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SAS® Model Manager 13.1

Administrator's Guide

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SAS® Model Manager 13.1: Administrator's Guide

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About This Book

Audience

SAS Model Manager Administration is for the following users:

- Those who are responsible for administering SAS Model Manager.
- Those who are responsible for administering the SAS Metadata Repository for use with SAS Model Manager.

You might be assigned to a specific user group or role. That assignment determines which tasks you can perform. For more information, see [Chapter 5, “Configuring Users, Groups, and Roles,”](#) on page 35.

Prerequisites

Here are the prerequisites for administering SAS Model Manager:

- The following software must be installed on your computer:
 - SAS Web Server and SAS Web Application Server
 - SAS Management Console 9.4

For more information, see *SAS Intelligence Platform: Installation and Configuration Guide*

- You must have a user ID and password for logging in to SAS Management Console and SAS Content Server Administration Console.

Conventions Used in This Document

The following typographical conventions are used for all text in this document except for syntax:

bold

identifies an item in the SAS Model Manager window or a menu item.

italics

identifies a book title or a value that is supplied by the user.

monospace

identifies SAS code.

UPPERCASE

identifies a SAS language element, such as the SAS statements KEEP or DROP.

The following typographical conventions are used in syntax:

bold

identifies the name of a macro.

italic

identifies an argument that must be supplied by the user.

< >

identifies an optional macro argument.

| (vertical bar)

indicates that you can choose one value from a group. Values that are separated by the vertical bar are mutually exclusive.

UPPERCASE

indicates a keyword that can be used as a value for an argument.

What's New in SAS Model Manager 13.1

Overview

The *SAS Model Manager: Administrator's Guide* contains new and updated administrative tasks that are associated with SAS Model Manager.

SAS Model Manager administrative tasks have the following new features and enhancements:

- post-installation configurations
- configurations for Model Manager Java Services options

Post-Installation Configurations

Additional steps were added to the post-installation verification and configuration steps. The steps that were added relate to configuring an Upgrade-in-Place and configuring users. For more information, see [“Post-Installation Configuration and Verification Steps” on page 16](#).

Configurations for Model Manager Java Services Options

More options have been added to the Model Manager Java Services Options setting in SAS Management Console. Additional settings can be modified for in-database options. For more information, see [“Configuring Model Manager Java Services Options” on page 25](#).

Accessibility

For information about the accessibility of any of the products mentioned in this document, see the usage documentation for that product.

Chapter 1

Introduction to SAS Model Manager Administrator's Guide

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Overview of SAS Model Manager Administration

This guide provides pre-installation tasks for SAS Model Manager 13.1 on SAS 9.4, and explains both how to prepare SAS Model Manager for use and how to manage information that is associated with SAS Model Manager. The administrator uses SAS Management Console to access metadata repositories that store information about SAS Model Manager users, libraries, data tables, and the Publishing Framework. Frequently used administrative and configuration tasks are included to provide guidance after the SAS Model Manager installation process is completed. The high-level tasks include the following:

- Completing pre-installation and configuration tasks
- Completing post-installation configuration and verification steps
- Creating and configuring published channels
- Configuring directory permissions

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About the Pre-Installation Tasks

Before you begin to install SAS Model Manager, be sure to review the Pre-Installation Checklist that is provided with your deployment plan. This checklist provides a detailed list of the pre-installation requirements. It also enables you to record important information that you need when you are installing the software.

Perform the following pre-installation tasks before you install SAS Model Manager:

1. [Verify that your system meets the minimum requirements.](#)
2. [Determine the location of the SAS environment file.](#)
3. [Determine the database that you want to use.](#)
4. [Install the prerequisite software.](#)
5. [Create standard user accounts in the operating system.](#)
6. [Obtain a deployment plan and installation data file.](#)

7. [Download your software and create a software depot.](#)

The following topics provide details about each step.

Verify Operating System Requirements

Ensure that you meet the minimum requirements that are described in the appropriate system requirements document for your installation. System requirements are unique for each operating system. They include software requirements, hardware requirements, space requirements, specific product requirements, and graphics hardware and software compatibility. System requirements documentation is available at <http://support.sas.com/documentation/installcenter/>.

Determine the Location of the SAS Environment File

During deployment of SAS Model Manager, you are prompted by the SAS Deployment Wizard to specify the location of the SAS environment file (named `sas-environment.xml`). An example is `http://<server>:<port>/sas/sas-environment.xml`). This file defines a set of SAS deployments at your site for client applications to use. The `sas-environment.xml` file does not need to physically exist at the location that you specify in the SAS Deployment Wizard before beginning the SAS installation. However, knowing the intended location of this file is important because every client installation is prompted for this value. If you do not specify the correct URL for the SAS environment file during deployment, then you must manually specify the URL in a file for every client. The URL is commonly stored in this location: `\<server>\<drive>:\Program Files\SASHome\sassw.conf`. As a best practice during your planning process, determine a URL and share it with administrators who perform installations.

For more information about the structure of this file, see Appendix 1, “Configuring the SAS Environment File,” in *SAS Intelligence Platform: Middle-Tier Administration Guide*.

Determine the Database to Use

You can use either Oracle or the SAS Decision Manager Common Data Server for your database. The SAS Decision Manager Common Data Server is based on PostgreSQL 9.1.9. For more information, see “SAS Web Infrastructure Platform Data Server” in Chapter 2 of *SAS Intelligence Platform: Middle-Tier Administration Guide* at <http://support.sas.com/documentation/intellplatform/index.html>.

For Oracle, complete the tasks described in “[Pre-Installation Tasks for an Oracle Database](#)” on page 6. For SAS Decision Manager Common Data Server, ensure that you have the information listed in “[Pre-Installation Tasks for SAS Decision Manager Common Data Server](#)” on page 6.

Install the Prerequisite Software

Before you install SAS Model Manager, install the following prerequisite software:

- Oracle, if you are using Oracle for your database. See “[Pre-Installation Tasks for an Oracle Database](#)” on page 6 for instructions.
- Adobe Flash Player version 10.1.0 or later. This software is required on each client machine that accesses SAS Model Manager.

Create Standard User Accounts

As a pre-installation task, you must create the following user accounts in the operating system:

- an account for the user who will install and configure the SAS software
- an account to run the spawned SAS servers

You should also create a SAS Server Users group on Windows and a sas group on UNIX.

For important details about setting up these users and groups, see the pre-installation checklist for your deployment. Also see Chapter 2, “Setting Up Users, Groups, and Ports,” in *SAS Intelligence Platform: Installation and Configuration Guide* at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Obtain a Deployment Plan and a SAS Installation Data File

Before you can install your SAS software, you must obtain a deployment plan. The deployment plan is an XML file that specifies the software that you will install and configure on each machine in your environment. The plan serves as input to the SAS Deployment Wizard. A deployment plan can be a custom plan for your specific software installation, or it can be a standard, predefined plan that describes a common configuration. For more information, see “About Deployment Plans” in Chapter 6 of *SAS Intelligence Platform: Installation and Configuration Guide*.

You must also obtain a SAS Installation Data (SID) file. The SID file contains license (SETINIT) information that is required to install SAS.

Download Your Software and Create a SAS Software Depot

Use the SAS Download Manager to download the software that is listed in your SAS Software Order. The SAS Download Manager creates a SAS Software Depot from

which you install your software. For more information, see Chapter 3, “Creating a SAS Software Depot,” in *SAS Intelligence Platform: Installation and Configuration Guide*. You can then use the SAS Deployment Wizard to install your software.

Pre-Installation Tasks for SAS Decision Manager Common Data Server

During the installation and configuration of SAS Model Manager, the SAS Deployment Wizard requires information about the database that SAS Model Manager uses.

The following table describes the information that you need in order to complete the steps in the SAS Deployment Wizard.

Table 2.1 SAS Deployment Wizard Information for SAS Decision Manager Common Data Server

Property	Description
Database Type	Specifies the database type to use for the SAS Decision Manager database. Select SAS Decision Manager Common Data Server .
Database User	Specifies the user name for the database administrator. This user owns the database and has superuser privileges.
Database Password	Specifies a password for the user name that is associated with the database account.
Port	Specifies the port that is used by the database. The default port for SAS Decision Manager Common Data Server is 10482.
Host Name	Specifies the fully qualified host name of the server on which the database is installed.
Database Name	Specifies the database name. The default name for the database is dcmdb . <i>Note:</i> The PostgreSQL database type is case sensitive.
User ID	Specifies the user name for the user whose credentials will be used to access the SAS Decision Manager Common Data Server database.

For database-specific information about configuring a database, see *SAS Intelligence Platform: Installation and Configuration Guide*.

Pre-Installation Tasks for an Oracle Database

About the Oracle Pre-Installation Tasks

If you are using Oracle for your SAS Decision Manager Common Data Server database, perform the following steps before you install SAS Model Manager:

1. [Install the Oracle database server.](#)

2. [Install the JDBC drivers.](#)
3. [Install a database client application.](#)
4. [Determine the required database information.](#)
5. [Specify the required database privileges.](#)
6. [Test the connection to your database.](#)

Install the Oracle Database Server

If you are using Oracle for your database, then you must install an Oracle database server. You must install this third-party software before you install SAS Model Manager. For more information, see the system requirements documents listed in [“Verify Operating System Requirements” on page 4](#).

