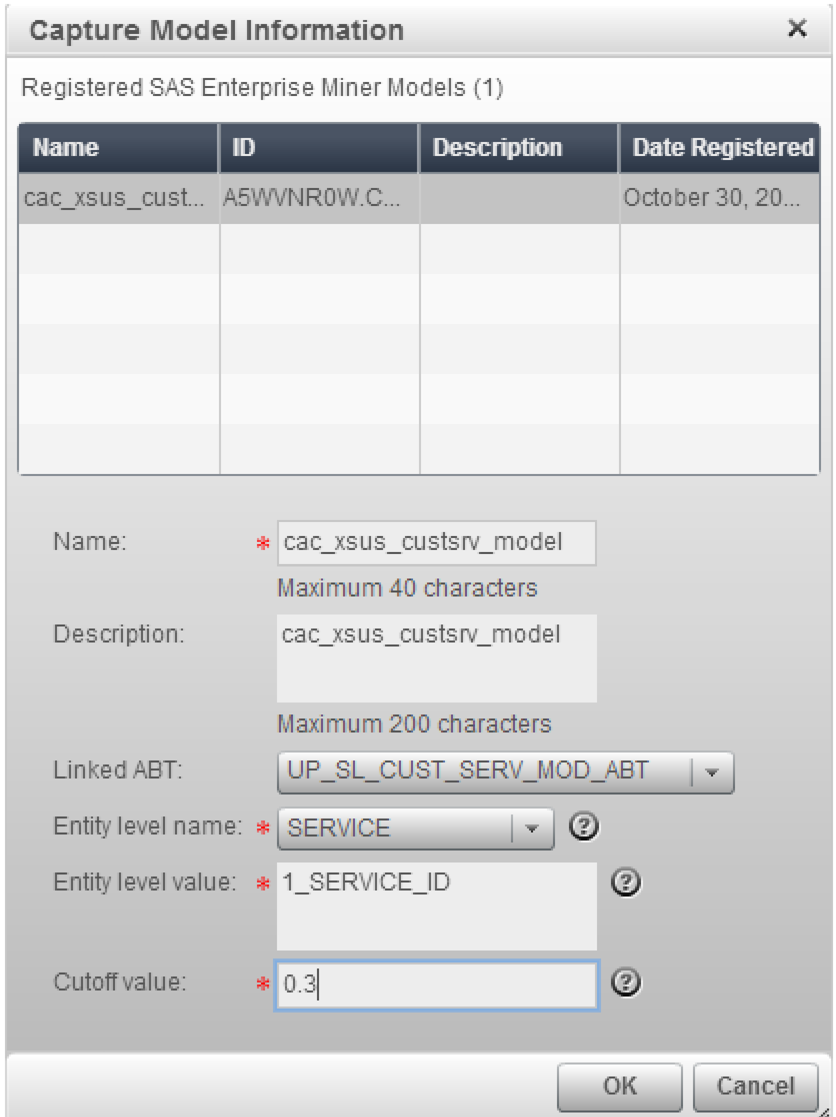
Display 8.4 *Capture Model Information: CLTV*



Unit of expected customer tenure

Select the unit of the expected customer tenure. The unit that you select must be the value that you select from the **Time Interval** field while building the model in SAS Enterprise Miner.

Display 8.5 *Capture Model Information: Cross-Sell or Up-Sell*



Entity level name

Select the entity level that the output of the analytical model supports. For cross-sell and up-sell, the output of the analytical model is in the form of propensity scores, which indicate the propensity to purchase a certain service or offer. Therefore, select the appropriate entity (service or offer) accordingly.

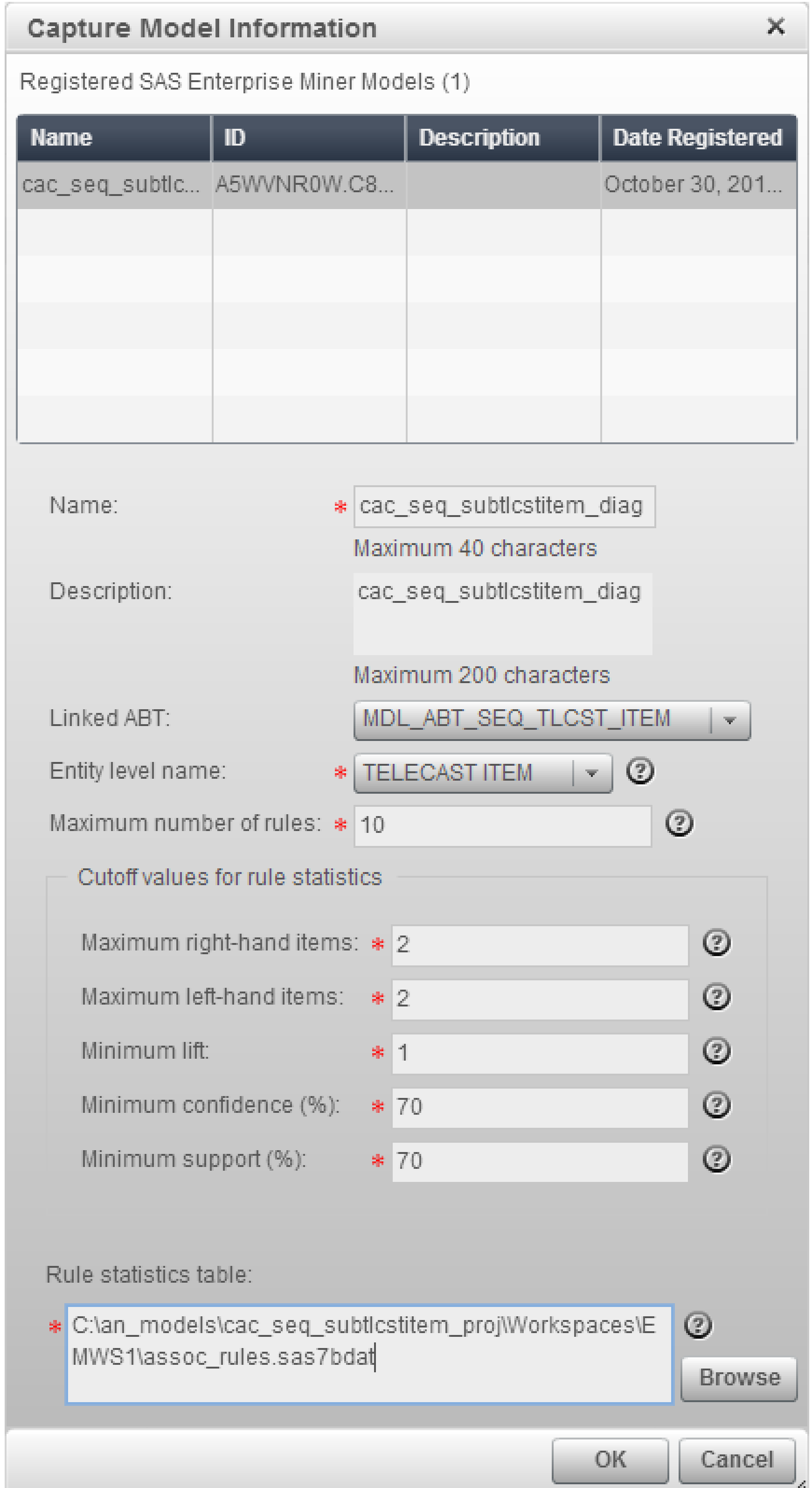
Entity level value

Enter the value for the entity level name that you selected. The value that you enter here must be the same as the corresponding ID value in the Foundation data mart. Also, the value that you enter in this field is case sensitive. Therefore, make sure that you enter the value in the same case as it is available in the Foundation data mart. For example, consider that you select **Service** as the entity level name. You want to indicate that the propensity scores that the analytical model generates are for the International roaming service. The ID that is specified in the Foundation data mart for this service is INTL_RM. In this case, you must enter *INTL_RM* in this field. If you want to indicate that the propensity scores are generated for multiple services, then you can enter these service names as comma-separated values.

Cutoff value

Specify a threshold value for the propensity scores that are generated by the model during the scoring process. The threshold value helps you conclude whether the event of interest will occur. For example, the propensity score for a certain service or offer can be greater than or equal to the threshold value. In this case, you can say that the customer is likely to purchase that service or offer.

Display 8.6 *Capture Model Information: Association Rules Analysis*



The analytical model that you built for association rules analysis generates the output in the form of a rules table. This table contains the association rules that are derived from the association rules analysis. Therefore, when you capture the model information, you have to capture the entity level name, maximum number of rules, and the cutoff values for the rule statistics.

Entity level name

Select the entity level that the output of the analytical model supports. For association rules analysis, the output of the analytical model is in the form of association rules that are generated at either service or offer level. Therefore, select the appropriate entity (service or offer) accordingly.

Maximum number of rules

Enter the maximum number of rules that should be considered for the analysis. The number of rules that is derived as an output of the analytical model can be greater than the number of rules that you specify in this field. In this case, only the significant rules are selected from the rules set. Rules are marked as significant based on the cutoff values that you enter for the rules statistics.

For example, the analytical model derives 70 rules as an output. You specify the maximum number of rules as 50. In this case, only significant rules are selected. Now, consider that the number of significant rules is 60. In this case, the significant rules are selected based on the lift ratio. The first 50 significant rules that have a higher lift ratio are selected.

Cutoff values for rule statistics

The format of the association rule that is generated in the Rules table is as mentioned below:

```
<Item 1 of left hand of rule> & <Item 2 of left hand of
rule> & and so on ==> <Item 1 of right hand of rule> & <Item
2 of right hand rule> & and so on
```

For example, the service-level rule that is generated as an output can be as follows:

```
Service_ID_1==>Service_ID_7
```

In this example, the left hand and right hand of the rule contains only a single item.

Rules are marked as significant if they satisfy the upper or lower limit that you have specified for the cutoff values that you enter for the following rules statistics.

Maximum left-hand items

Enter the maximum number of items in the left side of the rule that should be considered in order to identify a significant rule. For example, you type 2 as the cutoff value for the length of the left hand of rule. Only those rules whose left hand contains items less than or equal to 2 are considered for marking them as significant rules.

Maximum right-hand items

Enter the maximum number of items in the right side of the rule that should be considered in order to identify a significant rule. For example, you type 2 as the cutoff value for the length of the right hand of rule. Only those rules whose right hand contains items less than or equal to 2 are considered for marking them as significant rules.

Minimum lift

The lift ratio computes the ratio of confidence and expected confidence. The cutoff value that you enter for this statistic enable you to identify significant rules. For example, you enter 2 as the cutoff value for the lift ratio. In this case, only those rules that have the lift ratio greater than or equal to 2 are considered for marking them as significant rules.

Minimum confidence

The confidence rule statistic gives a percentage value. This value is computed as the ratio of number of customers or subscriptions that satisfy the rule and the number of customers or subscriptions that satisfy the left hand of rule. The cutoff value that you enter for this statistic enables you to identify significant rules. For example, you enter the cutoff value of 65 for this statistic. Only those rules that have the confidence value greater than or equal to 65 are considered for marking them as significant rules.

Minimum support

The support rule statistic gives the percentage of the total number of customers or subscriptions that qualify for the rule. The cutoff value that you enter for this statistic enables to you to identify significant rules. For example, you enter the cutoff value of 70 for this statistic. Only those rules that have the support value greater than or equal to 70 are considered for marking them as significant rules.

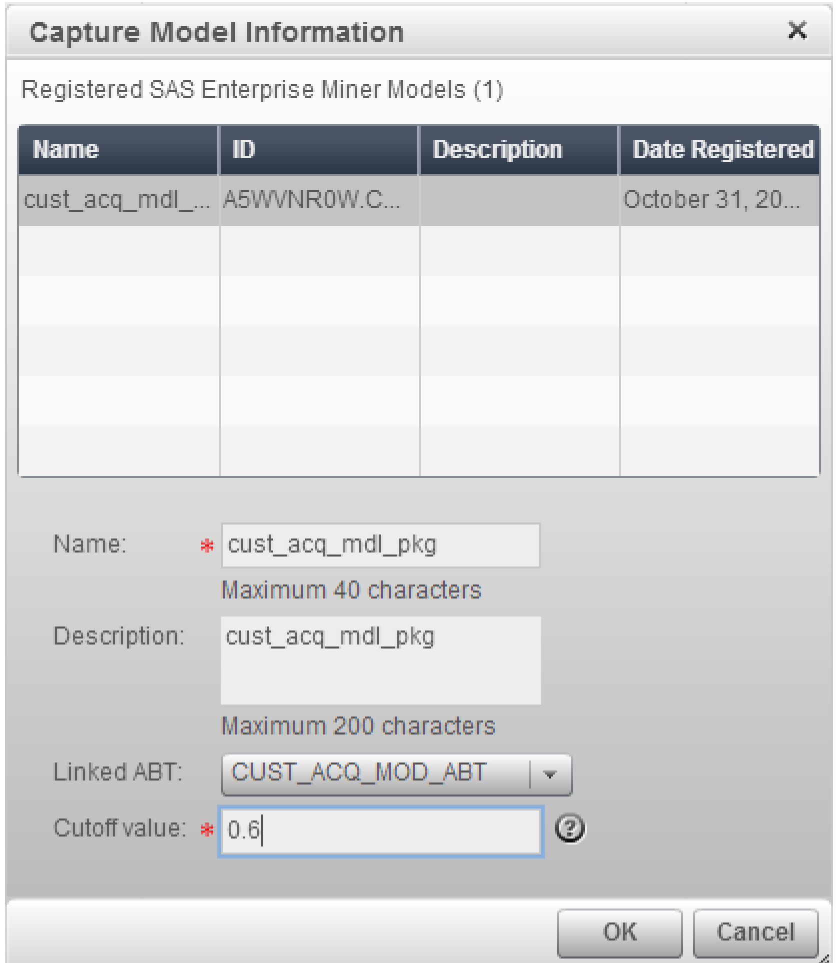
***Table 8.1** Example of Cutoff Values for Rule Statistics*

Rule Statistic	Cutoff Value	Actual Value of the Rule Statistic
Maximum left-hand items	2	2
Maximum right-hand items	3	2
Minimum lift	4	6
Minimum confidence	60	63
Minimum support	70	78

For the above rule, all the rules statistics fulfill the upper or lower limit that is set for the cutoff value. Therefore, this rule is marked as significant and is selected for the analysis.

For the **Rule statistics table** field, click **Browse** to select the table that stores the information about the rules statistics. For example, for each rule, the table contains details such as left-hand items, right-hand items, support, confidence, and lift.

Display 8.7 *Capture Model Information: Customer Acquisition*



Cutoff value

The analytical model that you built for customer acquisition generates the output in the form of acquisition score. Therefore, when you capture the model's information, you have to specify a threshold value for the acquisition score. The threshold value helps you conclude whether the event of interest will occur. For example, if the acquisition score is greater than or equal to the threshold value, you can say that the customer is likely to be acquired.

5. Click **OK**. The Capture Model Information window closes, and the model is added to the list of captured models on the Models page.

   Note: When you capture a model's information, the default scoring code is extracted from the SAS Enterprise Miner metadata and stored in the **<SAS configuration directory>/AppData/SASCustAnalyticsComm/5.4/project/<Project ID>/model/<Model ID>/scoring_code** folder with the filename scoring_code_<Model ID>.sas. If your Foundation data mart is in Teradata, you can use SAS Scoring Accelerator for Teradata to score your model. For that, you need to update the default scoring code to support in-database processing. For details, see "Using SAS Scoring Accelerator for Teradata for Scoring" on page 139.

Note: You might rebuild the ABT that was used to create the model in SAS Enterprise Miner. In this case, you must delete the information that you have captured about the model in SAS Customer Analytics for Communications. You must also rebuild the model in SAS Enterprise Miner with the latest ABT, and then capture the new information about the model. These steps ensure that the model contains the latest changes and also that the deployed scoring code is based on the updated ABT definition.