Install JDBC Drivers for Oracle

You must download the following JDBC drivers and place them in a separate directory that does not contain any other files on all middle-tier servers to ensure proper installation and configuration of SAS Model Manager.

The JDBC drivers for Oracle are located in the Oracle installation directory. You can also download the ojdbc6.jar file for Oracle Database 11g from <http://www.oracle.com/us/downloads/index.html>. Select **JDBC drivers**. Download the latest Oracle 11.2x driver. The JDBC driver version must match the database version.

For more information about supported database drivers, see the system requirements documents listed in [“Verify Operating System Requirements” on page 4](#).

Install the Oracle Client Application

You must install and configure an Oracle client application on all server-tier machines. If you choose to bypass database initialization when you run the SAS Deployment Wizard, you must run a set of database scripts to prepare and initialize your database. For information about these scripts, see [“Create Oracle Database Tables” on page 23](#).

Also, you must have an entry in the tnsnames.ora file for that Oracle client that corresponds to the database that you have set up.

Determine the Information Required for the Oracle Database

During the installation and configuration of SAS Model Manager, the SAS Deployment Wizard requires information about the Oracle database that SAS Model Manager uses.

The following table describes the information that you need in order to complete the steps in the SAS Deployment Wizard.

Table 2.2 SAS Deployment Wizard Information for Oracle

Property	Description
Database Type	Specifies the database type to use for the SAS Decision Manager database. Select Oracle .
User Name	Specifies the user name for the database that is used with your SAS Model Manager installation.

Property	Description
Password	Specifies a valid password for the user name associated with the database account.
Port	Specifies the port that is used by the database. The default port for Oracle is 1521.
Host Name	Specifies the fully qualified host name of the server on which the database is installed.
Database Name	<p>Specifies the Oracle database name. The Net Service Name and the Service Name fields that are configured in the tnsnames.ora file must be the same. You must use this value for the Database Name field in the SAS Deployment Wizard. For example, if you had the following entry in the tnsnames.ora file, you would enter monitordb in the Database Name field in the SAS Deployment Wizard:</p> <pre> monitordb = (DESCRIPTION = (ADDRESS_LIST = (ADDRESS = (COMMUNITY = TCP_COMM) (PROTOCOL = TCP) (HOST = hostname.your.company.com) (PORT = 1521))) (CONNECT_DATA = (SERVICE_NAME = monitordb))) </pre> <p>The Net Service Name and Service Name in this example are the same.</p>
Schema	Specifies the schema name for the database. The default schema is the same as the user ID.
DBMS JAR File	<p>Specifies the location of the database vendor's JDBC JAR file. This file must be available on the middle tier and on any machine on which you are deploying SAS Model Manager in order to configure SAS Model Manager Common Data Server.</p> <p>See “Install JDBC Drivers for Oracle” on page 7 for more information.</p>

Specify the Required Database Privileges for Oracle

Ensure that the users of your database have the required database privileges. The required privileges for Oracle databases are:

- CONNECT
- CREATE SESSION
- RESOURCE
- CREATE TABLE
- CREATE VIEW
- CREATE SEQUENCE
- CREATE TRIGGER

Test the Connection to Your Database

Execute a command from the terminal to verify that your database is set up. For example, to use an Oracle database, you can execute the following command using SQL*Plus:

```
sqlplus USER/PASSWORD@ORACLE_SID
```

You must be able to execute this command from any directory. If you are able to execute a database command such as this only from the database installation directory, then verify that the PATH variable is set up correctly. The database client application must be installed and available on the PATH.

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About the SAS Deployment Wizard

You use the SAS Deployment Wizard to install and configure the SAS software and related products that are included in your deployment plan file. When you execute the SAS Deployment Wizard, you select the deployment type that you are performing. You can install and configure the software in a single execution of the wizard, or you can install and configure the software in two separate executions. The latter approach gives you the opportunity to test the SAS license before the configuration step.

The SAS Deployment Wizard prompts you to perform a variety of tasks, including the following items:

- specify the software order, the deployment plan, and the SAS software products that you are installing and configuring
- specify host machine information
- specify information about user accounts that were created in the pre-installation phase
- for multiple-machine configurations, install the server-tier, middle-tier, and client-tier software on the appropriate machines

For more information, see Chapter 6, “Installing and Configuring Your SAS Software,” in *SAS Intelligence Platform: Installation and Configuration Guide*.

Single-Machine versus Multiple-Machine Installations

You can install SAS Model Manager on one or on several machines. This choice is determined when you order SAS Model Manager and is detailed in the deployment plan XML file.

For multiple-machine installations, you must first install SAS Model Manager on the server-tier machine. You can then install SAS Model Manager on other additional machines that are part of a middle tier in your configuration. For guidelines on installing SAS on multiple machines, see “Installation Order Rules for Multiple Machine Deployments” in Chapter 6 of *SAS Intelligence Platform: Installation and Configuration Guide*.

The server tier consists of a set of SAS servers that are installed as a part of the SAS Intelligence Platform. The server tier contains the code generation macro that is necessary for executing rules and integrating SAS Model Manager with other SAS products.

Products Installed with SAS Model Manager

Your deployment plan for SAS Model Manager includes additional SAS products that support and complement SAS Model Manager functionality. See the software order e-mail or the `ordersummery.html` file that is in your SAS Software Depot at `software_depot/install_doc/order_number/ordersummary.html`. The SAS Deployment Wizard prompts you to install and configure each of the products in your deployment plan.

Running the SAS Deployment Wizard

About Running the SAS Deployment Wizard

To run the SAS Deployment Wizard, follow the instructions in “Install and Configure SAS Interactively” in Chapter 6 of *SAS Intelligence Platform: Installation and Configuration Guide*.

Note: You can run the wizard on operating systems that do not use a windowing environment. For more information, see *SAS Deployment Wizard and SAS Deployment Manager: User's Guide* at <http://support.sas.com/documentation/installcenter/en/ikdeploywizug/66034/PDF/default/user.pdf>.

The type and number of configuration-related pages that you see depend on the prompt level that you choose, the SAS tier that you are currently deploying, and the contents of your SAS 9.4 custom order. The following topics provide information for prompts that are specific to SAS Model Manager. For additional information about any of the SAS Deployment Wizard prompts, see the online Help for the wizard page in question.

Select the SAS Application Server

If you are installing SAS Model Manager as an add-on product and have already defined other SAS application servers, the SAS Deployment Wizard asks you to select which application server you want to use. Select an application server other than SASMETA.

Configure the Database

During deployment of SAS Model Manager on SAS 9.4, the SAS Deployment Wizard creates and configures the database tables in the SAS Decision Manager Common Data Server database by default. This database uses the PostgreSQL database management system.

You can use a third-party database server with SAS 9.4. In SAS 9.4, Oracle is the only other third-party database management system that is supported for the SAS Decision Manager Common Data Server database. For information about which versions of the alternative databases are supported, see “Reviewing Third-Party Database Requirements” in Chapter 6 of *SAS Intelligence Platform: Installation and Configuration Guide*.

The SAS Deployment Wizard prompts you to enter the information that you gathered when you completed the pre-installation tasks for your database. See [“Pre-Installation Tasks for SAS Decision Manager Common Data Server” on page 6](#) and [“Pre-Installation Tasks for an Oracle Database” on page 6](#) for more information.

For database-specific information about configuring a database, see *SAS Intelligence Platform: Installation and Configuration Guide*.

Create and Load Tables through the SAS Deployment Wizard

If you select **SAS Decision Manager Common Data Server** as the database type, the database tables are automatically created and loaded during the installation and configuration process for the SAS Decision Manager Common Data Server. The default name for the database is **dcmdb**.

If you select **Oracle** as the database type, the **Automatically create tables and load data** check box in SAS Deployment Wizard is enabled. If you want the SAS Decision Manager Common Data Server database tables to be created and loaded automatically, leave this box selected. If you want to create the tables yourself, then clear the check box, and submit the necessary SQL statements after the wizard finishes running. See [“Create Oracle Database Tables” on page 23](#) for more information.

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Post-Installation Configuration and Verification Steps

After you install SAS Model Manager using SAS Software Depot, you must perform additional configuration steps before you can use SAS Model Manager.