Edit a Model's Information

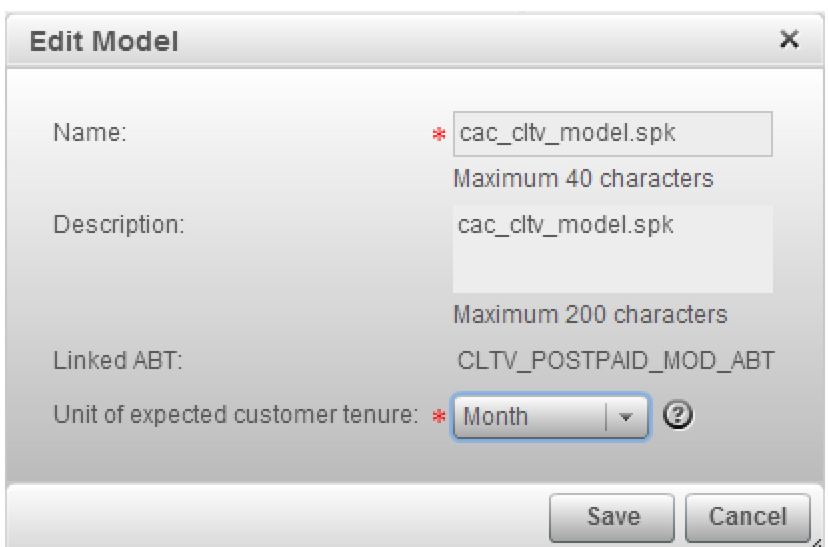
You can change the name and description of a model. You can also change the specific information such as the cutoff values that you captured for each type of model. When you change these values, there is an impact on the results that the model produces. Therefore, make sure that you make appropriate changes to the information that you have captured.

Note: For an association rules model, you can change the cutoff values for the rules statistics and the maximum number of rules. However, based on the new values that you have entered, a new set of rules is generated and the process of marking significant rules is run again. As a result, you will lose information about the earlier rules.

To edit a model's information:

1. On the Models page, select the model that you want to edit.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Edit Model**. The Edit Model Information window appears.

Display 8.8 *Edit Model Information*



3. Change the model information according to your requirements.

   Note: For a customer segmentation model, you cannot edit the number of segments that you have entered while capturing the model's information in the Capture Model Information window.

4. Click **Save**.

   TIP Click **Cancel** if you want to discard the changes that you have made.

Using SAS Scoring Accelerator for Teradata for Scoring

Overview of SAS Scoring Accelerator for Teradata

If your Foundation data mart is in Teradata (you have your ABT in a Teradata database), you can use SAS Scoring Accelerator for Teradata to score your model. Using SAS Scoring Accelerator for Teradata prevents data movement between SAS and Teradata during the scoring process. This, in turn, significantly reduces the time taken to complete the scoring process.

Note: You should not use SAS Scoring Accelerator for Teradata to score models that are built by using MBA node and association analysis node that are available in SAS Enterprise Miner. The score code of these nodes is not a single DATA step code and therefore is not supported by SAS Scoring Accelerator for Teradata.

Prepare and Publish the Model Using SAS Scoring Accelerator for Teradata

Before you can use SAS Scoring Accelerator for Teradata for scoring a model, you must prepare the model accordingly and publish the model using SAS Scoring Accelerator for Teradata. For details, read the following topics:

- `Introduction to the SAS Scoring Accelerator`
- `Exporting the Scoring Model Files from SAS Enterprise Miner`
- `SAS Scoring Accelerator for Teradata`

Moreover, if you have SAS Analytics Accelerator installed, you must grant certain database privileges to the Teradata database user. For details, see Chapter 6, “Configuring SAS Analytics Accelerator for Teradata” of *Configuration Guide for SAS 9.3 Foundation for Microsoft Windows*, which is available at **`http://support.sas.com/documentation/installcenter/en/ikfdtnwincg/64431/PDF/default/config.pdf`**.

Update the Default Scoring Code to Support In-DB Processing

When you capture a model’s information, the scoring code is extracted from the SAS Enterprise Miner metadata and is stored in the **`<`*`SAS configuration directory`*`>/AppData/SASCustAnalyticsComm/5.4/project/<`*`Project ID`*`>/model/<`*`Model ID`*`>/scoring_code`** folder (project path) with the filename scoring_code_<*Model ID*>.sas. <*Model ID*> represents the model identification number, a unique number that is automatically assigned to a model when it is captured. To view a model’s identification number, see the ID column of the Captured Models table on the Models page.

Later, when you create a scoring template, the scoring code is copied to the **`<`*`SAS configuration directory`*`>/AppData/SASCustAnalyticsComm/5.4/scoring/<`*`Scoring template ID`*`>/scr_act_run_exported_code`** folder (scoring path) with the filename scoring_eminer_code_<*Scoring template ID*>.sas. This copied code is used for scoring during the scoring process. However, this default scoring code is SAS dataset-based code and does not support in-database processing. You must update the default scoring code as explained in this topic for it to support in-database processing of the data during the scoring process.

You can update the scoring code in the scoring_code folder at the project path after capturing the model's information. This updated code is copied to the scr_act_run_exported_code folder at the scoring path (when you create a scoring template) and used for scoring. Alternatively, you can update the scoring code in the scr_act_run_exported_code folder at the scoring path after creating the scoring template.

To update the scoring code:

1. Open the scoring_code_<*Model ID*>.sas file.
2. Replace the contents of the file with the following code:

   Note: In the code, replace <*database name*> with the name of the database that contains the model table. Replace <*table name*> with the name of the model table in which the sasscore_modelname.ds2 and sasscore_modelname_ufmt.xml scoring files were published when the %INDTD_CREATE_MODELTABLE macro was run. Replace <*model name*> with the name of the model.

```
%let m_model_table_schema_nm = <database name>;
%let m_model_table_nm = <table name>;
%let m_published_model_nm = <model name>;
%let m_scored_abt_reqd_column_option = NULL;
*'options = DS2_KEEP = &m_scored_abt_keep_column_nm';
%let EP_TD_SCORING_CODE = %bquote(
    proc sql;
    &m_connect_string_for_scoring
    call SAS_SYSFNLIB.SAS_SCORE_EP(
        'MODELTABLE=&m_model_table_schema_nm..&m_model_table_nm.',
        'MODELNAME=&m_published_model_nm.',
        'INQUERY=select * from &m_scoring_schema_nm..&m_scoring_table_nm ',
        'OUTTABLE=&m_scored_schema_nm..&m_scored_table_nm',
        'OUTKEY=&m_level_key_column_nm',&m_scored_abt_reqd_column_option.)
    &m_disconnect_string_for_scoring
    quit;);
&EP_TD_SCORING_CODE
```

3. Save the changes, and then close the file.

Publish a Model for Scoring

After you have captured a model's information, you can decide whether you want to create a scoring template for that model. You have to publish the model only if you want to create a scoring template for it. After you publish a model, the model is available in the Scoring workpsace. The published model is also called scoring model.

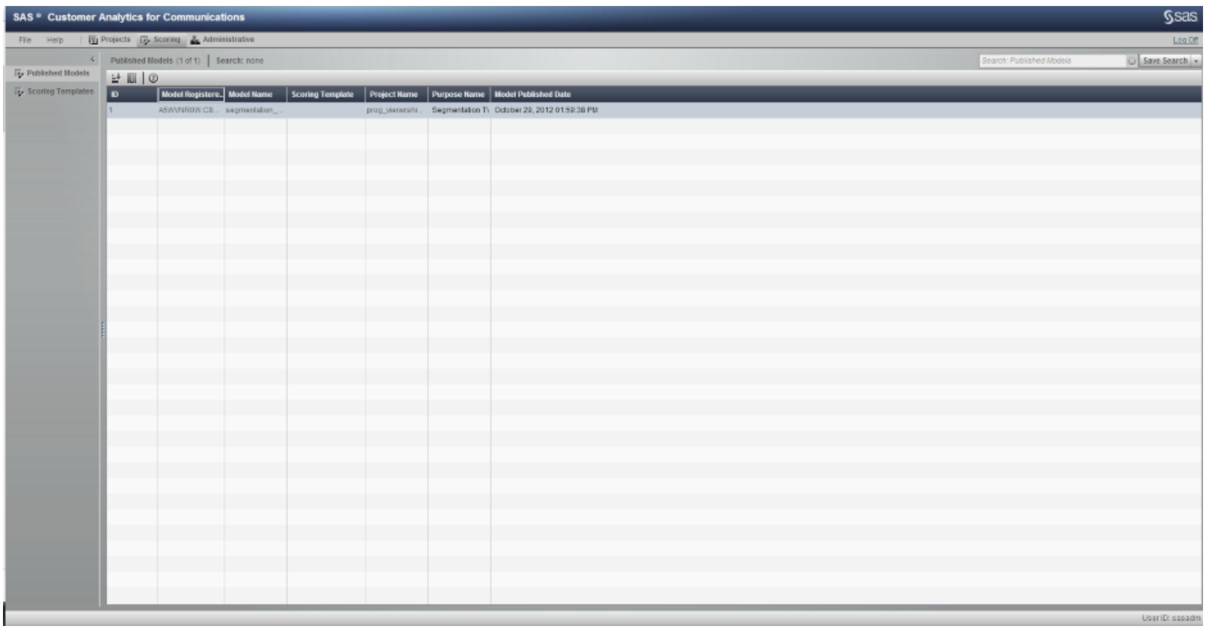
When you publish a model for scoring, a new instance of scoring model is created. Information such as significant variables, outcome variables, subset criterion, and outcome period is copied at a specific location and is associated with the scoring model.

Before you decide to publish a model, make sure that you have entered all the required information for the model. Once published, the model information cannot be changed. Moreover, after you publish a model for scoring, any changes that you make in the project's components (such as subset criterion, ABT, or variables) will not have any impact on the model in the scoring mode.

To publish a model, complete these steps:

1. On the Models page, select the model that you want to publish.
2. On the toolbar, click ▶ . Alternatively, on the toolbar, select **Menu** ⇨ **Publish for Scoring**.
3. In the confirmation message box that appears, click **Yes**. If the model is published successfully, a message is displayed that indicates that the model is published successfully and the published model is displayed in the Scoring page.

Display 8.9 *Published Model in Scoring Page*



If you receive an error message, contact your administrator.

Delete a Model’s Information

You can delete a model that is not published for scoring. You can also delete a model that you have published for scoring. However, in the later case, the published model will still be available in the Scoring workspace, and you can define a scoring template for it. For details, see “Create a Scoring Template” on page 150.

To delete a model’s information, complete these steps:

1. On the Models page, select the model whose information you want to delete.
2. On the toolbar, click 🗑. Alternatively, on the toolbar, select **Menu** ⇨ **Delete Model**.
3. In the confirmation message box that appears, click **Yes**.

Part 3

Working in the Scoring Workspace

Chapter 9

Introduction to the Scoring Process

About the Scoring Process

The scoring process can begin after you complete the following tasks:

- Build and register the analytical model in SAS Enterprise Miner.
- Capture the model's information and publish the model in the SAS Customer Analytics for Communications interface.

In the ABT building process, the modeling ABT considers data that spans a historical period (in months or weeks). In model building process, the model learns through behavioral patterns in this data and generates the results, which is also called the score code.

In the scoring process, results are generated for the recent data. The scoring process is an automated process. All you need to do is define the scoring template and then schedule the scoring process to generate the scores on a regular basis. You can also define a subset criterion in the scoring mode to filter the target population.

The Scoring Process

In the Scoring workspace, you must perform the tasks in the sequence mentioned below:

1. Make sure that you have published the models that you want to score.

2. (Optional) Edit the subset criterion that is available for the published model. For details, see "Edit the Subset Criterion of a Published Model" on page 149.

3. Define a scoring template for the model. For details, see "Create a Scoring Template" on page 150.

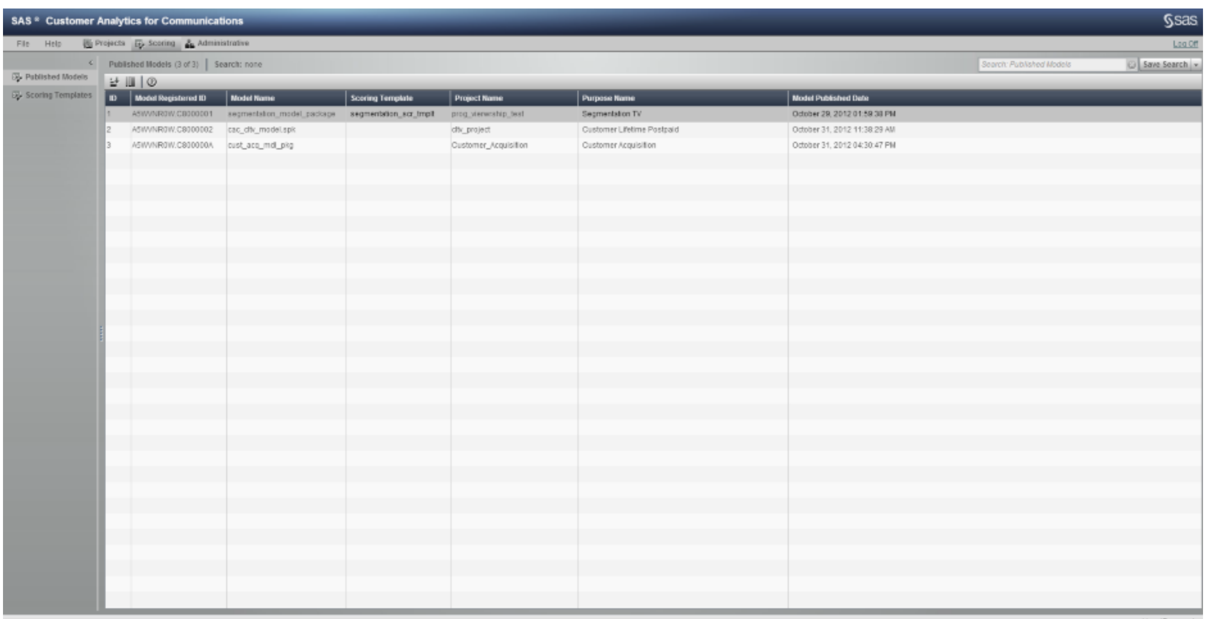
View the Details about Published Models

When you publish a model in the Projects workspace, it is available in the Scoring workspace.

To view details about a published model, complete these tasks:

1. Select the Scoring workspace. The models that are published are displayed.

Display 9.1 *Published Models*



2. For each model that you have published, the following details are displayed:

   ID
   displays the ID that SAS Customer Analytics for Communications generates for each model that is published.

   Model Registered ID
   displays the ID that is generated when the model was registered in SAS Enterprise Miner. The model is registered in the metadata with this ID.

   Model Name
   displays the model's name that was entered while capturing the model's information.

   Scoring Template
   displays the name of the scoring template that is defined for the published model. This column enables you to identify the published models for which a scoring template is not yet defined.

Project Name
displays the name of the project that is associated with the model.

Purpose Name
displays the purpose of the project.

Model Published Date
displays the date on which the model was published.

3. (Optional) Double-click the model to edit the subset criterion.

About the Subset Criterion in the Scoring Workspace

Overview of Subset Criterion

When you publish a model, the subset criterion that you defined for the associated project is automatically attached to it. In the Scoring workspace, you can change this subset criterion according to your requirements. In the Scoring workspace, the subset criterion enables you to score the members of the subject of analysis that satisfy the subset criterion.

For example, you define a project for the customer acquisition purpose. For this project, you can define the subset criterion to filter the target population of prospective customers who participated and responded to certain campaigns that were organized by the communications service provider (CSP). Let us assume that the codes for these campaigns are 5_CAMPAIGN and 1_CAMPAIGN. The following diagram illustrates the subset criterion that you can define to filter the target population for the modeling ABT.