1. If the installation type is an upgrade-in-place from SAS Model Manager 12.3 to SAS Model Manager 13.1, you must perform additional installation and configuration steps using the SAS Deployment Wizard in order to complete the installation and configuration process. For more information, see [“Installation and Configuration Steps for an Upgrade-In-Place”](#) on page 17.
2. Verify that all installation and configuration steps in the Instructions.html file have been completed. For more information, see [“Follow Instructions in Instructions.html ”](#) on page 18.
3. Create application users and assign permissions. For more information, see [“Create Users and Assign Permissions”](#) on page 18.
4. (Optional) SAS Model Manager supports the use of multiple SAS Application Servers to be used as part of a performance definition, a scoring test, or a model retrain definition. If you want to use a SAS Application Server other than the default **SASApp**, you must configure the other SAS Application Server using SAS Management Console. For more information, see [“Configuring a SAS Application Server”](#) on page 22.
5. If the SAS Workspace Server is located in a UNIX environment, you must enable the SAS Workspace Server XCMD option in order to support R model functionality. For more information, see [“Enabling the SAS Workspace Server XCMD Option”](#) on page 23.
6. During installation, if you cleared the **Automatically create tables and load data** then you must manually create and load the Oracle database tables for modeling project metadata, including history, job definitions and job logs. For more information, see [“Create Oracle Database Tables”](#) on page 23.
7. If the SAS Scoring Accelerator or SAS Model Manager In-Database Scoring Scripts products are a part of your SAS 9.4 deployment, additional configuration steps are required to prepare the database for publishing and scoring in SAS Model Manager. For more information, see [“Preparing a Database for Use with SAS Model Manager”](#) in Chapter 11 of *SAS In-Database Products: Administrator's Guide*.
8. Verify that the Certificate Authority certificate is available to the trust store for the browser and Java clients. For more information, see [“Verify the Certificate”](#) on page 24.
9. Configure SAS Workflow. For more information, see [“Configuring SAS Workflow for Use with SAS Model Manager”](#) on page 47.
10. Verify the configuration of the dashboard reports directory on the SAS Workspace Server. For more information, see [“Configuring the Dashboard Reports Directory”](#) on page 24.
11. Configure the Model Manager Java Services Options. For more information, see [“Configuring Model Manager Java Services Options”](#) on page 25.
12. (Optional) Modify log file settings.

For more information about post-installation tasks, see *SAS Intelligence Platform: Installation and Configuration Guide*.

Installation and Configuration Steps for an Upgrade-In-Place

When you are upgrading from SAS Model Manager 12.3 on SAS 9.4 to SAS Model Manager 13.1 on SAS 9.4M2, you can perform an upgrade-in-place. SAS Model Manager 13.1 now includes SAS Decision Manager Common components. Therefore, two passes of the SAS Deployment Wizard installation and configuration process are required in order to complete the upgrade. During the first pass of the SAS Deployment Wizard, it detects what products to upgrade. After the upgrade has completed successfully, the configuration stage starts. After the upgrade-in-place process has completed, you must run the SAS Deployment Wizard again to install the new product components and to complete the configuration. Follow the instructions provided in “Add SAS Products That Require Configuration” in Chapter 4 of *SAS Intelligence Platform: Installation and Configuration Guide* in order to complete the installation and configuration process for an upgrade-in-place.

Here is some product-specific information that should be reviewed during the installation and configuration process:

1. When running the SAS Deployment Wizard, be sure to select a plan file that contains SAS Model Manager and SAS Decision Manager Common products. The plan file can be a customer-defined plan or can be copied from the standard plans. Verify that you use the new SAS installation data file during this installation.

Note: For an installation in a multi-machine environment the server products are typically installed on the SAS Application Server. The rest of the products are on the Middle-Tier Server.

2. By default, all products that are displayed are installed. Leave all products selected. If there are no product changes, then the deployment wizard does not re-install any pre-existing products.

Make sure that the following products are selected for installation:

- SAS Decision Manager Common Data Server
- SAS Decision Manager Common Mid-Tier for Decision Manager
- SAS Decision Manager Common Mid-Tier for Decision Manager Help and Documentation

3. SAS Services must be started before beginning the configuration process.

Make sure that the following services are started:

- SAS Metadata Server
- Web Infrastructure Platform Data Server
- Web Server (httpd - WebServer)
- Object Spawner
- JMS Broker
- Cache Locator

4. Make sure that the following products are selected for configuration:

- SAS Decision Manager Common Data Server
 - SAS Decision Manager Server Configuration
 - SAS Web Application Server Configuration
 - SAS Help Viewer for Mid-Tier Applications
 - SAS Decision Manager Common Mid-Tier for Decision Manager
 - SAS Model Manager Mid-Tier
5. For the SAS Decision Manager Database type prompt, you can choose Oracle or Decision Manager Common Data Server. When you are re-configuring the SAS Model Manager Mid-Tier, the extracted data from the Model Manager Database is imported into the new SAS Decision Manager Common Data Server database automatically.
 6. After the SAS Deployment installation and configuration process has completed, you must complete the rest of the post-installation configuration and verification steps. See the `Instructions.html` file for the new application URL and for instructions that are associated with other products that you have installed. For more information, see [“Post-Installation Configuration and Verification Steps” on page 16](#).

Follow Instructions in Instructions.html

At the end of the installation process for SAS Model Manager, the SAS Deployment Wizard produces an HTML document named `Instructions.html`. If your server tier and middle tier are hosted on separate machines, there is an `Instructions.html` file for each machine.

The `Instructions.html` file is located in `\sasconfigdir\Lev#\Documents\`. Follow the instructions that are provided in the HTML documents.

Create Users and Assign Permissions

The SAS Deployment Wizard does not create application users by default. The SAS Administrator must create users in SAS Management Console with the appropriate group and role permissions. Make sure that all users are granted the appropriate permissions to the SAS Workspace Server.

In a Windows environment, each user or group must be granted permission to the **Log on as a batch job** local security policy. This permission is required in order to access functionality in the Data category. For more information, see [“Create Windows Operating System Accounts and Groups for Users” on page 19](#).

In a UNIX environment, all SAS Model Manager users must be part of a group that has the appropriate group permissions.

For more information, see [“Creating Operating System Accounts in UNIX Environments” on page 20](#) and Chapter 5, “Configuring Users, Groups, and Roles,” on page 35.

Create an Operating System Account for Product Administrators and Users

About the User Accounts for SAS Model Manager

SAS Model Manager provides two types of user accounts:

Product administrator

A SAS Model Manager administrative user is specific to SAS Model Manager. A product administrator account is not the same as a general administrator account, such as the SAS Administrator (sasadm@saspw). These users must have a valid host operating system account, and you must associate that account with a metadata user.

You must create the operating system account for the administrator as post-installation task. For more information, see [“Create Windows Operating System Accounts and Groups for Users” on page 19](#).

Users of SAS Model Manager

These users must have a valid host operating system account, and you must associate that account with a metadata user through SAS Management Console.

You can create regular user accounts for SAS Model Manager as a post-installation task. For more information, see [Chapter 5, “Configuring Users, Groups, and Roles,” on page 35](#).

Create Windows Operating System Accounts and Groups for Users

On the SAS Workspace Server, create an operating system account for the administrator of SAS Model Manager (for example, mdlmgradmin) and all SAS Model Manager users.

If the SAS Workspace Server is running Windows, use one of the following methods to create this operating system account:

- If you are working on a local machine, complete these steps to create this user account:
 1. If you are running in a Windows operating system environment, right-click the Computer icon on your desktop and select **Manage**. The Computer Management window appears.
 - Note:* If you are creating users on a server, you can use the Server Manager.
 2. In the left navigation pane, expand the **Local Users and Groups** node. The **Users** and **Groups** nodes appear.
 3. Right-click the **Users** node and select **New User**. The New User window appears.
 4. In the New User window, complete these tasks:
 - Specify a user name and password.

Note: In Windows, you cannot enter <domain>\username (you enter the user name only), but you must enter <domain>\username in the SAS Deployment Wizard and SAS Management Console.

- Clear the **User must change password at next logon** check box.
- Select the **User cannot change password** check box.
- Select the **Password never expires** check box.

Click **Create**.

5. Click **Close** to close the New User dialog box.
 6. If you want to add the users that you created to a group, perform the following steps:
 - a. Right-click the **Groups** node in the Computer Management window, and select **New Group**.
 - b. Click **Add**. Enter the user names, separated by semicolons, and click **Check Names**.
 - c. Click **OK**.
 7. Assign the security policy of **Log on as batch job** for each user or group.
 - a. Select **Start** ⇒ **Control Panel** ⇒ **System and Security** ⇒ **Administrative Tools** ⇒ **Local Security Policy**.
 - b. From the Local Security Policy window, expand the **Local Policies** node and select **User Rights Assignment**. Then double-click the **Log on as batch job** policy.
 - c. Click **Add user or Group**. Enter the user names or group names, separated by semicolons, and click **Check Names**.
 - d. Click **OK**.
- Define the user (for example, <domain>\username) on the Active Directory server.

Create UNIX Operating System Accounts and Groups for Users

You can create the SAS Model Manager UNIX user group as a pre-installation or post-installation task. For more information, see [“Creating Operating System Accounts in UNIX Environments” on page 20](#).

Creating Operating System Accounts in UNIX Environments

Using Operating System Groups to Assign Permissions

Users have different operating system privileges on the SAS Workspace Server. By defining a user group for SAS Model Manager, you can assign all users to the same group and grant the same permissions to all users at one time. All SAS Model Manager users must have Read, Write, and Execute permissions for each environment directory that a user is permitted to use. Users also need permissions to all of the files and directories in an environment directory. The operating system must be configured to grant these permissions when new files and directories are created. The steps that you follow to do this depend on which operating system groups are defined and your site's security policies.

Conditions for the User Group

If you are working in a UNIX operating environment, the following conditions must be met:

- A group of users is created for the UNIX operating environment. The logon IDs for each user must be in this group. The group must also include any user who might run code that is created by SAS Model Manager in a SAS session.
- Users can be members of multiple groups, but the SAS Model Manager group is the primary group for each user.
- The SAS scripts are updated to grant permissions to the SAS Model Manager users on the SAS Workspace Server. For more information, see [“Update the SAS Scripts to Grant Permissions to the User Group” on page 21](#).
- Each environment directory has the correct ownership, and the user group has Read, Write, and Execute permissions.

Update the SAS Scripts to Grant Permissions to the User Group

Using the **umask** option, you can grant permissions to users on a conditional basis if the user is part of the SAS Model Manager user group.

Note: This example might require changes to fit your server configuration. In particular, this example could result in changed permissions on other SAS files, such as OLAP cubes. For example, if you are working with multiple UNIX groups and have a SAS OLAP Server, you must ensure that the account under which the SAS OLAP Server runs has Read and Execute permissions to OLAP files.

To set these permissions:

1. On each SAS Workspace Server, open **/sasconfigdir/Lev1/SASApp/appservercontext_env.sh**.
2. Enter the configuration information for your operating environment. Here is the general format of this code:

Note: The following code uses grave accents and not quotation marks.

```
CMD=<your-operating-system-path>
CURR_GID=`eval $CMD -g`
GID=<solution-group-id>
if [$CURR_GID -eq $GID]; then umask 002 fi
```

- a In the **CMD=<your-operating-system-path>**, specify the full path on your server where the ID command is stored. You can get this information by entering a **which id** or **whence id** command on your console.
- b In the **GID=<solution-group-id>**, specify the group ID. Type **id** on your console to get the GID and UID information.
- c A value of 002 is recommended for the **umask** option.

Here are code examples for each UNIX environment where SAS Model Manager is supported:

Operating Environment	Sample Code
AIX	<pre> CMD=/usr/bin/id CURR_GID='eval \$CMD -g' GID=201 if [\$CURR_GID -eq \$GID]; then umask 002 fi </pre>
H64I (HP-Itanium)	<pre> CMD=/usr/bin/id CURR_GID='eval \$CMD -g' GID=201 if [\$CURR_GID -eq \$GID] ; then umask 002 fi </pre>
S64 (Solaris)	<pre> CMD=/usr/xpg4/bin/id CURR_GID='eval \$CMD -g' GID=201 if [\$CURR_GID -eq \$GID] ; then umask 002 fi </pre>
SAX (Solaris for X64)	<pre> CMD=/usr/xpg4/bin/id CURR_GID='eval \$CMD -g' GID=201 if [\$CURR_GID -eq \$GID] ; then umask 002 fi </pre>
LNx (Linux)	<pre> #!/bin/bash CMD=/usr/bin/id CURR_GID='eval \$CMD -g' GID=500 if ["\$CURR_GID" -eq "\$GID"] ; then umask 002 fi </pre>

Configuring a SAS Application Server

SAS Model Manager on SAS 9.4 provides support for multiple SAS Application Servers that can be used when specifying a performance definition, a scoring test, or a model retrain definition.

To add a new SAS Application Server:

1. From SAS Management Console, expand the **Application Management** node on the **Plug-ins** tab.
2. Right-click **Server Manager** and select **New Server**.
3. Select **Resource Templates** ⇒ **Servers** ⇒ **SAS Servers** ⇒ **SAS Application Server**, and then click **Next**.
4. Enter the name and the description of your SAS Application Server. Click **Next**.
5. Accept the default values for the server properties and click **Next**.
6. Select **Workspace Server** and click **Next**.
7. Enter the full server name for the **Host Name** and click **Next**.
8. Click **Finish**.

9. Right-click **Object Spawner** and select **Properties**. Click the **Servers** tab, and then click the right-arrow to move the new server to the selected servers.

Click **OK**.

10. To make the new server available to the JobExecutionService:
 - a. Expand **Application Management** ⇒ **Configuration Manager** ⇒ **SAS Application Infrastructure** ⇒ **Web Infra Platform Services 9.4**.
 - b. Right-click **JobExecutionService**, and then select **Properties**.
 - c. Select the **Settings** tab and move the new server from the **Available** servers list to the **Selected** servers list.
 - d. Clear the check box for the **Enable for Interactive execution** setting.
 - e. Click **OK**.
11. Restart the SAS servers and the web application server.

For more information, see Chapter 10, “Managing SAS Application Servers,” in *SAS Intelligence Platform: Application Server Administration Guide*.

Enabling the SAS Workspace Server XCMD Option

When you are running the SAS Workspace Server in a UNIX environment for SAS Model Manager 13.1 on a SAS 9.4 deployment, the XCMD option is turned off by default. Therefore, you cannot use the SYSTEM function, the X command, or the PIPE option in a FILENAME statement. You must enable the SAS Workspace Server XCMD option in order to support R model functionality.

To enable the XCMD option:

1. From SAS Management Console, expand the **Server Manager** node on the **Plug-ins** tab.
2. Select and expand **SASApp** ⇒ **SASApp – Logical Workspace Server**.
3. Right-click **SASApp - Workspace Server** and select **Properties**.
4. Select **Options** ⇒ **Advanced Options** ⇒ **Launch Properties** and then select the **Allow XCMD** check box.
5. Click **OK** to save the setting.
6. (Optional) If you have multiple SAS Application Servers with the server type of Workspace Server, repeat steps 2 through 5.
7. Stop and restart your SAS Object Spawner.

Create Oracle Database Tables

When you ran the SAS Deployment Wizard, the **Automatically create tables and load data** check box was selected by default for the SAS Decision Manager Common Data Server. (See [“Create and Load Tables through the SAS Deployment Wizard”](#) on page

13.) If you cleared the **Automatically create tables and load data** check box and you do not have an existing database instance, you must run the SQL scripts to create and load the tables.

Run the CreateMMTables.sql script in order to create and load the model tables. The script is located in **SAS-installationdirectory\SASModelManagerMidTier\13.1\Config\Deployment\Content\dbscript\database-type**.

Verify the Certificate

During installation and configuration of SAS 9.4, the SAS Deployment Wizard enables you to configure the SAS Web Server to use HTTPS and Secure Sockets Layer (SSL) certificates automatically. Verify that the Certificate Authority certificate is available to the trust store for the browser and Java clients such as SAS Workflow Studio and SAS Management Console. For more information, see the Instructions.html file in the directory **\SASConfigDir\Lev1\Documents**, and Chapter 5, “Setting Up Certificates for SAS Deployment,” in *SAS Intelligence Platform: Installation and Configuration Guide*.

If you did not use the SAS Deployment Wizard to configure the SAS Web Server to use HTTPS and SSL certificates, you can configure it manually. For more information, see “Configuring SAS Web Server Manually for HTTPS” in Chapter 19 of *SAS Intelligence Platform: Middle-Tier Administration Guide*.

The communication path between SAS Web Server and SAS Web Application Server uses HTTP by default. If you configured the SAS Web Server to use HTTPS using the SAS Deployment Wizard, additional steps are required in order to use HTTPS between SAS Web Server and SAS Web Application Server. For more information, see “Configuring SAS Web Application Server to Use HTTPS” in Chapter 19 of *SAS Intelligence Platform: Middle-Tier Administration Guide*.

Configuring the Dashboard Reports Directory

In SAS Model Manager, the dashboard reports directory is configured during installation. The default directory is **\SASConfigDir\Lev#\AppData\SASModelManager13.1\Dashboard**.

Note: When the SAS Application Server and the SAS Workspace Server are located on different physical machines, the Software Deployment Wizard creates a directory on the Application Server machine and uses that value for the **App.DashboardDir** property value. You must create a directory that is accessible by the SAS Workspace server, and the SAS Model Manager users must have permissions to the directory.

To configure a different directory to store the SAS Model Manager dashboard reports:

1. Connect to the SAS Workspace Server.
2. Create a new directory (for example, **C:\Dashboard**).

Note: The directory must be located on the SAS Workspace Server or on a network drive that is accessible by the SAS Workspace Server. Do not include special characters or spaces in the name of the directory.

3. Grant user permissions for the new directory. For example, perform the following tasks:

- Grant Full Control permission to users who need to create subdirectories, write content, or delete content. This type of user includes a user who you will add (using SAS Management Console) to the Model Manager Administrator Users group or a user who is a SAS administrator.
- Grant Read, Write, and Execute permissions to users who need to create performance indicators and execute dashboard reports. This type of user includes a user who you will add (using SAS Management Console) to the Model Manager Advanced Users group.
- Grant Read and Execute permissions to users who need only to view the dashboard reports. This type of user includes a user who you will add (using SAS Management Console) to the Model Manager Users group.