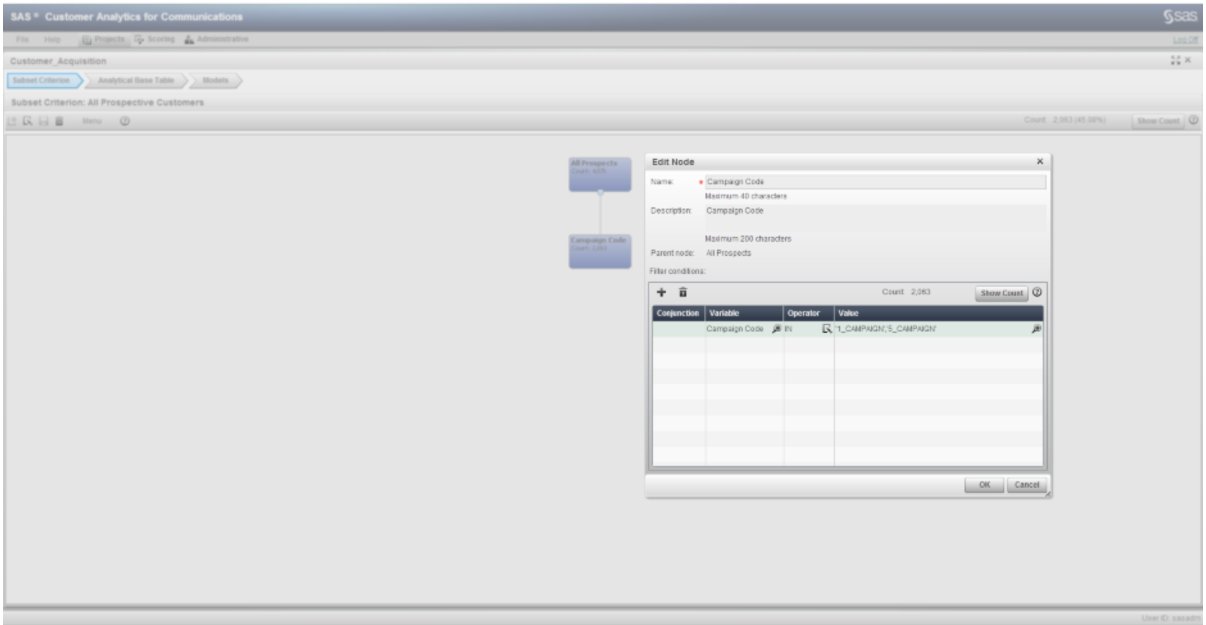
A scoring ABT contains one record for each subject (customer or account) that meets the following criteria as of the scoring date:

- subset criterion associated with the scoring model
- implicit filter criteria, if applicable

  For details, see "Purpose-Specific Predefined Implicit Subset Criteria" on page 177.
- filter conditions in the subject group of the project
- outcome-based filter

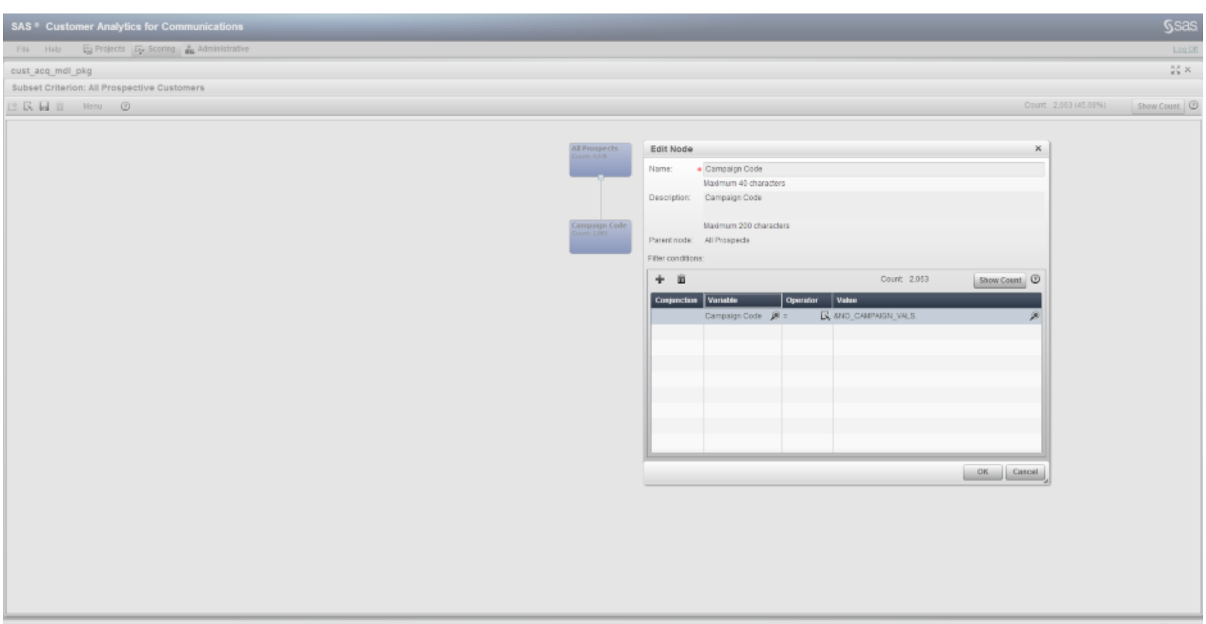
  For details, see "Outcome-Based Filtering" on page 115.

Figure 9.1 *Subset Criterion for Modeling ABT*



Further, you can build the modeling ABT and the analytical model based on this population. However, in the scoring mode, the target population need not include the prospective customers who have already been contacted for any campaigns. In this case, you need to eliminate such customers from the scoring ABT. Therefore, in the Scoring workspace, you can edit the subset criterion as illustrated below to filter customers for whom the campaign code is a NULL value.

Display 9.2 *Subset Criterion for Scoring ABT*



As a result, you can restrict the target population to include only those prospective customers who have not been contacted for any of the campaigns before.

Edit the Subset Criterion of a Published Model

You can edit the default subset criterion that is associated with a published model. The procedures to work with subset criterion for the published model is the same as the procedures of a subset criterion that you define for a project. For details, see Chapter 6 Managing the Subset Criterion on page 33.

To edit a subset criterion for a published model, complete these steps:

1. In the Scoring workspace, from the object manager, click **Published Model**. The list of models that you have published for scoring are displayed.
2. Double-click the model whose subset criterion you want to edit. The subset criterion that is defined for the associated project is displayed.

   Note: For few purposes such as customer acquisition, certain subset criteria are predefined and are not displayed in the SAS Customer Analytics for Communications interface. These are the mandatory subset criteria (also called implicit subset criterion) that must be applied to derive the target population. For more details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

3. On the toolbar, click . The Edit Subset Criterion window appears.
4. Edit the details about the subset criterion or the filter criteria according to your requirement. For details, see "Edit a Subset Criterion" on page 50.

   Note: You cannot delete the root node of the subset criterion.

About the Scoring Template

In SAS Customer Analytics for Communications, you define the scoring template in the Scoring workspace. A scoring template enables you to associate the scoring process with a model and an ABT. In addition, the scoring template creates a code package for the score code that is generated in SAS Enterprise Miner. This code package is stored in a predefined location. Your administrator can schedule this package to run it at a predefined frequency, which can be daily, weekly, or monthly. For details, see *SAS Customer Analytics for Communications: Administrator's Guide*.

The code package that is created as a result of the scoring template performs the following tasks:

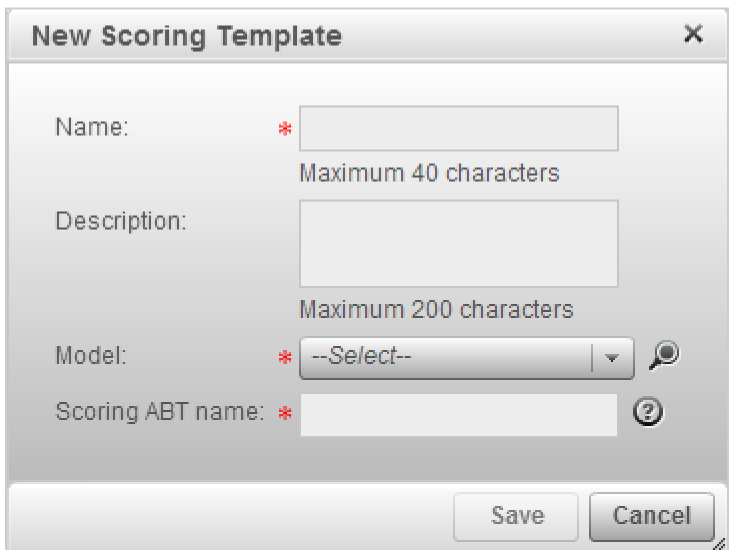
- Generates the scoring ABT that stores the significant variables from the modeling ABT.
- Applies the score code that the SAS Enterprise model generates.
- Generates the scored ABT that contains the analytical output of your interest. For example, for a churn model, this output can be a churn score. For a segmentation model, it can be a segment code and for a survival model, it can be the expected tenure of a customer.

Create a Scoring Template

To create a scoring template, complete these tasks:

1. Select the Scoring workspace.
2. On the toolbar, . Alternatively, on the toolbar, select **Menu** ⇨ **New**. The New Scoring Template window appears.

   Display 9.3 *New Scoring Template Window*

3. In the **Name** field, enter a name for the scoring template.
4. In the **Description** field, enter a description for the scoring template.
5. From the **Model** list, select a model for the scoring template. The list displays the models whose information you have captured in SAS Customer Analytics for Communications. A model that you have already used in a scoring template does not appear in the list. That is, you can use a model with only one scoring template.

   TIP Before you select a model, you can click to view the model information, such as the name of the model, the project that the model belongs to, and so on. You can also use this icon to search for a model.

6. In the **Scoring ABT name** field, enter a name with which the scoring ABT is created. The table name must be a valid name and must not exceed 30 characters.

   Note: Make sure that the table name that you enter is unique across all scoring templates.

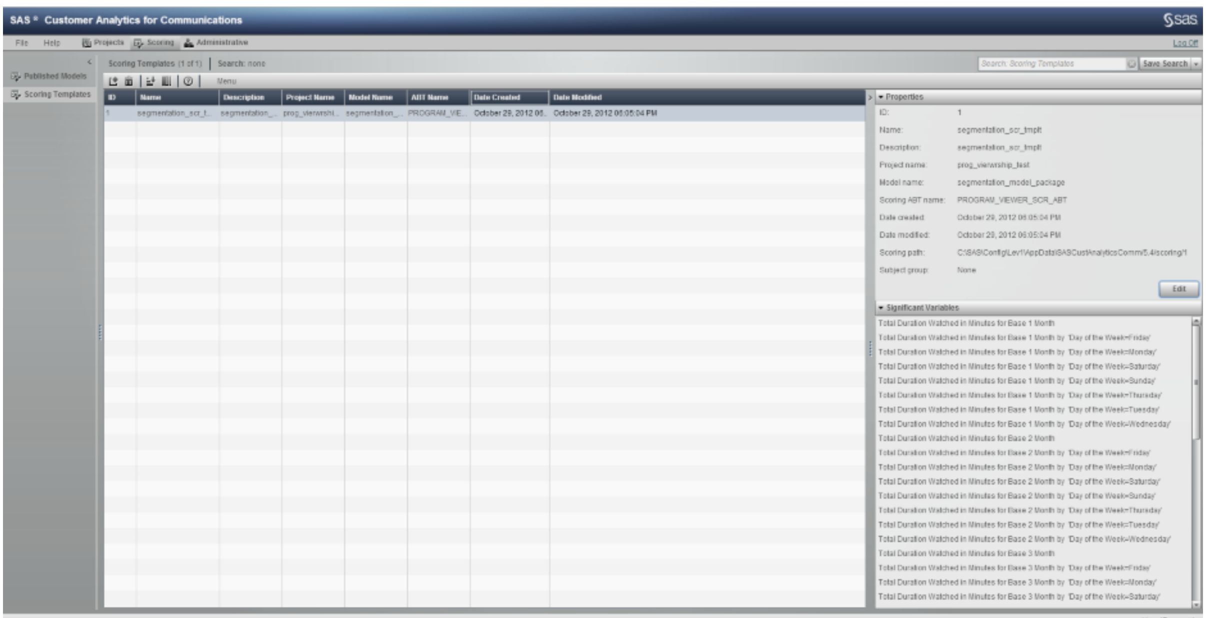
7. Click **Save**. The scoring template is added to the Scoring Templates list. The modeling ABT, the analytical model, and the scoring ABT are linked together through the scoring template. Also, the code package is created at the predefined location: **<SAS configuration directory>/AppData/SASCustAnalyticsCommServer/5.4/scoring/<Scoring template ID>/scr_act_run_exported_code**.

`<SAS configuration directory>` represents the path to the folder where SAS configuration data is stored. For example, on a Windows computer, this can be **`C:/SAS/Config/Lev1`**.

`<Scoring template ID>` represents the scoring template identification number —a unique number that is automatically assigned to each scoring template when it is created.

This code package is used when you run the scoring process. It contains information such as variable definitions and dimensional attribute values that are associated with the scoring model as of the time when you create the scoring template. If you change this information after you define a scoring template, then these changes are not updated in the code package.

Display 9.4 *Scoring Template: Significant Variables*



Note: After you create a scoring template, except for association analysis, the Significant Variables pane shows a list of variables that the model that is linked with the scoring template considers significant. In the scoring run, a scoring ABT is built with these significant variables. The model ignores the insignificant variables because only significant variables are required for scoring.

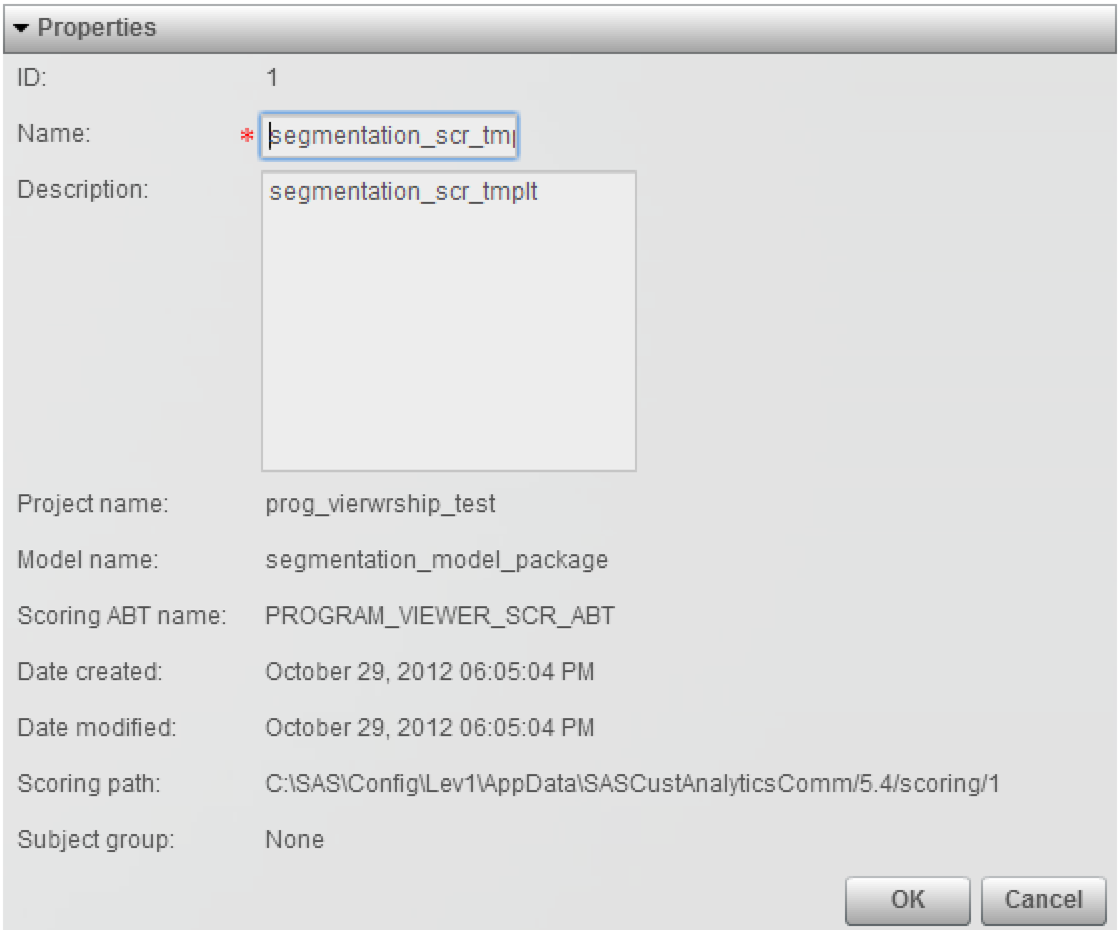
Edit a Scoring Template

You can change the name and description of a scoring template.

To edit a scoring template, complete these steps:

1. In the Scoring workspace, select the scoring template that you want to edit.
2. In the Properties pane, click **Edit**.

Display 9.5 *Properties Pane*



3. Change the name and description of the scoring template according to your requirements.
4. Click **OK** to save the changes.

   TIP Click **Cancel** if you want to discard the current changes and retain the original name and description.

Delete a Scoring Template

To delete a scoring template, complete these steps:

1. In the Scoring workspace, select the scoring template that you want to delete.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Delete**.
3. On the confirmation dialog box that appears, click **Yes**.

Part 4

Working in the Administrative Workspace

Chapter 10

Configuring the Input Data Sources

About the Administrative Workspace

The Administrative workspace displays a list of data sources whose configuration information is available in the Application data. These data sources are certain fact or dimension tables from the Foundation data mart. In addition, they can be base tables or information maps. The libraries to which these data sources belong are configured in the Application data. For details about how to configure libraries, see *SAS Customer Analytics for Communications: Administrator's Guide*.

You can use the Administrative workspace to configure the usage of these data sources. As a result, you can use these data sources to define subset criterion and create ABT variables in the application. You can also use this workspace to import configuration information of new data sources into the Application data .

Note: You can work in the Administrative workspace only if you are assigned the administrator's role.