Note: In a UNIX environment all SAS Model Manager users must be part of a group that has the appropriate group permissions. For more information, see [“Creating Operating System Accounts in UNIX Environments” on page 20](#) and [Chapter 5, “Configuring Users, Groups, and Roles,” on page 35](#).

4. From SAS Management Console, expand the **Application Management** node on the **Plug-ins** tab.
5. Select and expand **Configuration Manager** ⇒ **SAS Application Infrastructure**.
6. Right-click **Model Manager JavaSvcs 13.1** and select **Properties**.
7. (optional) Click the **Settings** tab and then select **Report Options**. Use this setting to specify the styles that are available when a user generates dashboard reports, and to enable the indicator override option for defining dashboard report indicators. When you use the indicator override configuration, indicators with conditions are available when you add dashboard report indicators using SAS Model Manager. For more information, see [“Report Options” on page 26](#).
8. Click the **Advanced** tab to modify the application dashboard directory. Change the property value for **App.DashboardDir** to the directory path that was configured.
9. Click **OK**.
10. For changes to take effect, you must restart the web application server.

Configuring Model Manager Java Services Options

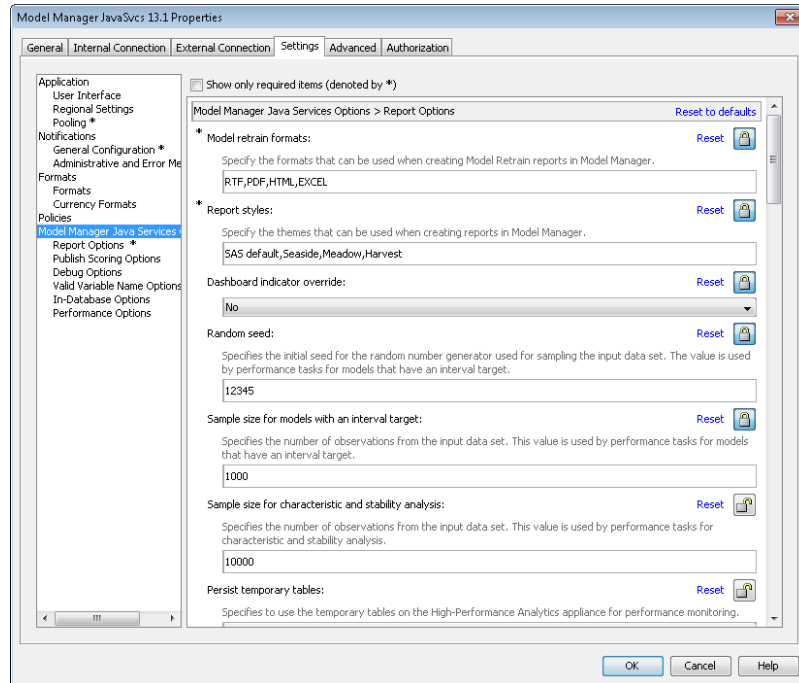
Overview of Configuring Model Manager Java Services Options

The **Model Manager Java Services Options** setting in SAS Management Console enables you to modify model management configurations. The configurations can be modified for reporting, for metadata tables usage when publishing a scoring function, for SAS code debugging, SAS system options, In-database connection and publishing options, and performance options for the SAS High-Performance Analytics procedures.

To modify the settings for the report options:

1. Log on to SAS Management Console as a SAS administrator.
2. On the **Plug-ins** tab, navigate to **Application Management** ⇒ **Configuration Manager** ⇒ **SAS Application Infrastructure**.

3. Right-click **Model Manager JavaSvcs 13.1** and select **Properties**.
4. Click the **Settings** tab and then select **Model Manager Java Services**.



5. Select one of the following options to view and configure the available settings.
 - **Report Options**
 - **Publish Scoring Options**
 - **Debug Options**
 - **Valid Variable Name Options**
 - **In-Database Options**
 - **Performance Options**
6. Click **OK**.
7. For changes to take effect, you must restart the web application server.

Report Options

The **Report Options** setting in SAS Management Console enables you to modify the SAS Model Manager configurations for the dashboard reports, for model retrain reports, and for performance monitoring. These reports are available on the **Reports** page for a project in SAS Model Manager.

To modify the report options setting:

1. Specify the formats that are available when a user creates model retrain reports. The default values are RTF, PDF, HTML, and EXCEL. You can remove any of the default values so that they are not available in SAS Model Manager.
2. Specify the report styles that are available when a user creates the model retrain reports and dashboard reports. You can add or remove SAS styles. The default values are SAS default, Seaside, Meadow, and Harvest. For more information about SAS

styles, see Chapter 9, “Style Templates,” in *SAS Output Delivery System: User's Guide*.

3. Select **Yes** for the dashboard indicator override. When you do that, indicators with conditions are available when a user adds dashboard report indicators.
4. Specify a value for a random seed to be used by performance definitions for models that have an interval target. The default value is **12345**. The **random seed** is the initial seed for the random number generator used for sampling the input data set.
5. Specify a value for the sample size that is used by performance definitions for models that have an interval target. The default value is **1000**. The **sample size for models with an interval target** is the number of observations from the input data set.
6. Specify a value for the sample size that is used by performance definitions for characteristic and stability analysis. The default value is **10000**. The **sample size for characteristic and stability analysis** is the number of observations from the input data set.
7. Select **Yes** or **No** to specify whether to use the temporary tables on the High-Performance Analytics appliance for performance monitoring. The default is **Yes**.
8. Specify a value for the correlation coefficient (rho) that is used by the binomial test to estimate the probability of default (PD) levels. The default value is **0.04**.

Publish Scoring Options

The **Publish Scoring Options** setting enables you to indicate that the metadata tables be populated in the target database when publishing a scoring function. The default is **Yes**. During the installation and configuration process of the database, the metadata tables must be created in the database if this setting is set to **Yes**. If you plan to use only the SAS Embedded Process publish method to publish scoring model files, this setting can be ignored, and you do not need to create the metadata tables during the database configuration process.

For information about the database configurations, see “Preparing a Database for Use with SAS Model Manager” in Chapter 11 of *SAS In-Database Products: Administrator's Guide*. For more information about publishing models to a database, see “Publishing Models to a Database” in Chapter 17 of *SAS Model Manager: User's Guide*.

Debug Options

The **Debug Options** setting enables you to use the debug options when executing SAS code within SAS Model Manager. The default value is **No**.

The **Debug Options** setting does not work for scoring tests, performance definitions, and model retrain definitions. To enable debug options with scoring tests, you must add the following line of code to the `sasv9_usermods.cfg` file in the `\sasconfigdir\Lev#\SASApp\WorkspaceServer\` directory:

```
options mprint symbolgen notes;
```

Note: You can also add this code using the Edit Start-up Code feature in SAS Model Manager.

Valid Variable Name Options

The **Valid Variable Name Options** setting enables you to set the VALIDVARNAME system option to ANY when executing SAS code. The default value is **No**.

The **Valid Variable Name Options** setting does not work for scoring tasks. To use the VALIDVARNAME system option with scoring tasks, you must add the following line of code to the `sasv9_usermods.cfg` file in the `\sasconfigdir\Lev#\SASApp\WorkspaceServer\` directory:

```
options validvarname='any';
```

Note: You can also add this code using the Edit Start-up Code feature in SAS Model Manager.

In-Database Options

The **In-Database Options** settings enables you to specify the publish type, database connection settings, and publish settings that are used when publishing models to a database using SAS Model Manager.

To modify the settings for the in-database options:

1. Select a method to publish models to the database for scoring. The default publish type is the **SAS Embedded Process** publish method.
2. Select a database type.
3. Specify values for database settings that are required to publish to the selected database type.

Here are the available database settings according to the publish method and database type:

Database Settings	SAS Embedded Process	Scoring Function
Server name	<ul style="list-style-type: none"> • Teradata • Oracle • Netezza • Greenplum • DB2 • SAP HANA 	<ul style="list-style-type: none"> • Teradata • Netezza • Greenplum • DB2
HDFS directory path	Hadoop	Not applicable
MapReduce server name	Hadoop	Not applicable
Database name or instance number	<ul style="list-style-type: none"> • Teradata • Oracle • Netezza • Greenplum • DB2 • SAP HANA 	<ul style="list-style-type: none"> • Teradata • Netezza • Greenplum • DB2

Database Settings	SAS Embedded Process	Scoring Function
User ID	<ul style="list-style-type: none"> • Teradata • Oracle • Netezza • Greenplum • DB2 • Hadoop • SAP HANA 	<ul style="list-style-type: none"> • Teradata • Netezza • Greenplum • DB2
Server user ID	Not applicable	DB2
Schema	<ul style="list-style-type: none"> • Oracle • Greenplum • DB2 • SAP HANA 	<ul style="list-style-type: none"> • Greenplum • DB2

- Specify to use the model manager table when publishing. The default value is **No**. When you are publishing the scoring model files to a database using the SAS Embedded Process publish method, the files are by default stored in the table `sas_model_table`. If the **Use model manager table** value is set to **Yes**, the scoring model files are stored in the table `sas_mdlnmgr_ep`. These tables are located in the target database. This setting enables users to separate the SAS Model Manager scoring model files from the SAS model scoring files when using the SAS Embedded Process publish method.
- Specify to force the republish of model scoring files by default when using the SAS Embedded Process publish type. The default value is **No**. If you set this setting to **Yes**, then the **Replace scoring files that have the same publish name** option in the Publish Models to a Database window in SAS Model Manager is selected by default.
- Select the default format of the model publish name when using the SAS Embedded Process publish method. The format selected determines the value that appears for the publish name in the Publish Models window in SAS Model Manager. The scoring function publish method publish name defaults to the model name.
- Specify a directory path to store the temporary scoring files. If a value is not specified, the SAS work directory is used by default. However, if you select the **Display detailed log messages** option when publishing to a database, the SASUSER directory is used.