Configuring the Data Sources

Viewing the Preconfigured Data Sources

As a post-installation task, your administrator populates the default configuration information of the data sources that SAS Customer Analytics for Communications uses, in the Application data. The configuration information includes the column metadata, subject of analysis, the data source usage, and properties of the data sources. In the SAS Customer Analytics for Communications interface, you can view this default configuration information, in the Administrative workspace. You can change this configuration information according to your requirements if you have administrative privileges.

Note: The changes that you make to the default configuration information are effective only from your next logon.

Changing the Default Configuration Information

You cannot change certain information about the preconfigured data sources, such as the library to which a data source belongs. However, you can configure other information based on your requirements. The following list explains a few scenarios for which you can change the default configuration information.

Data aggregation
: For a particular data source, you want to change the grain at which it stores data. For example, a data source is preconfigured to capture data at **Daily** grain. In addition, you want to capture information at **Weekly** and **Monthly** grains. In this case, you can configure these grains for the data source.

Subject of analysis
: A certain data source might store information about one or more subjects of analysis. If your administrator has configured only one subject of analysis, you can configure the other subjects of analysis. For example, for the **CSCOM_SERVICE_ACTIVITY_IM** data source, **Customer** and **Subscription** are the two subjects of analysis that are initially configured. As a result, this data source would be available only for projects that analyze data pertaining to these subjects of analysis. However, this data source is also required for projects that analyze data pertaining to **Subscription Service** and **Customer Service** subjects of analysis. In this case, you can configure these subjects of analysis for this data source.

Dimensional attribute values
: The names and values of analytical variables that are defined in the modeling ABT use the values of the dimensional attributes. Because these variables are implementation-specific, they cannot be prepopulated. Therefore, you can configure these values according to your requirements. For example, for the **CUST_STATUS_CD** column of the **CUST_D** data source, you can specify the dimensional values such as *ACTIVE*, *DORMANT*, and *SUSPENDED*.

New column information

A new column is added in a Foundation data mart data source. If this column is significant for building the modeling ABT, you can import the metadata of this column in the Application data.

New data source

A new data source is added in the Foundation data mart, which is significant for building the modeling ABT. In this case, you can import the metadata of this data source and its column in the Application data and configure it according to your requirements.

Configuring the Usage of Data Sources

As a post-installation task, your administrator configures the usage of the data sources. As a result, you can use these data sources when you define the subset criterion or ABT variables. You can change this default configuration according to your requirements. For example, the **PROSPECT_CUST_D** data source can be initially configured for defining all types of basic ABT variables (time-based, behavioral, and direct) and subset criterion. However, you might not require this data source when you define a behavioral variable. Therefore, you can update the data source usage accordingly.

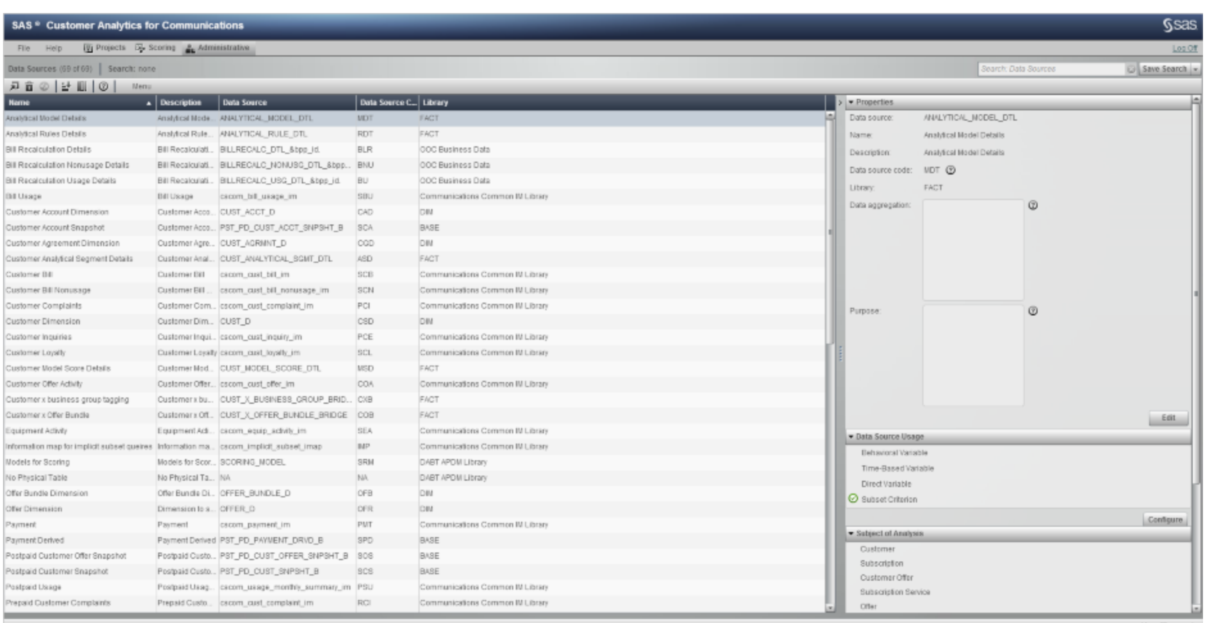
Managing the Configuration of Data Sources

Edit the Properties of a Data Source

To edit the properties of a data source, complete these steps:

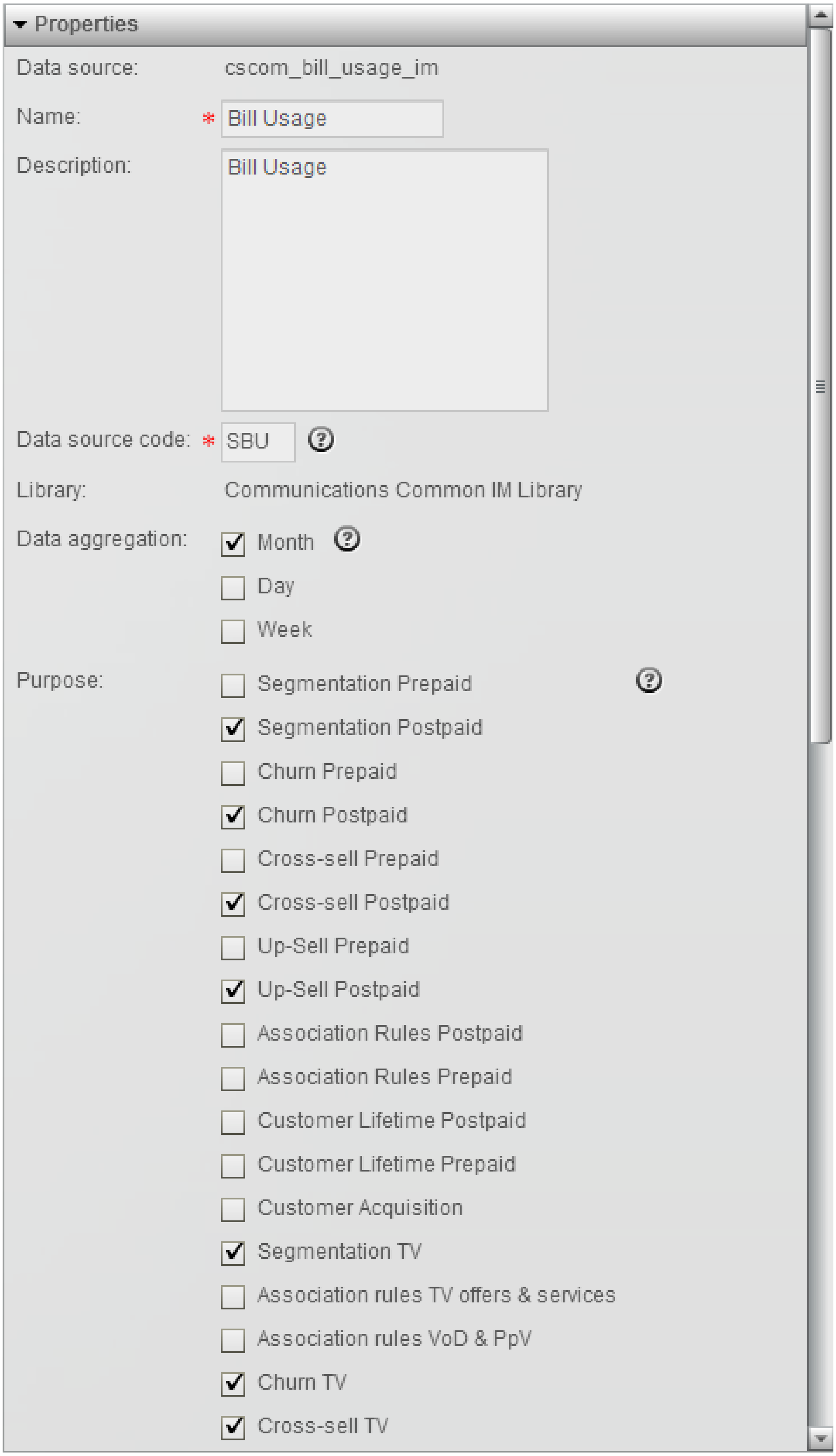
1. In the Administrative workspace, select the data source whose properties you want to change.

Display 10.1 *Administrative Workspace*



2. In the Properties pane, click **Edit** to change the default properties of the data source.

Display 10.2 *Properties Pane*



You can change the values according to your requirements.

Data source name
displays the name of the data source as defined in the metadata.

Name
displays a short name of the data source, which can easily identify the data source in the SAS Customer Analytics for Communications interface. For example, if the data source name is CUST_AGRMNT_D, you can enter the data source name as *Customer Agreement Dimension*.

Description
description of the data source, which can briefly indicate its usage or purpose.

Data source code
a unique code that is assigned to the data source. The code can contain only three characters. In addition, it cannot start with a number, and cannot contain special characters other than an underscore (_). This code is concatenated with codes of other attributes that are used in variable definitions to create default variable names in a project. For example, for the SUBSCRP_D and SERVICE_D dimensions, you can enter the code as *SUB* and *SRV* respectively.

Library
indicates the library to which the data source belongs.

Data aggregation
indicates the grains at which the data source stores data. If you select the lowest grain, **Day**, then the data source can aggregate information at the other grains as well. Therefore, you can select the other two grains, **Month** and **Week** also for the data source. Also, this field is applicable to only those data sources that you want to use for creating variables.

Purpose
determines the data source's availability for a project. Select one or more purposes. For example, if you select **Segmentation Postpaid**, the data source will be available for creating ABT variables for all projects that you create for the **Segmentation Postpaid** purpose.

3. Click **OK**.

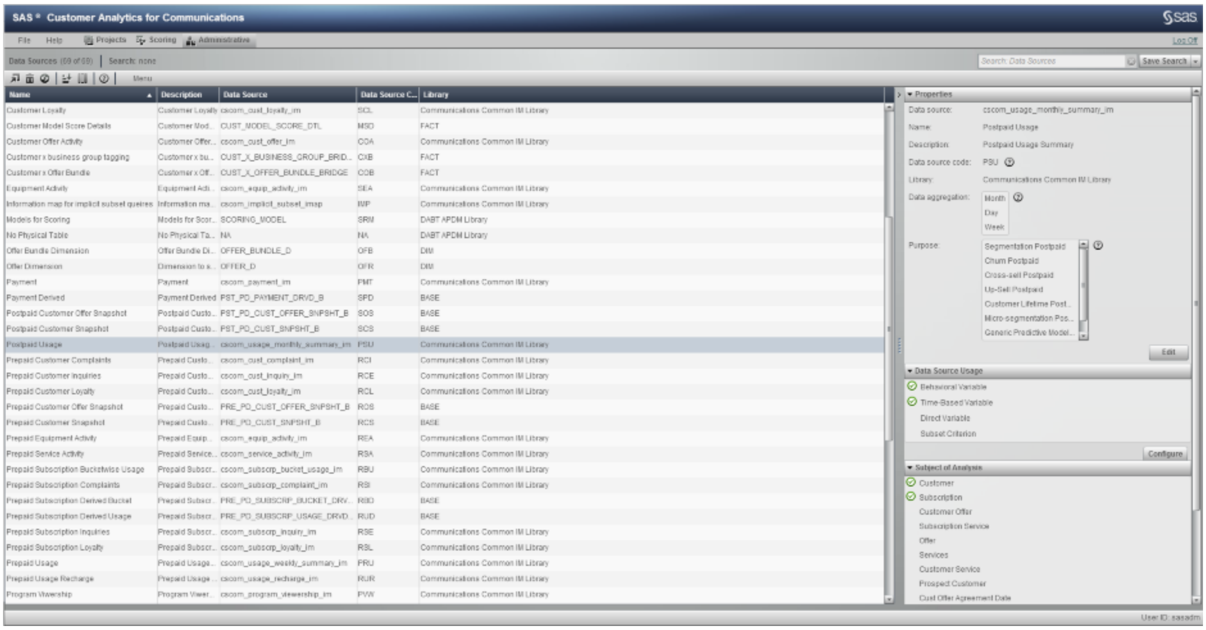
Configure the Usage of a Data Source

A data source that you configure for creating a particular type of variable appears in the **Data sources** list for that variable type in the New Variables window.

To configure the usage of a data source, complete these steps:

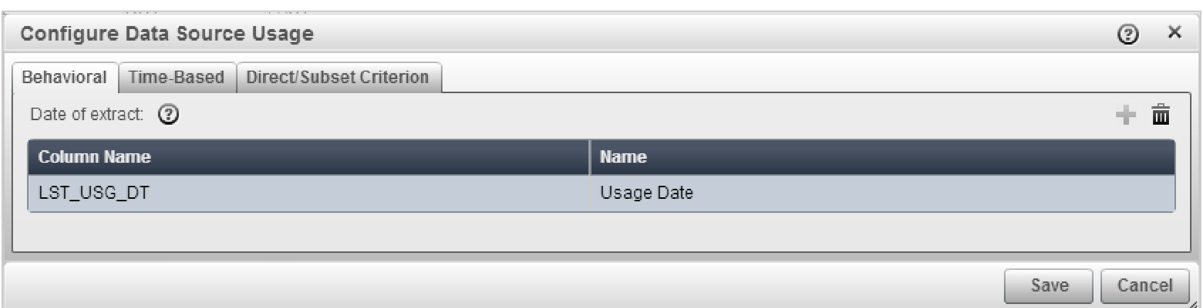
1. In the Administrative workspace, select the data source whose usage you want to configure.

Display 10.3 *Administrative Workspace*



2. In the Data Source Usage pane, click **Configure**. The Configure Data Source Usage window appears.

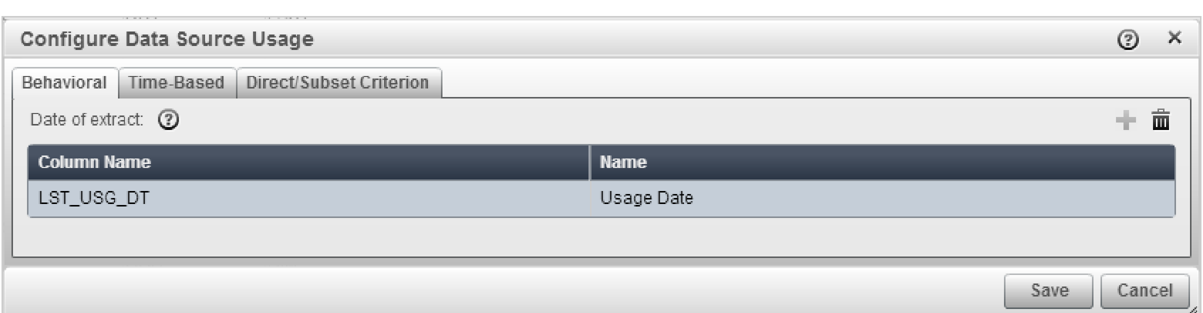
Display 10.4 *Configure Data Source Usage Window*



3. Select the appropriate tab, depending on the type of ABT variables that you want to define using this data source.

   Behavioral tab

Display 10.5 *Behavioral Tab*

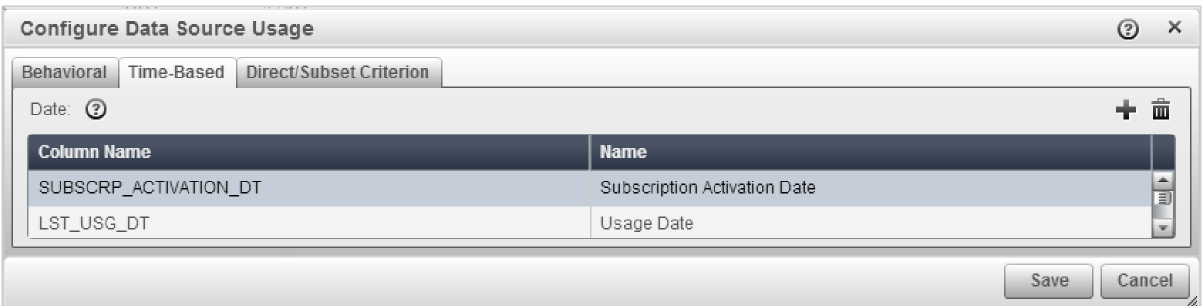


   Click +. The Select Column window appears. This window shows a list of all those columns in the selected data source that have their data type defined as **Date** or **Datetime**. When the modeling ABT is built, data is extracted from the data source based on the date that you have specified here.

Note: You can configure only one date of extract per data source.

For example, consider that you are configuring the **PST_PD_PAYMENT_DRVD_B** data source, so that it can be used for defining behavioral variables. You can add the **LAST_PYMNT_DT** column as the date of data extraction. A behavioral variable that computes the total amount paid in the past six months is defined. The ABT build date is July 31, 2011. When the ABT is built, data is extracted for this variable such that **LAST_PYMNT_DT** for each record is between the dates February 1, 2011 and July 31, 2011.

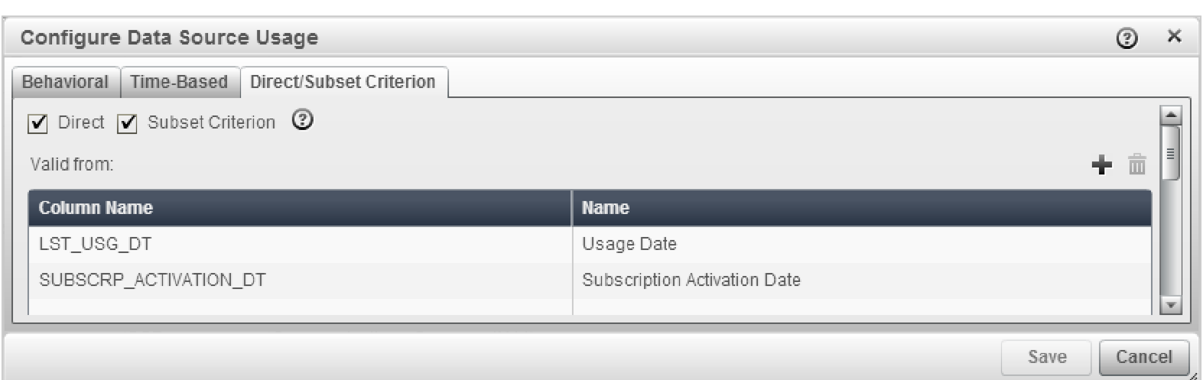
Display 10.6 *Time-Based Tab*



Click . The Select Column window appears. This window shows a list of all those columns in the selected data source that have their data type defined as **Date** or **Datetime**. You can add one or more dates. When the modeling ABT is built, data is sorted based on these dates and the time-based variable is populated with the most recent data in the specified time period.

For example, consider that you are configuring the **CSCOM_USAGE_RECHARGE_IM** data source, so that it can be used for defining the time-based variable. You can add the **PYMNT_DT** as the date for sorting the records. A time-based variable that computes the latest recharge value for a subscription in past three months is defined. For a certain subscription, the recharge values are 50 USD, 10 USD, 20 USD, and 30 USD in the months of October 2011, November 2011, December 2011, and February 2012 respectively. The ABT build date is January 31, 2011. When the ABT is built, the records are sorted based on the PYMNT_DT. Therefore, the most recent recharge value (as of the ABT build date) 20 USD is populated as the variable value.

Display 10.7 *The Direct and Subset Criterion Tab*

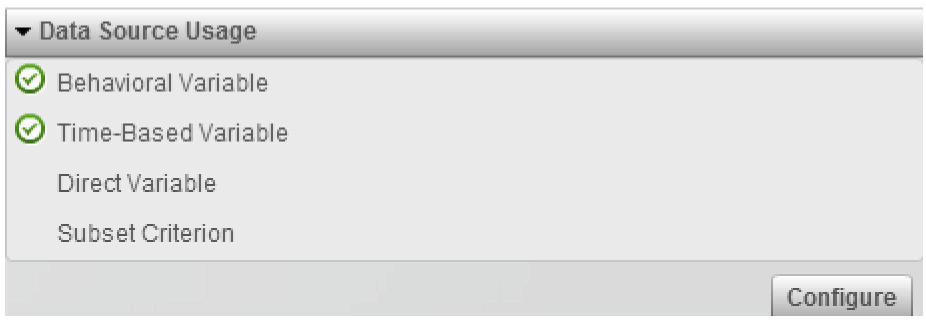


Click to add date range values. When the modeling ABT is built, direct variables are populated based on the starting and ending date that you specify here. In addition, this data source can also be used in a subset map based on which you can define a subset criterion.

For example, you want to configure the **CUST_D** data source, so that it can be used to define direct variables. To do so, you can add the **VALID_START_DTTM** and **VALID_END_DTTM** as the date range values. A direct variable that gives the status of a customer in the last week is defined. Consider that a particular subscription of a customer has an **Active** status until the month of January 2011. However, the customer churns in the month of February 2011. If the modeling ABT is built in the month of January, the variable value will contain the status as of the ABT build date. Therefore, the value for the direct variable will be **Active**.

4. Click **Save**. Depending on the information that you configure on each tab, is displayed in the Data Source Usage pane, beside the respective type (behavioral, time-based, and direct) of variable and subset criterion.

Display 10.8 *Data Source Usage Pane*



Configure the Subject of Analysis for a Data Source

The subject of analysis for a data source indicates the type of information that it contains. You can select one or more subjects of analysis for a data source. For example, if the data source contains usage-related information for all subscriptions of a customer, you can select the subject of analysis as **Customer** and **Subscription**. In addition, this data source is available for a project, if the subject of analysis of the project is one of the subjects of analysis of the data source.

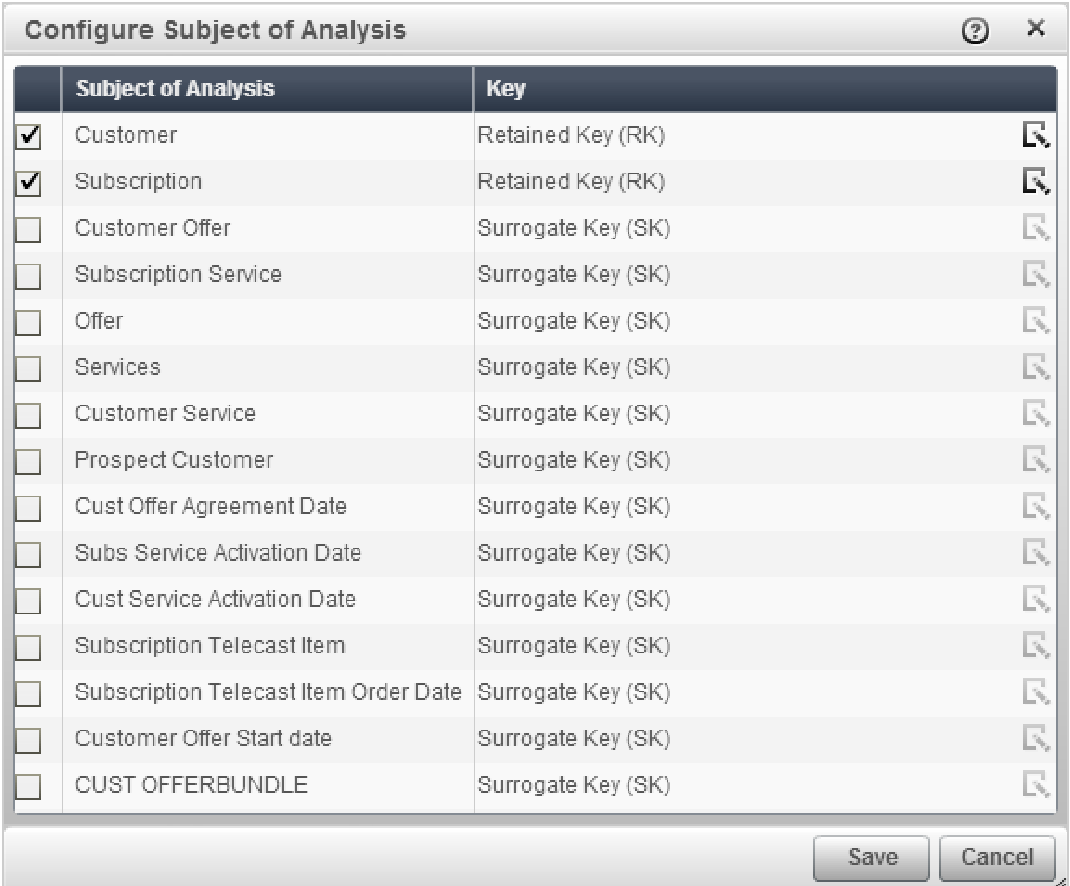
Also, before you select a subject of analysis for a data source, make sure that the data source has the key column that uniquely identifies each subject in the data source. For a fact, a dimension, or a base table this column must be a retained key. However, for an information map, you can choose the key type as retained key or surrogate key. Make sure that you select the correct key type.

To configure the subject of analysis for a data source, complete these steps:

1. In the Administrative workspace, select the data source whose subject of analysis you want to define.

2. In the Subject of Analysis pane, click **Configure**. The Configure Subject of Analysis window appears.

Display 10.9 *The Configure Subject of Analysis Window*



3. Select one or more subjects of analysis that you want to configure for the data source.

4. (Optional) If you are configuring a subject of analysis for an information map, then you must select the type of key each subject of analysis that you have selected represents. The key type can be **Surrogate Key (SK)** or **Retained Key (RK)**. If your information map is based on a fact table, select the **Key** as**Surrogate Key (SK)**. Otherwise, select **Retained Key (RK)**

   Note: If you are configuring a base table, the default key is **Retained Key (RK)**. You cannot change this key type.

5. Click **Save**. The Configure Subject of Analysis window closes and in the Subject of Analysis pane, a appears next to the subjects of analysis that you selected.

Managing Data Sources

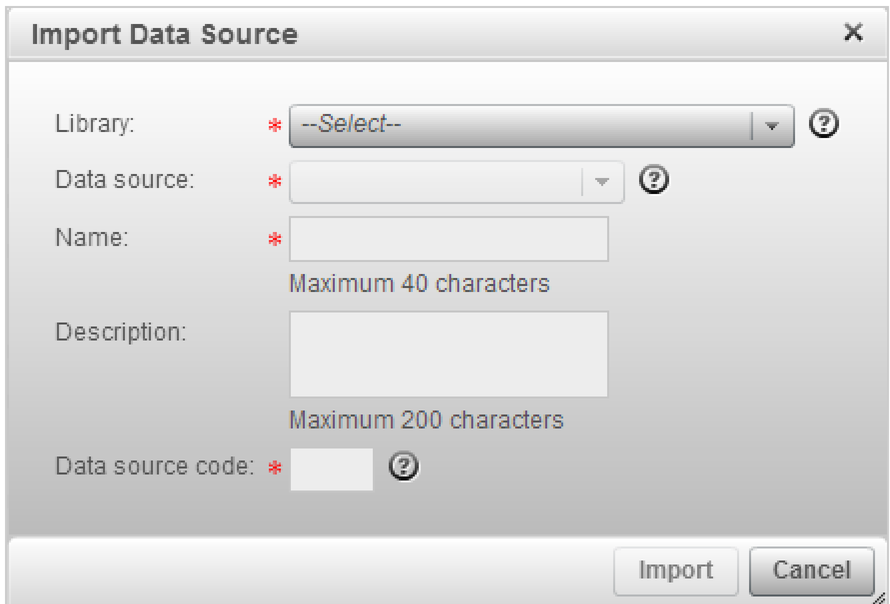
Import a Data Source

When a new data source is added, you can consider whether you need to use this data source for building the modeling ABT. If you want to use it in SAS Customer Analytics for Communications, you must import it in the Application data. Importing a data source does not actually import the data source into the Application data. It simply imports the configuration information of the data source into the Application data. The Administrative workspace enables you to modify this default configuration information. As a result, the data source can be used in the application for creating subset maps and ABT variables.

To import a data source, complete these steps:

1. Select the Administrative workspace.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Data Source**. The Import Data Source window appears.

Display 10.10 *Import Data Source Window*



3. Specify the following details for the data source:

Library
: Select the library from which you want to import the data source. This list displays a list of the configured libraries. These libraries store the data sources that you can use in your application. However, if a library does not contain a data source, or if you have imported all the data sources from the library, the library does not appear in the list. For information about how to configure libraries, see *SAS Customer Analytics for Communications: Administrator's Guide*.

Data source name
: Select the data source that you want to import. This list displays the data sources that are available in the selected library and that have not yet been imported into the application. You can select and import only one data source at a time.

Name
: Enter a name for the data source such that it is easily identified in the SAS Customer Analytics for Communications interface.

Description
: Enter a description for the data source to indicate its purpose or usage.

Data source code
: Enter a unique three-character code for the data source. The code cannot begin with a number and cannot contain special characters other than an underscore (_).

4. Click **Import**. The Import Data Source window closes, and the imported data source is displayed in the list of data sources in the Administrative workspace. The values that you have entered in this window are displayed in the Properties pane. You can configure the usage, properties, and subjects of analysis of the data source that you have imported according to your requirements. For details, see “Managing the Configuration of Data Sources” on page 157.

   When you import a data source, its columns are also imported into the application.SAS Customer Analytics for Communications automatically assigns certain data types, column types, and column codes to the columns of the data source. You must review these columns and modify the automatically assigned column types and codes, as required. You cannot modify the data types of the columns.

Delete a Data Source from the Administrative Workspace

You can delete a data source from the Administrative workspace if it is no longer used in the application. If the data source is used for creating variables or used in a subset map definition in a project, you cannot delete the data source.

Note: Deleting a data source from the Administrative workspace does not actually delete that data source from the library. It simply deletes the data source's configuration information from the application.

To delete a data source, complete these steps:

1. In the Administrative workspace, select the data source that you want to delete.
2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Delete Data Source**.
3. In the confirmation message box that appears, click **Yes**.

Configuring the Columns of a Data Source

Overview

In the Administrative workspace, you can double-click a data source to view its columns. On the page that shows the list of columns, you can also perform the following tasks:

- Edit the name of a column, column code, description, and column type.
- Import new columns that are added to the source data source.
- Define dimensional attribute values for columns with column type **Dimensional Attribute**.

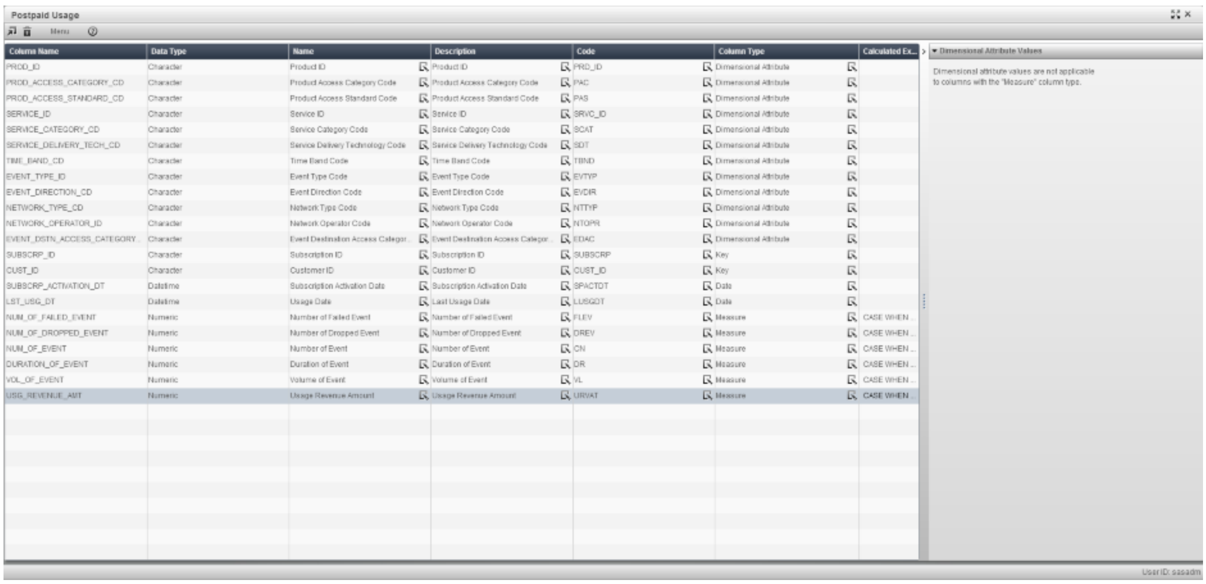
Import a Column of a Data Source

One or more columns can be added to a Foundation data mart data source, base data source, or an information map, which you have configured in the Application data. These columns can be significant for building the modeling ABT. Therefore, you must import the metadata of these columns in the corresponding data source of your Application data.