For information about the database configurations, see “Preparing a Database for Use with SAS Model Manager” in Chapter 11 of *SAS In-Database Products: Administrator's Guide*. For more information about publishing models to a database, see “Publishing Models to a Database” in Chapter 17 of *SAS Model Manager: User's Guide*.

Performance Options

The **Performance Options** setting contains the performance parameters for the PERFORMANCE statement to use the SAS High-Performance Analytics procedures. Currently only the Teradata and Greenplum database types support SAS High-Performance Analytics.

The PERFORMANCE statement defines performance parameters for multithreaded and distributed computing, passes variables about the distributed computing environment, and requests detailed results about the performance characteristics of a high-performance analytics procedure.

The following performance options can be specified for the PERFORMANCE statement.

Option	Description	Default Value
Commit	Specifies an integer to request that the High-Performance Analytics procedure writes periodic updates to the SAS log.	10000
CPU count	Specifies how many processors the procedure should assume are available on each host in the computing environment. You can enter the value of ACTUAL, or enter an integer between 1 and 256.	ACTUAL
Database server	Specifies the name of the server for the database as defined through the hosts file and as used in the LIBNAME statement.	
Details	Requests a table that shows a timing breakdown of the procedure steps.	No
Timeout	Specifies the time-out in seconds for a High-Performance Analytics procedure to wait for a connection to the appliance and establish a connection back to the client.	120
Host name	Specifies the name of the appliance. If a value for the Host option is specified, it overrides the value of the grid host environment variable.	
Installation directory	Specifies the name of the directory in which the High-Performance Analytics shared libraries are installed on the appliance.	

Option	Description	Default Value
Install location	Specifies the name of the directory in which the High-Performance Analytics shared libraries are installed on the appliance. If a value is specified for the Installation directory option, it overrides this option.	
Number of nodes	Specifies the number of nodes in the distributed computing environment, provided that the data is not processed alongside the database. You can enter an integer or you can specify a value of ALL if you want to use all available nodes on the appliance without oversubscribing the system.	
Number of threads	Specifies the number of threads for analytic computations. This option overrides the SAS system option THREADS NOTHEADS. If you do not specify a value for this option, the number of threads are determined based on the number of CPUs on the host on which the analytic computations execute.	
Grid host	Specifies the host name for the grid. If a value for the Host option is specified, it overrides the value of the grid host environment variable.	
Grid RSH command	Specifies the command to run a remote shell.	
Grid reply host	The host name of the client node to which the grid connects.	
Grid port range	Specifies the range of ports that are permitted by the firewall.	
Grid path	Specifies the local directory path for the grid node.	

Option	Description	Default Value
Grid mode	Specifies whether the HPFORECAST procedure runs in symmetric (SYM) mode or asymmetric (ASYM) mode. The default is symmetric (GRIDMODE=SYM).	Symmetric

For more information about High-Performance Analytics, see *SAS High-Performance Analytics Server: User's Guide*.

Configuring the Limitation for the Number of Observations for a Scoring Result Set

When a scoring test is added on the **Scoring** page of a project in SAS Model Manager, and the **Type** field is set to **Test**, you can use SAS Management Console to limit the number of observations that a scoring result set can contain.

To configure a limitation for the number of observations:

1. From SAS Management Console, expand the **Application Management** node on the **Plug-ins** tab.
2. Select and expand **Configuration Manager** ⇒ **SAS Application Infrastructure**.
3. Right-click **Model Manager JavaSvcs 13.1** and select **Properties**.
4. Click the **Advanced** tab. Change the property value for **App.TableObsLimitation** to limit the number of observations in the scoring result set. The default value of **0** indicates that there is no limit to the number of observations that a scoring result set can contain.
5. Click **OK**. The value that you specified now appears in the Number of Observations result set property when you create a scoring test using SAS Model Manager.

Modify Log File Settings

Log4j Configuration File

SAS Model Manager uses log4j to perform logging. When SAS Model Manager starts, the log4j configuration file for the web application is read from **SAS-config-dir\Lev1\Web\Common\LogConfig\SASModelManager-log4j.xml**. This file is a standard log4j configuration file.

You should not change the existing categories or root logger in a configuration file unless you are instructed to do so by SAS Technical Support.

Logging Priority Levels

You can change the logging priority levels in a log configuration file if needed.

Table 4.1 Logging Priority Levels

Priority	Description
DEBUG	The most verbose logging level. This level displays information that is most useful for debugging an application. SAS Model Manager should run under this priority only for capturing additional log information. This priority level is not an acceptable priority level for the day-to-day operation of SAS Model Manager.
INFO	Verbose logging level. This level displays messages that highlight the progress of an application. SAS Model Manager should run under this priority only for capturing additional log information. This priority level is not an acceptable priority level for the day-to-day operation of SAS Model Manager.
WARN	Restrictive logging. This level displays information about potentially harmful situations and is an acceptable priority for the day-to-day operation of SAS Model Manager.
ERROR	The most restrictive logging level. This level displays error events and is an acceptable priority for the day-to-day operation of SAS Model Manager.

Log Files

SAS Model Manager writes information to the following log files:

SASModelManager13.1.log
contains messages from SAS Model Manager

SASDecMgrCommon2.2.log
contains messages from the Workflow and Data plug-ins

SASDecMgrShell2.2.log
contains general messages from the Shell

By default, the application writes the SAS Decision Manager log files to **SAS-config-dir\Lev1\Web\Logs\SASServer7_1**. The SASModelManager13.1.log file is written to **SAS-config-dir\Lev1\Web\Logs\SASServer11_1**. You can change the location of these log files in the configuration file. Changes to the configuration file take effect when the middle-tier application server is restarted. See “Administering Logging for SAS Web Applications” in Chapter 8 of *SAS Intelligence Platform: Middle-Tier Administration Guide* for more information about this configuration file.

SAS Model Manager creates new log files each day. For information about logging configurations, see “Modifying Your Server Logging Configurations” in Chapter 10 of *SAS Intelligence Platform: System Administration Guide*.

Turn on SQL Logging

To turn on SQL logging and write SQL parameter values for each query to the log file, add the following categories to the log4j.xml configuration file:

```
<category additivity="false" name="org.hibernate.type">
  <priority value="TRACE"/>
  <appender-ref ref="SAS_FILE"/>
</category>

<category additivity="false" name="org.hibernate.SQL">
  <priority value="DEBUG"/>
  <appender-ref ref="SAS_FILE"/>
</category>
```

Chapter 5

Configuring Users, Groups, and Roles

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Security Administration Tasks for SAS Model Manager

Security administration for SAS Model Manager consists of the following tasks:

- administering SAS identities for your users by adding account information to the SAS Metadata Server
- administering groups of users in order to simplify the management of roles
- administering roles, which provide users with access to specific application features

The information included here is a brief introduction to the concepts of users, SAS identities, groups, roles, and capabilities. For complete information about security

administration, see *SAS Management Console: Guide to Users and Permissions* and *SAS Intelligence Platform: Security Administration Guide* at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Administering SAS Identities for Users

Overview of SAS Identities

For each SAS Model Manager user, you must create an individual SAS identity on the SAS Metadata Server. The SAS identity is a copy of the ID with which the user logs on to SAS applications. Based on this identity, the system can determine who can access which application and can audit individual actions in the metadata layer. The SAS identity consists of a name and the user ID for the user's external account. This ID can be any type of account that is known to the metadata server's host, such as an LDAP account, Active Directory account, host account, or other type of account.

When you are entering user IDs for Windows accounts, be sure to qualify the ID (for example, `WIN\myID` or `myID@mycompany.com`).

In a Windows environment, add new users to the **Log on as a batch job** local security policy on the machine that hosts the SAS Workspace Server.

Note: Enter a user ID for Microsoft Windows in the format `domain\userID`. In order for a user to be able to schedule jobs using SAS Model Manager, you must specify a valid password in their user account. A user must also sign in with the same user ID (`domain\userID`) and password that you specified in their user account.

Note: Users who log on to SAS Model Manager using an internal account (a user ID that ends in `@saspw`) cannot access all of the features of the application. All users should be assigned external accounts.