To import a column of a data source, complete these steps:

1. In the Administrative workspace, double-click the data source whose column you want to import. The list of columns is displayed.

Display 10.11 *Data Source Columns List*



2. On the toolbar, click . Alternatively, on the toolbar, select **Menu** ⇨ **Column**. The Import Column window appears. This window shows a list of the columns that have been added to the data source but have not yet been imported into the application.
3. Select the column that you want to import. To select multiple adjacent columns, select a column, hold down the Shift key, and then use the down arrow key to select the columns. To select multiple nonadjacent columns, select a column, and then hold down the Ctrl key while you click other columns that you want to select.
4. Click **Import**. The Import Column window closes, and the imported columns are added to the list of columns on the columns page.
5. (Optional) View the default details that are configured for the column. You can modify the automatically assigned column types, descriptions, and codes, as required. However, you cannot modify the data types of the columns.

Configure Columns

When you import a data source, SAS Customer Analytics for Communications automatically assigns a column code to each column of the data source. It also assigns a column type to each column. You can review these automatically assigned values and edit them according to your requirements.

Note: You cannot change the **Column Name** and **Name**.

Click to change the column details such as name, description, code, and column type.

Column Name
: The column name that you enter must be unique as the column is identified with this name in the SAS Customer Analytics for Communications interface.

Code

The column code that you enter is concatenated with codes of other attributes used in variable definitions to create default variable names in a project. Moreover, the column code cannot exceed 20 characters, cannot begin with a number, and cannot include special characters other than an underscore (_).

Column Type

You have to select the column type from the list. Here are the available values:

Measure

indicates that this column will be available under the **Measures** list in the New Variables window for creating behavioral variables. That is, this column can be used as a measure on which aggregations can be performed. You must select **Measure** only for columns with Numeric data type.

Dimensional Attribute

indicates that this column will be available under the **Selection Criterion** list in the New Variables window for creating behavioral and time-based variables. The column can also be used to define filter conditions in the Add Child Node window.

Typically, you must select **Dimensional Attribute** only for columns with Character data type. However, you can select **Dimensional Attribute** also for a column with Numeric data type.

For a dimensional attribute column, you must also define dimensional attribute values. The dimensional attribute values are used to define selection criteria when creating behavioral or time-based variables. These values are also used to define filter conditions in a subset criterion. For details, see "Add Dimensional Attribute Values" on page 171.

Date

represents the columns that store date-specific information such as agreement date, birthdate, subscription activation date, and so on.

Key

represents the key columns such as CUST_ID and SUBSCRP_ID.

Delete a Column of a Data Source

You can delete a column from a data source in the Administrative workspace if the column is no longer used in the application. If the column is used in a variable definition or a subset map definition in a project, you cannot delete the column.

Note: Deleting a column from a data source in the Administrative workspace does not actually delete the column from the data source. It simply removes the column's metadata from the Application data.

To delete columns from a data source, complete these steps:

1. In the Administrative workspace, double-click the data source from which you want to delete columns.
2. On the page that appears (the Columns page), select the column that you want to delete, and then on the toolbar, click 🗑. Alternatively, on the toolbar, select **Menu** ⇨ **Delete Column**.

   Note: You can select and delete only one column at a time.
3. In the confirmation message box that appears, click **Yes**.

Update the Information Map Configuration

SAS Customer Analytics for Communications provides you with a set of predefined information maps. In the Administrative workspace, these information maps are displayed as data sources that belong to the **Communications Common IM Library** library. When your administrator installs SAS Customer Analytics for Communications, the metadata of these information maps is automatically configured in the Application data (SOURCE_COLUMN_MASTER table (available in the CSCAPDM library). This is also applicable if you import a new information map in SAS Customer Analytics for Communications. This metadata contains information about how the columns (also called data items) of an information map are mapped to the corresponding columns (source columns) of the Foundation data mart tables (source tables). It also indicates whether the column of an information map is a calculated field. In addition, it stores the expression of the calculated field. For details about the SOURCE_COLUMN_MASTER table and the data mapping of information maps, see *SAS Customer Analytics for Communications: Data Reference Guide*.

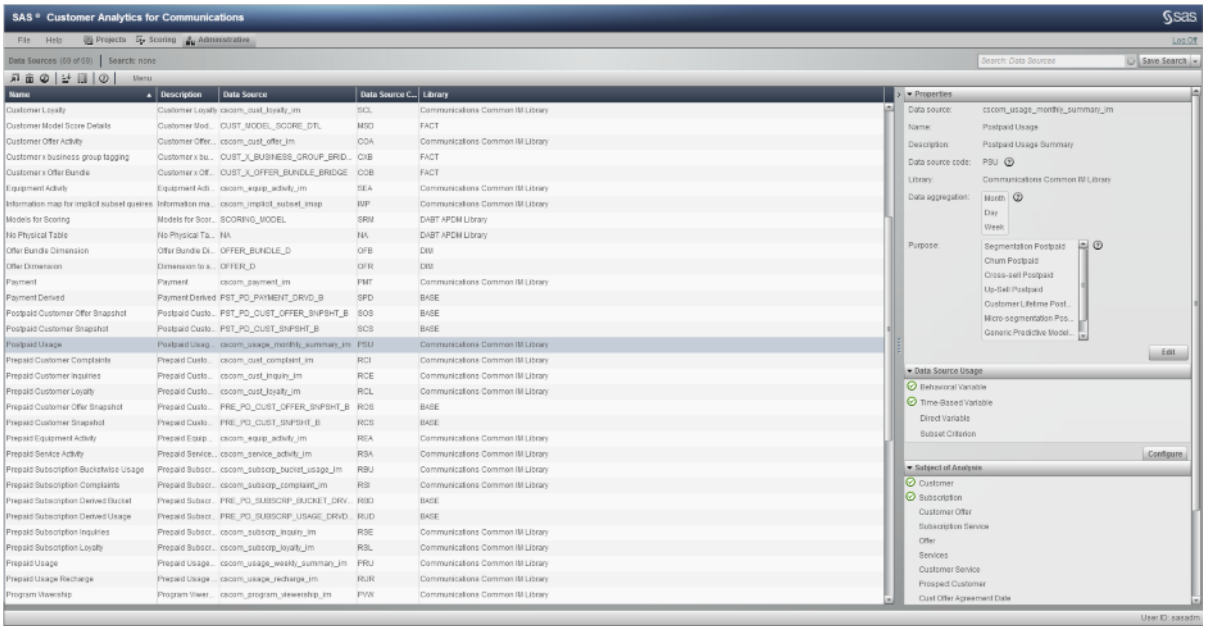
There can be certain scenarios in which the column metadata of information maps that are configured in SAS Customer Analytics for Communications is changed. These information maps can either be predefined or the ones that you have imported into SAS Customer Analytics for Communications. For example, the expression that is used in an existing column (calculated field) of an information map can be changed. Also, the source column or the source table to which an existing column of an information map is mapped, can be changed. In both cases, the corresponding information also needs to be updated in the Application data. In order to do so, SAS Customer Analytics for Communications enables you to update the Application data with the changes that are done to the metadata of existing columns of an information map.

Note: This feature enables to you update the Application data if the metadata of existing columns of an information map is changed. However, it does not update the Application data if new columns are added to an information map or existing columns are deleted from an information map.

To update the information map configuration, complete these steps:

1. In the Administrative workspace, select the information map data source whose metadata information you want to update.

Display 10.12 *Update Metadata for Information Map*



TIP In order to select the correct information map, you can sort on the **Library** column. The data sources that have the **Library** as **Communications Common IM Library** are configured as information maps.

2. On the toolbar, select . The Application configuration data is updated according to the latest metadata of the information map that you have selected.

Dimensional Attribute Values of a Column

Overview of Dimensional Attributes

The values of columns, which are of **Dimensional Attribute** type can be implementation-specific and therefore cannot be assigned default values. Therefore, you have to configure all dimensional values according to your requirements. These values are required when you define a subset criterion or specify one or more dimensions when you define an ABT variable.

Note: If a dimensional attribute value is used in a variable definition or a subset criterion, a warning message is displayed when you change the value. However, you can still change the value. The new value is used when you perform a Show Count operation or build the modeling ABT the next time. The new value is not automatically used by the existing scoring jobs.

Note: Some columns of the **Dimensional Attribute type**, might have default values. However, you must verify these values and change them according to your requirements.

SAS Customer Analytics for Communications enables you to either import or define dimensional values.

Import Dimensional Attribute Values

You can import dimensional attribute values that are defined in the source data. As a result, these values are made available in the Application data, and you can use these values when you define subset criterion or ABT variables.

For example, let us assume that the following values are defined for the **CUST_STATUS_CD** column of the **CUST_D** table of the Foundation data mart. You can import these values into the Application data.

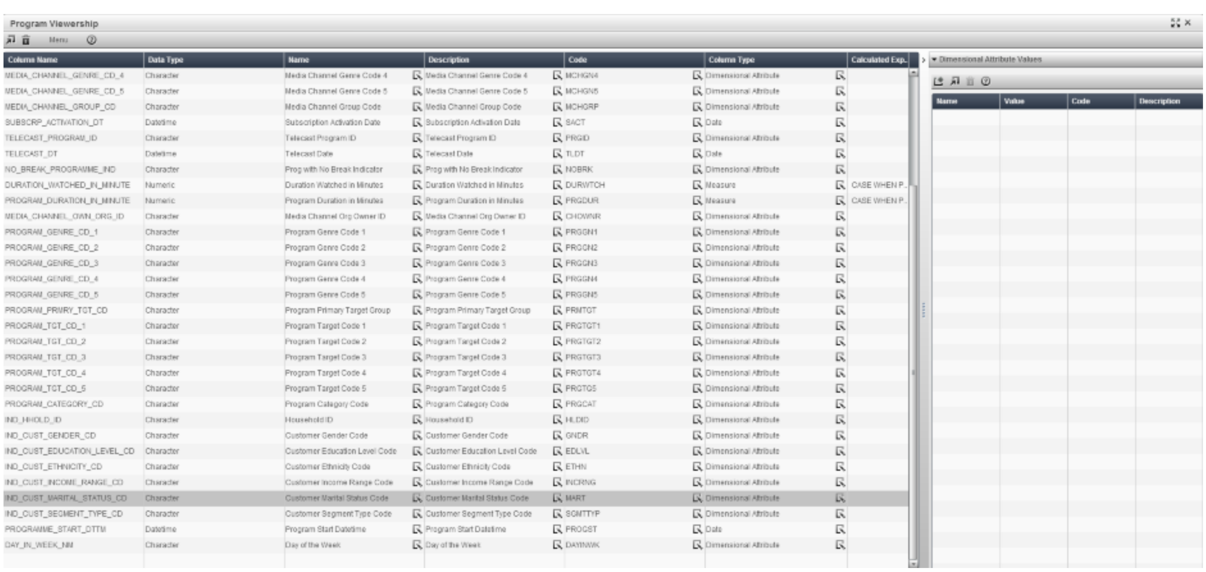
Table 10.1 *Example of Dimensional Attribute Values*

Name	Value	Code	Description
Active Status Flag	'ACTIVE'	ACT	Flag value for Customer with Active status
Dormant Status Flag	'DORMANT'	DOR	Flag value for Customer with Dormant status

To import dimensional attribute values for a column, complete these steps:

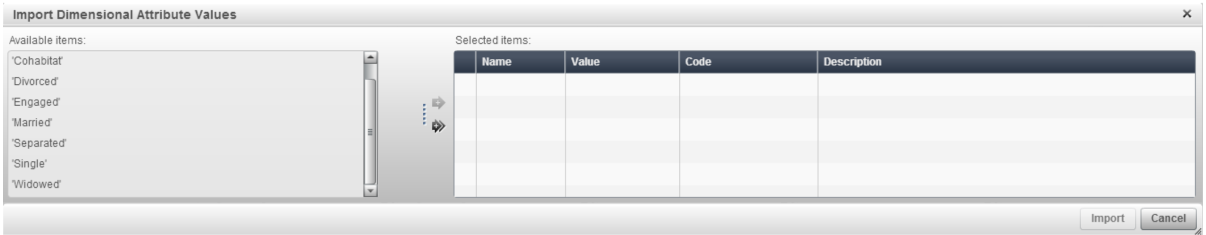
1. In the Administrative workspace, double-click the data source in which you want to add dimensional values to a column.
2. In the Columns list that is displayed, select the column for which you want to add dimensional values. You must select a column of the type **Dimensional Attribute**.

Display 10.13 *Import Dimensional Attribute Values*



3. In the Dimensional Attributes Values pane, click the import icon. The Import Dimensional Attribute Values window appears.

Display 10.14 *Import Dimensional Attribute Values Window*



4. From the **Available items** list, select the values that you want to import. The list displays the distinct values that are present in the selected column of the corresponding data source. These values are yet to be configured.
5. Click to move the selected values to the **Selected items** list.

   TIP To move all the values to the **Selected items** list, click .
6. (Optional) Verify the name, code, value, and description of the dimensional attributes that you are importing.
7. (Optional) Change the name, code, and description of the value if required.
8. Click **Import** to import the values that you have selected.

Add Dimensional Attribute Values

SAS Customer Analytics for Communications enables you to define dimensional attributes, which are not available in the source data. For example, let us assume that the values, ACTIVE and DORMANT, are available for the **CUST_STATUS_CD** column of the **CUST_D** table of the Foundation data mart. You might have imported these values into the Application data. In addition, you want to use the dimensional attribute value, SUSPENDED, in your application. You can add this value in the Application data by using the Add Dimensional Attribute window. In this window, you can specify the details that appear in the following table for this dimensional attribute value.

Note: The dimensional attribute value that you add in the Application data would eventually needs to be added in the source data also.

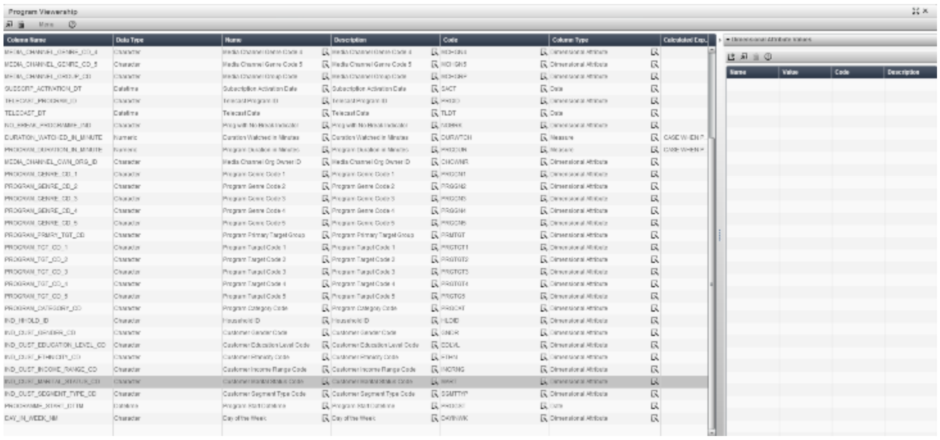
Table 10.2 *New Dimensional Attribute Value*

Name	Value	Code	Description
Suspended Status Flag	‘SUSPENDED’	SUS	Flag value for Customer with Suspended status

To add dimensional attributes, complete these steps:

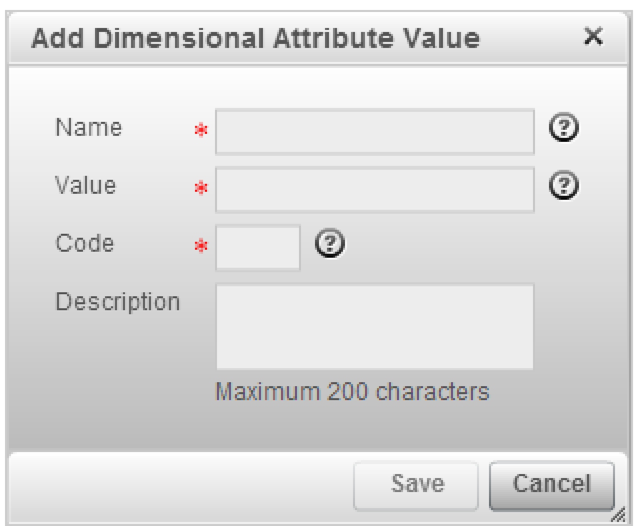
1. In the Administrative workspace, double-click the data source in which you want to add dimensional values to a column.
2. In the Columns list that is displayed, select the column for which you want to add dimensional values. You must select a column of the type **Dimensional Attribute**.

***Display 10.15** Add Dimensional Attributes*



3. In the Dimensional Attributes Values pane, click . The Add Dimensional Attribute Value window appears.

***Display 10.16** Add Dimensional Attribute Value Window*



4. Enter the following details for the attribute values:

Name
Enter a meaningful name for the dimensional attribute value. The dimensional attribute value is identified by this name in the SAS Customer Analytics for Communications interface. The name must be unique within a column and must not exceed 40 characters.

Value
Enter a dimensional attribute value for the column. This value, exactly as you enter it, is used in filter conditions of a subset criterion. Also, it is used as a selection criterion when you define ABT variables. Therefore, you must ensure the syntactical accuracy of the value. Follow these guidelines when entering a value:

Here are a few examples of valid dimensional attribute values:

- If the data type of the column is numeric, you can enter a number or a global macro variable that resolves to a number.

- If the data type of the column is character, you can enter a character, a text string, or a global macro variable that resolves to a character or text string. You must enclose the character or the text string within single quotation marks. 'Y', 'ACTIVE', and 'Wilkes-Barre' are examples of valid character and text strings.

  If a text string contains an apostrophe, you must enclose the text string within double quotation marks. For example, "Coeur d'Alene" is a valid text string.
- If you enter multiple dimensional attribute values, you must separate each value with a comma. For example, you can enter 'ACTIVE', 'INACTIVE' or 25, 50, 100.
- The values that you enter are case sensitive. You must enter the values in the same case in which they are present in the data source.
- A global macro variable must begin with an ampersand (&). Typically, global macro variables are declared through parameters that are stored in the PARAMETER_VALUE_DTL table. For details about the PARAMETER_VALUE_DTL table, see *SAS Customer Analytics for Communications: Administrator's Guide*.
- 1
- 1, 2, 3
- 'CHN'
- ‘ACTIVE, ‘SUSPENDED’, ‘DORMANT’
- &SUBSCRP_ACT_STATUS_VALS

Code
Enter a code for the dimensional attribute value. This code is concatenated with codes of other attributes used in variable definitions to create default variable names in a project. A code must be unique within values that are configured for a given column and must not exceed three characters. Moreover, a code must begin with a character and must not include any special characters.

Description
Enter a description of the attribute value.

5. Click **Save**.

Delete a Dimensional Attribute Value

You can delete a dimensional attribute value from a column if the dimensional attribute value is no longer used in the application. If the dimensional attribute value is used in a variable definition in a project, you cannot delete the value.

To delete a dimensional attribute value, complete these steps:

1. In the Administrative workspace, double-click the data source in which you want to delete one or more dimensional values of a column.
2. In the Columns list that is displayed, select the column whose dimensional values you want to delete. You must select a column of the type **Dimensional Attribute**.
3. In the Dimensional Attributes Values pane, click .
4. In the confirmation dialog box that appears, select **Yes**.

Part 5

Appendix

Appendix 1

Purpose-Specific Selections

Purpose-Specific Predefined Implicit Subset Criteria

Table A1.1 *Purpose-Specific Predefined Implicit Criteria*

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Association Rules Postpaid	Customer Service Activation Date	Postpaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Postpaid	Customer Service Activation Date	Postpaid Active Customer selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Postpaid	Customer Offer Agreement Date	Postpaid Non TV customers selection for offer level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Association Rules Postpaid	Customer Offer Agreement Date	Postpaid Active Customer selection for offer level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Postpaid	Customer Offer	Postpaid Non TV customers selection for offer level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Postpaid	Customer Offer	Postpaid Active Customer selection for offer level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Postpaid	Customer Service	Postpaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Postpaid	Customer Service	Postpaid Active Customer selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Postpaid	Subscription Service Activation Date	Postpaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Postpaid	Subscription Service Activation Date	Postpaid Active Subscription selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable

Purpose	**Subject of Analysis**	**Implicit Subset Criterion for Modeling Run**	**Applicable for Modeling or Scoring Run**	**Implicit Variable Name in Modeling Run**	**Implicit Variable Used in Scoring Run (Y/N)**
Association Rules Postpaid	Subscription Service	Postpaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Postpaid	Subscription Service	Postpaid Active Subscription selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Prepaid	Customer Offer Agreement Date	Prepaid Non TV customers selection for offer level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Prepaid	Customer Offer Agreement Date	Prepaid Active Customer selection for offer level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Prepaid	Customer Service Activation Date	Prepaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Prepaid	Customer Service Activation Date	Prepaid Active Customer selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Prepaid	Customer Offer	Prepaid Non TV customers selection for offer level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Association Rules Prepaid	Customer Offer	Prepaid Active Customer selection for offer level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Prepaid	Customer Service	Prepaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Prepaid	Customer Service	Prepaid Active Customer selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Prepaid	Subscription Service Activation Date	Prepaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Prepaid	Subscription Service Activation Date	Prepaid Active Subscription selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable
Association Rules Prepaid	Subscription Service	Prepaid Payment Mode selection for service level MBA or Sequence Analysis	Modeling	Not applicable	Not applicable
Association Rules Prepaid	Subscription Service	Prepaid Active Subscription selection for service level MBA or Sequence Analysis	Scoring	Not applicable	Not applicable

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Association Rules for VOD and PPV	Subscription Telecast Item	TV customers/ subscriptions with telecast items (This is a subset map)	Scoring	Not applicable	Not applicable
Association Rules for VOD and PPV	Subscription Telecast Item Order Date	TV customers/ subscriptions with telecast items (This is a subset map)	Scoring	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Service Activation Date	All customers with TV	Modeling	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Service Activation Date	Active customers with TV	Scoring	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Offer	All customers with TV	Modeling	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Offer	Active customers with TV	Scoring	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Offer Start date	All customers with TV	Modeling	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Offer Start date	Active customers with TV	Scoring	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Service	All customers with TV	Modeling	Not applicable	Not applicable
Association Rules TV Offers and Services	Customer Service	Active customers with TV	Scoring	Not applicable	Not applicable
Association Rules TV Offers and Services	Subscription Service Activation Date	All Subscription with TV	Modeling	Not applicable	Not applicable
Association Rules TV Offers and Services	Subscription Service Activation Date	Active Subscription with TV	Scoring	Not applicable	Not applicable
Association Rules TV Offers and Services	Subscription Service	All Subscription with TV	Modeling	Not applicable	Not applicable

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Association Rules TV Offers and Services	Subscription Service	Active Subscription with TV	Scoring	Not applicable	Not applicable
Churn Postpaid	Subscription	Postpaid Customers or Subscriptions	Modeling	S_SUM_PSU_URVAT_L6M	Y
Churn Postpaid	Subscription	Postpaid Active Subscriptions	Scoring	S_SUM_PSU_URVAT_L6M	Y
Churn Prepaid	Subscription	Prepaid Customers or Subscriptions	Modeling	S_SUM_PRU_URVAT_L6W	Y
Churn Prepaid	Subscription	Prepaid Active Subscriptions	Scoring	S_SUM_PRU_URVAT_L6W	Y
Churn TV	Subscription	All customers with TV	Modeling	D_SUM_IPU_IPUSG_L6M	Y
Churn TV	Subscription	Active Subscription with TV	Scoring	D_SUM_IPU_IPUSG_L6M	Y
Cross-sell Postpaid	Customer	Postpaid Customers or Subscriptions	Modeling	Not applicable	Not applicable
Cross-sell Postpaid	Customer	Postpaid Active Customers	Scoring	Not applicable	Not applicable
Cross-sell Postpaid	Subscription	Postpaid Customers or Subscriptions	Modeling	S_SUM_PSU_URVAT_L6M	Y
Cross-sell Postpaid	Subscription	Postpaid Active Subscriptions	Scoring	S_SUM_PSU_URVAT_L6M	Y
Cross-sell Prepaid	Customer	Prepaid Customers or Subscriptions	Modeling	Not applicable	Not applicable
Cross-sell Prepaid	Customer	Prepaid Active Customers	Scoring	Not applicable	Not applicable
Cross-sell Prepaid	Subscription	Prepaid Customers or Subscriptions	Modeling	S_SUM_PRU_URVAT_L6W	Y
Cross-sell Prepaid	Subscription	Prepaid Active Subscriptions	Scoring	S_SUM_PRU_URVAT_L6W	Y
Cross-sell TV	Customer	All customers with TV	Modeling	Not applicable	Not applicable

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Cross-sell TV	Customer	Active customers with TV	Scoring	Not applicable	Not applicable
Cross-sell TV	Subscription	All Subscription with TV	Modeling	D_SUM_IPU_ IPUSG_L6M	Y
Cross-sell TV	Subscription	Active Subscription with TV	Scoring	D_SUM_IPU_ IPUSG_L6M	Y
Customer Acquisition	Prospect Customer	Contacted Prospects	Modeling	Not applicable	Not applicable
Customer Acquisition	Prospect Customer	Fresh Prospects	Scoring	Not applicable	Not applicable
Customer Lifetime Postpaid	Customer	Postpaid Customers or Subscriptions	Modeling	A_CSD_ FRCSTDT_CM	N
Customer Lifetime Postpaid	Customer	Postpaid Customers or Subscriptions	Modeling	A_CSD_ TERMNDT_CM	N
Customer Lifetime Postpaid	Customer	Postpaid Customers or Subscriptions	Modeling	_T_	Y
Customer Lifetime Postpaid	Customer	Postpaid Active Customers	Scoring	A_CSD_ FRCSTDT_CM	N
Customer Lifetime Postpaid	Customer	Postpaid Active Customers	Scoring	A_CSD_ TERMNDT_CM	N
Customer Lifetime Postpaid	Customer	Postpaid Active Customers	Scoring	_T_	Y
Customer Lifetime Prepaid	Customer	Prepaid Active Customers	Scoring	A_CSD_ FRCSTDT_CM	N
Customer Lifetime Prepaid	Customer	Prepaid Customers or Subscriptions	Modeling	A_CSD_ FRCSTDT_CM	N
Customer Lifetime Prepaid	Customer	Prepaid Customers or Subscriptions	Modeling	_T_	Y
Customer Lifetime Prepaid	Customer	Prepaid Active Customers	Scoring	_T_	Y
Customer Lifetime TV	Customer	All customers with TV	Modeling	A_CSD_ TERMNDT_CM	N

Purpose	Subject of Analysis	Implicit Subset Criterion for Modeling Run	Applicable for Modeling or Scoring Run	Implicit Variable Name in Modeling Run	Implicit Variable Used in Scoring Run (Y/N)
Customer Lifetime TV	Customer	All customers with TV	Modeling	_T_	Y
Customer Lifetime TV	Customer	All customers with TV	Modeling	A_CSD_ FRCSTDT_CM	N
Customer Lifetime TV	Customer	Active customers with TV	Scoring	A_CSD_ FRCSTDT_CM	N
Customer Lifetime TV	Customer	Active customers with TV	Scoring	A_CSD_ TERMNDT_CM	N
Customer Lifetime TV	Customer	Active customers with TV	Scoring	_T_	Y
Segmentation Postpaid	Customer	Postpaid Customers or Subscriptions	Modeling	Not applicable	Not applicable
Segmentation Postpaid	Customer	Postpaid Active Customers	Scoring	Not applicable	Not applicable
Segmentation Prepaid	Customer	Prepaid Customers or Subscriptions	Modeling	Not applicable	Not applicable
Segmentation Prepaid	Customer	Prepaid Active Customers	Scoring	Not applicable	Not applicable
Segmentation TV	Customer	All customers with TV	Modeling	Not applicable	Not applicable
Segmentation TV	Customer	Active customers with TV	Scoring	Not applicable	Not applicable
Up-Sell Postpaid	Customer	Postpaid Customers or Subscriptions	Modeling	Not applicable	Not applicable
Up-Sell Postpaid	Subscription	Postpaid Customers or Subscriptions	Modeling	S_SUM_PSU_ URVAT_L6M	Y
Up-Sell Postpaid	Customer	Postpaid Active Customers	Scoring	Not applicable	Not applicable
Up-Sell Postpaid	Subscription	Postpaid Active Subscriptions	Scoring	S_SUM_PSU_ URVAT_L6M	Y
Up-Sell Prepaid	Customer	Prepaid Customers or Subscriptions	Modeling	Not applicable	Not applicable

Purpose	**Subject of Analysis**	**Implicit Subset Criterion for Modeling Run**	**Applicable for Modeling or Scoring Run**	**Implicit Variable Name in Modeling Run**	**Implicit Variable Used in Scoring Run (Y/N)**
Up-Sell Prepaid	Subscription	Prepaid Customers or Subscriptions	Modeling	S_SUM_PRU_URVAT_L6W	Y
Up-Sell Prepaid	Customer	Prepaid Active Customers	Scoring	Not applicable	Not applicable
Up-Sell Prepaid	Subscription	Prepaid Active Subscriptions	Scoring	S_SUM_PRU_URVAT_L6W	Y
Up-Sell for TV	Customer	All customers with TV	Modeling	Not applicable	Not applicable
Up-Sell for TV	Subscription	All Subscription with TV	Modeling	D_SUM_IPU_IPUSG_L6M	Y
Up-Sell for TV	Subscription	Active Subscription with TV	Scoring	D_SUM_IPU_IPUSG_L6M	Y
Up-Sell for TV	Customer	Active customers with TV	Scoring	Not applicable	Not applicable

Purpose-Specific Predefined Values for Outcome Period

***Table A1.2** Purpose-Specific Predefined Values for Outcome Period*

Purpose	Subject of Analysis	Time Grain	Minimum Value of Outcome Period	Maximum Value of Outcome Period	Default Value for Outcome Period	Score Writeback ARM table
Association Rules Postpaid	Customer Offer Agreement Date	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Service Activation Date	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Offer	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Service	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Subs Service Activation Date	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub
	Subscription Service	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub

Purpose	Subject of Analysis	Time Grain	Minimum Value of Outcome Period	Maximum Value of Outcome Period	Default Value for Outcome Period	Score Writeback ARM table
Association Rules Prepaid	Customer Offer Agreement Date	Week	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Service Activation Date	Week	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Offer	Week	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Service	Week	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Subscription Service Activation Date	Week	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub
	Subscription Service	Week	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub
Association Rules TV Offers and Services	Customer Service Activation Date	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Offer	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Offer Start date	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Customer Service	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_cust
	Subs Service Activation Date	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub
	Subscription Service	Month	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub

Purpose	Subject of Analysis	Time Grain	Minimum Value of Outcome Period	Maximum Value of Outcome Period	Default Value for Outcome Period	Score Writeback ARM table
Association Rules for VOD and PPV	Subscription Telecast Item	Day	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub
	Subscription Telecast Item Order Date	Day	Not applicable	Not applicable	Not applicable	Rules_ scoring_ result_sub
Churn Postpaid	Subscription	Month	1	3	1	Predicted_ scoring_ result_sub
Churn Prepaid	Subscription	Week	1	3	1	Predicted_ scoring_ result_sub
Churn TV	Subscription	Month	1	3	1	Predicted_ scoring_ result_sub
Cross-sell Postpaid	Customer	Month	1	3	1	Predicted_ scoring_ result_cust
	Subscription	Month	1	3	1	Predicted_ scoring_ result_sub
Cross-sell Prepaid	Customer	Week	1	3	1	Predicted_ scoring_ result_cust
	Subscription	Week	1	3	1	Predicted_ scoring_ result_sub
Cross-sell TV	Customer	Month	1	3	1	Predicted_ scoring_ result_cust
	Subscription	Month	1	3	1	Predicted_ scoring_ result_sub
Customer Acquisition	Prospect Customer	Month	Not applicable	Not applicable	Not applicable	Predicted_ scoring_ result_cust
Customer Lifetime Postpaid	Customer	Month	Not applicable	Not applicable	Not applicable	Predicted_ scoring_ result_cust
Customer Lifetime Prepaid	Customer	Week	Not applicable	Not applicable	Not applicable	Predicted_ scoring_ result_cust