The following users are created as part of the SAS Model Manager installation process:

Table 5.1 *Types of Users*

User	Description
SAS Administrator	This user has access to all SAS Management Console capabilities and metadata administrative tasks.
SAS Demo User	This user is optional. You can choose to create this user during installation. However, this user is not assigned to a group during installation.

Creating SAS Identities

To create SAS identities for your users, manually enter the information for each user through the User Manager plug-in in SAS Management Console. If you have a large number of users, then you can extract user and group information from one or more enterprise identity sources. You can then use SAS bulk-load macros to create the identity metadata from the extracted information.

For more information about creating and managing identities, see *SAS Management Console: Guide to Users and Permissions*. For information about the SAS bulk-load macros, see Appendix 2, “User Import Macros,” in *SAS Intelligence Platform: Security Administration Guide*. These documents are available at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Groups and Group Membership

About Groups

A group is a set of users. Groups enable you to grant multiple users membership in a role or permissions to metadata, thus simplifying security administration. You can create as many groups as are needed in order to manage your installation.

TIP A group's membership can include other groups as well as individual users. This enables you to create a nested group structure.

Predefined User Groups in SAS Model Manager

Table 5.2 Predefined User Groups

Group	Description
Public	This group includes everyone who can access the metadata server, either directly or through a trust relationship. If a user is able to log on to a client application but does not have an individual SAS identity, the user is assumed to be in the public group. Because this group has implicit membership, you cannot explicitly add or remove users from this group.
SAS Users	This group includes everyone who can access the metadata server, either directly or through a trust relationship. If a user is able to log on to a client application but does not have an individual SAS identity, the user is assumed to be in the public group. Because this group has implicit membership, you cannot explicitly add or remove users from this group.
SAS Administrators	This is a standard group for metadata administrators. In a standard configuration, members are granted broad access and administrative capabilities, but are not unrestricted.
Decision Manager Common Administrators	This group has administrative permissions. Membership in this group is required to administer workflows. In your initial installation, this group is a member of the Decision Manager Common: Administration and Model Manager: Administration Usage roles.
Decision Manager Users	This group is created during the installation process. Members of this group have permission to read, add, or delete table summary information in the Data category.

Group	Description
Model Manager Administrator Users	This group has administrative permissions in the Projects and Portfolio categories.
Model Manager Advanced Users	This group has permissions to read, write, and delete content in the Projects and Portfolios categories.
Model Manager Users	This group has permission to read content in the Projects category.
SAS System Services	This group enables members to export files on the Folders tab of SAS Management Console.

Roles and Capabilities

About Roles and Capabilities

A role manages the availability of application features such as menu items and plug-ins. An application feature that is under role-based management is called a capability.

Certain actions are available only to users or groups that have a particular role. Any user or group who is a member of a role has all of that role's capabilities.

Roles can contribute to one another. A role automatically includes all of the capabilities of a role that contributes to it.

Roles differ from permissions. In general, roles do not affect access to metadata or data.

Predefined Roles and Capabilities for SAS Model Manager

Your installation includes several predefined roles for administrators and users of SAS Model Manager. Depending on what software you have installed, you might have other predefined roles.

Note: The ability to access and update metadata is subject to permissions that are placed on that metadata. These roles do not affect permissions.

Table 5.3 Predefined User Roles and Capabilities

Role	Description
Decision Manager Common: Administration	Users in this role can perform all Decision Manager Common tasks, including administering workflows. This role is assigned to the group Decision Manager Common Administrators and has the Decision Manager Common: Workflow category capability.

Role	Description
Model Manager: Administration Usage	<p>Users in this role can perform all model management tasks.</p> <p>This role is assigned to the group Model Manager Administrator Users and has the following Model Manager Plug-in capabilities by default:</p> <ul style="list-style-type: none"> • Model Projects category • Model Portfolios category
Model Manager: Advanced Usage	<p>Users in this role can perform all model management tasks except for tasks that can be performed only by an application administrator.</p> <p>This role is assigned to the group Model Manager Advanced Users and has the following Model Manager Plug-in capabilities by default:</p> <ul style="list-style-type: none"> • Model Projects category • Model Portfolios category
Model Manager: Usage	<p>Users in this role are general users that can perform all tasks except for advanced user tasks and administrator tasks.</p> <p>This role is assigned to the group Model Manager Users.</p>
Comments: Administrator	<p>Users in this roll can edit or delete comments.</p> <p>The ability to edit and delete comments is controlled by the capabilities under Applications ⇒ SAS Application Infrastructure ⇒ Comments in SAS Management Console.</p>
Management Console: Advanced	<p>Provides access to all plug-ins in SAS Management Console.</p> <p>This role is assigned to the group SAS Administrators.</p>
Metadata Server: Operation	<p>Supports adding metadata repositories and operating the metadata server.</p> <p>This role is assigned to the group SAS Administrators.</p>
Metadata Server: User Administration	<p>Supports management of users, groups, and roles other than the unrestricted users role.</p> <p>This role is assigned to the group SAS Administrators.</p>




Role	Description
Metadata Server: Unrestricted	Provides all capabilities in SAS Management Console and provides access to all metadata. This role is assigned to the group SAS Administrator Users.

Viewing Roles and Capabilities in SAS Management Console

To view details about a role, open the User Manager plug-in in SAS Management Console, right-click the role, and select **Properties**. You can then view tabs that display the role's members, capabilities, and contributing roles.

Note: Some roles have implicit capabilities that are not specified on the **Capabilities** tab.

The following table describes the icons used in the Properties window.

Icon	Description
	None of the capabilities in this category have been specified for this role.
	Some of the capabilities in this category have been specified for this role, either explicitly or through a contributing role.
	All of the capabilities in this category have been specified for this role, either explicitly or through a contributing role.

Shaded check boxes indicate capabilities that come from contributing roles.

Administering Group and Role Membership

To administer group and role membership, use the User Manager plug-in in SAS Management Console.

Adding a User to a Group or Role

In most cases, the best way to place a user in a role is to add the user to a group that belongs to the role. You can also add users directly to groups or roles.

To place a user in one of the predefined roles, you can add the user to one of the predefined groups. For example, to add a user to the Decision Manager Common: Administration role, add the user to the Decision Manager Common Administrators group.

For more information, see *SAS Management Console: Guide to Users and Permissions* at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Creating New Groups and Roles

The predefined groups and roles might be sufficient for many sites. Other sites might need to make application features available to users on either a broader or more granular basis than the predefined groups or roles allow.

You can use combinations of capabilities to create a new role. However, you can use only the capabilities that already appear in User Manager. You cannot create new capabilities.

For detailed information about roles and how to create them, see *SAS Management Console: Guide to Users and Permissions* at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Modifying Roles

The User Manager plug-in in SAS Management Console enables you to modify roles by selecting or deselecting different capabilities.

CAUTION:

No automated method can revert a role to its original set of capabilities. Instead of adjusting the capabilities of a predefined role, consider creating a new role. This advice is especially important if you need to make major changes.

If you modify a role, then follow these best practices:

- Do not rename the predefined roles. Renaming the predefined roles makes it difficult for SAS Technical Support to help you resolve problems.
- Back up the metadata server before modifying roles, and keep a record of the changes that you make.

When modifying a role, you can use only the capabilities that already appear in User Manager. You cannot create new capabilities.

For more information about roles and how to modify them, see *SAS Management Console: Guide to Users and Permissions* at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Model Management User Tasks

Overview of Model Management User Tasks

When you work in SAS Model Manager, the application administrator assigns your user ID to one of three SAS Model Manager groups: Model Manager Administrators, Model Manager Advanced Users, and Model Manager Users. Groups can perform certain tasks within SAS Model Manager. For example, users in the Model Manager Administrator group are the only users who can lock a version.

Users in the Model Manager Administrator Users group can perform all task in the Models category view. The Model Manager Advanced Users and Model Manager Users groups are more restrictive. See the tables in the subsequent sections for a list of tasks and the groups whose users can perform the task.

An application administrator can create custom groups for your organization as well as assign roles to those groups. The pre-defined roles enable specific users or groups to be

assigned in order to complete specific tasks within SAS Model Manager. In most cases, roles are assigned to groups. Three of the roles are general and correspond to the groups that are supplied by SAS Model Manager. Contact your application administrator to find out your group and roles.