Purpose	Subject of Analysis	Time Grain	Minimum Value of Outcome Period	Maximum Value of Outcome Period	Default Value for Outcome Period	Score Writeback ARM table
Customer Lifetime TV	Customer	Month	Not applicable	Not applicable	Not applicable	Predicted_ scoring_ result_cust
Segmentation Postpaid	Customer	Month	Not applicable	Not applicable	Not applicable	Segment_ scoring_ result_cust
Segmentation Prepaid	Customer	Week	Not applicable	Not applicable	Not applicable	Segment_ scoring_ result_cust
Segmentation TV	Customer	Month	Not applicable	Not applicable	Not applicable	Segment_ scoring_ result_cust
Up-Sell Postpaid	Customer	Month	1	3	1	Predicted_ scoring_ result_cust
	Subscription	Month	1	3	1	Predicted_ scoring_ result_sub
Up-Sell Prepaid	Customer	Week	1	3	1	Predicted_ scoring_ result_cust
	Subscription	Week	1	3	1	Predicted_ scoring_ result_sub
Up-Sell TV	Customer	Month	1	3	1	Predicted_ scoring_ result_cust
	Subscription	Month	1	3	1	Predicted_ scoring_ result_sub

Recommended Purpose-Specific Outcome Variables

Table A1.3 *Recommended Purpose-Specific Outcome Variables*

Purpose	Subject of Analysis	Outcome Variable Definition
Association Rules Postpaid	Customer Offer	Not applicable
	Customer Service Activation Date	Not applicable
	Subscription Service Activation Date	Not applicable
	Customer Offer Agreement Date	Not applicable
	Customer Service	Not applicable
	Subscription Service	Not applicable
Association Rules Prepaid	Customer Offer	Not applicable
	Customer Service Activation Date	Not applicable
	Subscription Service Activation Date	Not applicable
	Customer Offer Agreement Date	Not applicable
	Customer Service	Not applicable
	Subscription Service	Not applicable
Association Rules TV Offers and Services	Customer Offer	Not applicable
	Subscription Service	Not applicable
	Customer Service	Not applicable
	Subscription Service Activation Date	Not applicable
	Customer Service Activation Date	Not applicable
	Customer Offer Start date	Not applicable
Association Rules VOD & PPV	Subscription Telecast Item	Not applicable
	Subscription Telecast Item Order Date	Not applicable

Purpose	Subject of Analysis	Outcome Variable Definition
Churn Prepaid	Subscription	Customer churn is not explicit in case of Prepaid business. The occurrence of the event has to be inferred from the customer's behavior. For example, if the tenure on network of a subscription is greater than 30 days and the decrement in revenue in the past 2 weeks is less than 20 USD, then the churn flag is marked as 1 and 0 otherwise.
Churn Postpaid	Subscription	The churn flag is marked as 1 if the customer closes the subscription during the outcome period and 0 otherwise.
Churn TV	Subscription	The churn flag is marked as 1 if the TV subscription is closed during the outcome period and 0 otherwise.
Cross-Sell Prepaid	Customer	The cross-sell flag is marked as 1 if the customer activates the target service or offer during the outcome window and 0 otherwise.
	Subscription	The cross-sell flag is marked as 1 if the target service or offer is activated for the subscription during the outcome period and 0 otherwise.
Cross-Sell Postpaid	Customer	The cross-sell flag is marked as 1 if the customer activates the target service or offer during the outcome period and 0 otherwise.
	Subscription	The cross-sell flag is marked as 1 if the target service or offer was activated for the subscription during the outcome period and 0 otherwise.
Cross-Sell TV	Customer	The cross-sell flag is marked as 1 if the customer activates the TV service or offer during the outcome period and 0 otherwise.
	Subscription	The cross-sell flag is marked as 1 if the subscription activates the TV service or offer during the outcome window and 0 otherwise.
Customer Acquisition	Prospect Customer	The acquisition indicator is marked as 1 if the prospective customer is acquired through a particular campaign and 0 otherwise.

Purpose	Subject of Analysis	Outcome Variable Definition
Customer Lifetime Postpaid	Customer	The deactivation indicator is marked as 1 if the customer terminates the subscription before the reference date and 0 otherwise.
Customer Lifetime Prepaid	Customer	Customer churn is not explicit in case of Prepaid business. The occurrence of this event has to be inferred from the customer's behavior. For example, if there is no inbound or outbound usage in the past 30 days, then the deactivation indicator can be marked as 1 and 0 otherwise.
Customer Lifetime TV	Customer	The deactivation indicator is marked as 1 if the TV customer terminates before the reference date and 0 otherwise.
Up-Sell Prepaid	Subscription	The up-sell flag is marked as 1 if the target service or offer was activated for the subscription during the outcome period and 0 otherwise.
	Customer	The up-sell flag is marked as 1 if the customer activates the target service or offer during the outcome period and 0 otherwise.
Up-Sell Postpaid	Subscription	The up-sell flag is marked as 1 if the target service or offer is activated for the subscription during the outcome period and 0 otherwise.
	Customer	The up-sell flag is marked as 1 if the customer activates the target service or offer during the outcome period and 0 otherwise.
Up-Sell TV	Customer	The up-sell flag is marked as 1 if the customer activates the TV service or offer during the outcome period and 0 otherwise.
	Subscription	The up-sell flag is marked as 1 if the subscription activates the TV service or offer during the outcome window and 0 otherwise.
Segmentation Prepaid	Customer	Not applicable
Segmentation Postpaid	Customer	Not applicable
Segmentation TV	Customer	Not applicable

Purpose-Specific Subset Maps

Table A1.4 *Purpose-Specific Subset Maps*

Purpose	Subject of Analysis	Subset Map
Association Rules Postpaid	Customer Offer Agreement Date	Customer Offer Selection Postpaid
	Customer Service Activation Date	Customer Service Selection
	Customer Offer	Customer Offer Selection Postpaid
	Customer Service	Customer Service Selection
	Subs Service Activation Date	Subscription Service Selection
	Subscription Service	Subscription Service Selection
Association Rules Prepaid	Customer Offer Agreement Date	Customer Offer Selection Prepaid
	Customer Service Activation Date	Customer Service Selection
	Customer Offer	Customer Offer Selection Prepaid
	Customer Service	Customer Service Selection
	Subs Service Activation Date	Subscription Service Selection
	Subscription Service	Subscription Service Selection

Purpose	Subject of Analysis	Subset Map
Association Rules TV Offers & Services	Customer Service Activation Date	TV customers or subscriptions and services or offers
	Customer Offer	TV customers or subscriptions and services or offers
	Customer Offer Start Date	TV customers or subscriptions and services or offers
	Customer Service	TV customers or subscriptions and services or offers
	Subs Service Activation Date	TV customers or subscriptions and services or offers
	Subscription Service	TV customers or subscriptions and services or offers
Association rules VOD & PPV	Subscription Telecast Item	TV customers or subscriptions and telecast items
	Subscription Telecast Item Order Date	TV customers or subscriptions and telecast items
Churn Postpaid	Subscription	Subscriptions or Customers level selection
Churn Prepaid	Subscription	Subscriptions or Customers level selection
Churn TV	Subscription	TV customers or subscriptions and services or offers

Purpose	Subject of Analysis	Subset Map
Cross-sell Postpaid	Customer	Subscriptions or Customers level selection
	Customer	Rule Based Customer Selection
	Customer	Customer Offer Selection Postpaid
	Customer	Customer Service Selection
	Subscription	Subscriptions or Customers level selection
	Subscription	Rule Based Subscription Selection
	Subscription	Subscription Service Selection
Cross-sell Prepaid	Customer	Subscriptions or Customers level selection
	Customer	Rule Based Customer Selection
	Customer	Customer Offer Selection Prepaid
	Customer	Customer Service Selection
	Subscription	Subscriptions or Customers level selection
	Subscription	Rule Based Subscription Selection
	Subscription	Subscription Service Selection
Cross-sell TV	Customer	Rule Based Customer Selection
	Customer	TV customers or subscriptions and services or offers
	Subscription	TV customers or subscriptions and services or offers
Customer Acquisition	Prospect Customer	All Prospects
Customer Lifetime Postpaid	Customer	Subscriptions or Customers level selection

Purpose	Subject of Analysis	Subset Map
Customer Lifetime Prepaid	Customer	Subscriptions or Customers level selection
Customer Lifetime TV	Customer	TV customers or subscriptions and services or offers
Up-Sell Postpaid	Customer	Subscriptions or Customers level selection
	Customer	Rule Based Customer Selection
	Customer	Customer Offer Selection Postpaid
	Customer	Customer Service Selection
	Subscription	Subscriptions or Customers level selection
	Subscription	Rule Based Subscription Selection
	Subscription	Subscription Service Selection
Up-Sell Prepaid	Customer	Subscriptions or Customers level selection
Up-Sell Prepaid	Customer	Rule Based Customer Selection
	Customer	Customer Offer Selection Prepaid
	Customer	Customer Service Selection
	Subscription	Subscriptions or Customers level selection
	Subscription	Rule Based Subscription Selection
	Subscription	Subscription Service Selection
Up-Sell TV	Customer	Rule Based Customer Selection
	Customer	TV Customers or subscriptions and services or offers
	Subscription	TV Customers or subscriptions and services or offers

Purpose	Subject of Analysis	Subset Map
Segmentation Postpaid	Customer	Subscriptions or Customers level selection
Segmentation Prepaid	Customer	Subscriptions or Customers level selection
Segmentation TV	Customer	TV Customers or subscriptions and services or offers

Data Sources, Purposes, and Subjects of Analysis

Table A1.5 Configuring Purposes and Subjects of Analysis for Data Sources

Data Source Name	Purpose	Subject of Analysis
Bill Usage	Churn TV	Subscription
	Churn Postpaid	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Customer
	Cross-sell Postpaid	Subscription
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Customer
	Up-Sell Postpaid	Subscription

Data Source Name	Purpose	Subject of Analysis
Customer Account Snapshot	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
Customer Analytical Segment Details	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Cross-sell Prepaid	Customer
	Customer Lifetime TV	Customer
	Segmentation Postpaid	Customer
	Segmentation Prepaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
	Up-Sell Prepaid	Customer
Customer Bill	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
Customer Bill Non-usage	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer

Data Source Name	Purpose	Subject of Analysis
Customer Complaints	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
Customer Dimension	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Cross-sell Prepaid	Customer
	Customer Lifetime TV	Customer
	Customer Lifetime Postpaid	Customer
	Customer Lifetime Prepaid	Customer
	Segmentation Postpaid	Customer
	Segmentation Prepaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
	Up-Sell Prepaid	Customer
Customer Inquiries	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer

Data Source Name	Purpose	Subject of Analysis
Customer Loyalty	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
Customer Model Score Details	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Cross-sell Prepaid	Customer
	Segmentation Postpaid	Customer
	Segmentation Prepaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
	Up-Sell Prepaid	Customer
Customer Offer Activity	Association rules TV offers & services	Customer Offer
	Cross-sell TV	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
Customer x Offer Bundle	Cross-sell TV	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer

Data Source Name	Purpose	Subject of Analysis
Equipment Activity	Churn Postpaid	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Customer
	Cross-sell Postpaid	Subscription
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Customer
	Up-Sell Postpaid	Subscription
Payment	Cross-sell TV	Customer
	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell Postpaid	Customer
Postpaid Customer Offer Snapshot	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Up-Sell Postpaid	Customer
Postpaid Customer Snapshot	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Up-Sell Postpaid	Customer
Postpaid Payment Derived	Cross-sell Postpaid	Customer
	Segmentation Postpaid	Customer
	Up-Sell Postpaid	Customer

Data Source Name	Purpose	Subject of Analysis
Postpaid Usage	Churn Postpaid	Subscription
	Cross-sell Postpaid	Customer
	Cross-sell Postpaid	Subscription
	Customer Lifetime Postpaid	Customer
	Segmentation Postpaid	Customer
	Up-Sell Postpaid	Customer
	Up-Sell Postpaid	Subscription
Prepaid Customer Complaints	Cross-sell Prepaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
Prepaid Customer Inquiries	Cross-sell Prepaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
Prepaid Customer Loyalty	Cross-sell Prepaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
Prepaid Customer Offer Snapshot	Cross-sell Prepaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
Prepaid Customer Snapshot	Cross-sell Prepaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
Prepaid Equipment Activity	Churn Prepaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription

Data Source Name	Purpose	Subject of Analysis
Prepaid Service Activity	Churn Prepaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription
Prepaid Subscription Bucketwise Usage	Churn Prepaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription
Prepaid Subscription Complaints	Churn TV	Subscription
	Churn Prepaid	Subscription
	Cross-sell Prepaid	Subscription
	Up-Sell Prepaid	Subscription
Prepaid Subscription Derived Bucket	Churn Prepaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription
Prepaid Subscription Derived Usage	Churn Prepaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription

Data Source Name	Purpose	Subject of Analysis
Prepaid Subscription Inquiries	Churn Prepaid	Subscription
	Cross-sell Prepaid	Subscription
	Up-Sell Prepaid	Subscription
Prepaid Subscription Loyalty	Churn Prepaid	Subscription
	Cross-sell Prepaid	Subscription
	Up-Sell Prepaid	Subscription
Prepaid Usage	Churn Prepaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Customer Lifetime Prepaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription
Prepaid Usage Recharge	Churn TV	Subscription
	Churn Prepaid	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Segmentation Prepaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription
Prospect Customer Dimension	Customer Acquisition	Prospect Customer

Data Source Name	Purpose	Subject of Analysis
Service Activity	Association Rules TV Offers & Services	Customer Service
	Association Rules TV Offers & Services	Subscription Service
	Churn TV	Subscription
	Churn Postpaid	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Customer
	Cross-sell Postpaid	Subscription
	Segmentation Postpaid	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Customer
	Up-Sell Postpaid	Subscription
TV Summarized Usage	Churn TV	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Customer Lifetime TV	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription

Data Source Name	Purpose	Subject of Analysis
Subscription Bill Non-usage	Churn TV	Subscription
	Churn Postpaid	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Customer
	Cross-sell Postpaid	Subscription
	Segmentation Postpaid	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Customer
	Up-Sell Postpaid	Subscription
Subscription Complaints	Churn TV	Subscription
	Churn Postpaid	Subscription
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Subscription
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Subscription
Subscription Dimension	Churn TV	Subscription
	Churn Postpaid	Subscription
	Churn Prepaid	Subscription
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Subscription
	Cross-sell Prepaid	Subscription
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Subscription
	Up-Sell Prepaid	Subscription

Data Source Name	Purpose	Subject of Analysis
Subscription Inquiries	Churn TV	Subscription
	Churn Postpaid	Subscription
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Subscription
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Subscription
Subscription Loyalty	Churn TV	Subscription
	Churn Postpaid	Subscription
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Subscription
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Subscription
Subscription Model Score	Churn TV	Subscription
	Churn Postpaid	Subscription
	Churn Prepaid	Subscription
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Subscription
	Cross-sell Prepaid	Subscription
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Subscription
	Up-Sell Prepaid	Subscription

Data Source Name	Purpose	Subject of Analysis
Subscription Service Activity	Association rules TV offers & services	Customer Service
	Association rules TV offers & services	Subscription Service
	Churn TV	Subscription
	Churn Postpaid	Subscription
	Churn Prepaid	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Cross-sell Postpaid	Customer
	Cross-sell Postpaid	Subscription
	Cross-sell Prepaid	Customer
	Cross-sell Prepaid	Subscription
	Segmentation Postpaid	Customer
	Segmentation Prepaid	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription
	Up-Sell Postpaid	Customer
	Up-Sell Postpaid	Subscription
	Up-Sell Prepaid	Customer
	Up-Sell Prepaid	Subscription
Telecast Item Order	Churn TV	Subscription
	Cross-sell TV	Customer
	Cross-sell TV	Subscription
	Customer Lifetime TV	Customer
	Segmentation TV	Customer
	Up-Sell TV	Customer
	Up-Sell TV	Subscription

Glossary

ABT variable
See analytical base table variable

analytical base table
a highly denormalized data structure that is designed to build an analytical model or to generate scores based on an analytical model. Short form: ABT.

analytical base table variable
a column in an analytical base table that is used to build a statistical model to predict defaults. Short form: ABT variable.

analytical model
a statistical model that is designed to perform a specific task or to predict the probability of a specific event.

child level
the level of information added below the primary node of a hierarchical list.

child node
a node of a hierarchical list that originates from a single node at a previous level.

data mart
a subset of the data in a data warehouse. A data mart is optimized for a specific set of users who need a particular set of queries and reports.

dimension table
in a star schema or snowflake schema, a table that contains data about a particular dimension. A primary key connects a dimension table to a related fact table. For example, if a dimension table named Customers has a primary key column named Customer ID, then a fact table named Customer Sales might specify the Customer ID column as a foreign key.

fact table
the central table in a star schema or snowflake schema. The fact table contains the individual facts that are being stored in the database as well as the keys that connect each fact to the appropriate value in each dimension.

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