The following table lists the abbreviations for groups that are used in the task tables below:

Group	Abbreviation
Model Manager Administrator Users	MM Admin
Model Manager Advanced Users	MM Adv User
Model Manager Users	MM User
Decision Manager Users	DCM User
Decision Manager Administrator Users	DCM Admin

The following table describes the roles and lists the role abbreviations that are used in the list of tasks:

Role	Abbreviation
Comments: Administrator	:CAdmin
Decision Manager Common: Administration	:DMAdmin
Model Manager: Administration Usage	:Admin
Model Manager: Advanced Usage	:Adv
Model Manager: Usage	:User

Setting Up SAS Model Manager

Use the following table to determine the users who can complete the tasks to set up SAS Model Manager:

Task	Group
Create users in SAS Management Console	SAS Administrator
Create data libraries in SAS Management Console	MM Adv User, MM Admin, SAS Administrator
Create data libraries in the Data category view	DCM Admin, DCM User, MM Adv User, MM Admin, SAS Administrator

Task	Group
Create channel location folders on a SAS server	MM Admin
Create SAS channels in SAS Management Console	SAS Administrator
Define channel subscribers in SAS Management Console	SAS Administrator
Create project tables	MM User, MM Adv User, MM Admin
Register tables	DCM Admin, DCM User, MM Adv User, MM Admin
Configure the SAS Content Server for SAS Model Manager	MM Admin
Create workflows	MM Admin, MM Adv User, MM User, DCM Admin, DCM User
Manage workflows	DCM Admin

Setting Up Projects and Portfolios

Use the following table to determine the users who can complete the tasks to set up projects and versions in SAS Model Manager:

Task	Group
Create folders	MM Adv User, MM Admin
Create portfolios	MM Adv User, MM Admin
Create projects	MM Adv User, MM Admin
Create versions	MM Adv User, MM Admin
Delete folders, projects, and portfolios	MM Adv User, MM Admin
Archive and restore folders	MM Admin, MM Adv User
Create and upload model and report templates	MM User, MM Adv User, MM Admin
Create a workflow	MM Admin, MM Adv User, MM User
Assign participants to a workflow	DCM Admin
View workflows that are associated with a version	DCM Admin

Importing and Assessing Models

Use the following table to determine the users who can complete the tasks to import and assess models:

Task	Group
Import models	MM Adv User, MM Admin
Configure model properties	MM Adv User, MM Admin
Map model variables to project variables	MM Adv User, MM Admin
Run model comparison and model validation reports	MM Adv User, MM Admin
Create user reports	MM Adv User, MM Admin
Create aggregated reports	MM Adv User, MM Admin
Create scoring output tables	MM Adv User, MM Admin
Create and run scoring tests	MM Adv User, MM Admin
Schedule a scoring test to execute	MM Adv User, MM Admin

Deploying and Delivering Models

Use the following table to determine the users who can complete the tasks to deploy and deliver models:

Task	Group
Set a champion model	MM Adv User, MM Admin
Flag a challenger model	MM Adv User, MM Admin
Validate the champion model by running a scoring test using test data and reviewing the scoring output	MM Adv User, MM Admin
Lock or unlock versions	MM Admin
Publish a project or model to a SAS channel	MM Adv User, MM Admin
Extract a model	any user who has the appropriate access rights to the SAS Metadata Repository

Task	Group
Publish a model to the SAS Metadata Repository	MM Adv User, MM Admin
Publish a model scoring function or model scoring files to a database	MM Adv User, MM Admin

Monitor Champion Model Performance and Retrain Models

Use the following table to determine the users who can complete the tasks to create and run the reports that are used to monitor the champion model performance and to retrain models:

Task	Group
Set project properties	MM Adv User, MM Admin
Monitor performance of project champion models that are within a portfolio	MM Adv User, MM Admin
Edit a performance definition	MM Adv User, MM Admin
Schedule a performance definition to execute	MM Adv User, MM Admin
Execute the performance definition.	MM Adv User, MM Admin
Run performance monitoring batch jobs	in Test mode: MM User, MM Adv User, MM Admin in Production mode: MM Adv, MM Admin
View monitoring reports and charts	MM User, MM Adv User, MM Admin
Delete performance data sets	MM Adv User, MM Admin
Create and manage dashboard report definitions	MM Adv User, MM Admin
Generate dashboard reports	MM Adv User, MM Admin
View dashboard reports	MM User, MM Adv User, MM Admin
Edit a model retrain definition	MM Adv User, MM Admin
Execute or schedule a model retrain definition	MM Adv User, MM Admin
View retrained models and the associated model comparison reports	MM User, MM Adv User, MM Admin

General Tasks

Use the following table to determine the users who can complete these general tasks:

Task	Group or Role
Add attachments and comments	MM User, MM Adv User, MM Admin
Search for models	MM User, MM Adv User, MM Admin
Set the status of a project champion model and challenger models	MM Adv User, MM Admin
Replace a champion model	MM Adv User, MM Admin
View workflow tasks	MM User, MM Adv User, MM Admin A user must be the actual owner of a task or assigned the workflow participant role of potential owner or business administrator to view tasks in the My Tasks category
Work with workflow tasks	MM User, MM Adv User, MM Admin A user who is a workflow participant can claim, release, and complete tasks.

Chapter 6

Configuring SAS Workflow

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Configuring SAS Workflow for Use with SAS Model Manager

Overview

SAS Workflow provides services that work together to model, automate, integrate, and streamline business processes. It provides a platform for more efficient and productive business solutions.

SAS Workflow is used by SAS solutions that benefit from business process management. SAS Workflow Studio is a desktop client application that is used to design and deploy workflow definitions. The SAS middle tier hosts the workflow engine and the workflow services as part of the SAS Web Infrastructure Platform. SAS Model Manager is used to manage the workflows that are associated with versions. For more information about SAS Workflow, see “SAS Workflow” in Chapter 1 of *SAS Intelligence Platform: Middle-Tier Administration Guide*.

To use SAS Workflow with SAS Model Manager, be sure the following prerequisites are met:

1. SAS Workflow Engine, SAS Workflow Services, and SAS Workflow Studio must be installed and configured. For more information, see *SAS Intelligence Platform: Installation and Configuration Guide*
2. If you want to receive notifications for a workflow, you must configure alert notifications using SAS Management Console. For more information, see [“Configuring Alert Notifications for SAS Workflow” on page 52](#).

3. Users must be a member of the Decision Manager Common Administrators Group or another user group that is associated with the Decision Manager Common: Administration role.
4. Workflow definitions must be created using SAS Workflow Studio. For more information about creating workflow definitions, see the *SAS Workflow Studio: User's Guide*.

Guidelines for Creating Workflow Definitions

When you create workflow definitions in SAS Workflow Studio to use with SAS Model Manager, follow these guidelines:

- Participants, and policies must be added to the task level. Statuses added at the task level and the default statuses at the workflow definition level can be used for a task status. Data objects can be added at the workflow definition level or task level. Users can see only the data objects defined at the task level from the Workflows category in SAS Model Manager.
- Only the Potential Owner and Business Administrator workflow roles are used by SAS Model Manager and they can be used in either a participant or swimlane definition. The Actual Owner workflow role should not be used as part of a workflow definition.
- In order to assign additional participants to tasks in SAS Model Manager, the user must have or be in a group that is assigned the workflow role of Business Administrator. Also, in order to manage workflows and assign participants, the user must be in the Decision Manager Common Administrators group, or in a group that is a member of the Decision Manager Common Administrators group or that is associated with the Decision Manager Common: Administration role in SAS Management Console.

The following groups are created at installation time:

- Decision Manager Common Administrators Group
- Decision Manager Users Group
- Model Manager Administrator Users Group (mdlmgradminusers)
- Model Manager Advanced Users Group (mdlmgradvusers)
- Model Manager Users Group (mdlmgrusers)

For more information, see [Chapter 5, “Configuring Users, Groups, and Roles,” on page 35](#).

- Only workflow definitions that are activated in the Workflow repository, that are associated with the `mmapi` tag attribute in the file properties, are available to SAS Model Manager.

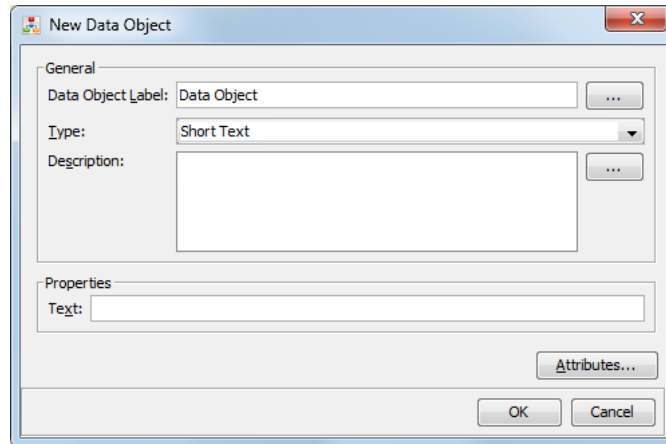
How to Associate a Milestone with a Workflow Task

You can associate a milestone ID with a task as part of creating a workflow definition. This enables the name of the milestone ID to be displayed in the **Milestone** column in SAS Model Manager. This column appears in the Workflows category view, the workflow details view, and in the workflow task drop-down menu that can be accessed from the project toolbar menu.

First you must create a workflow definition using SAS Workflow Studio. Add the tasks, statuses, and data objects that you want to include in your workflow. For more information about creating a workflow definition, see the *SAS Workflow Studio: User's Guide*.

To associate a milestone ID with a task:

1. Start SAS Workflow Studio, and then open a workflow definition.
2. Expand the **Tasks** node in the workflow tree.
3. Expand a task node, right-click the **Data Objects** folder, and select the **New Data Object** menu option.



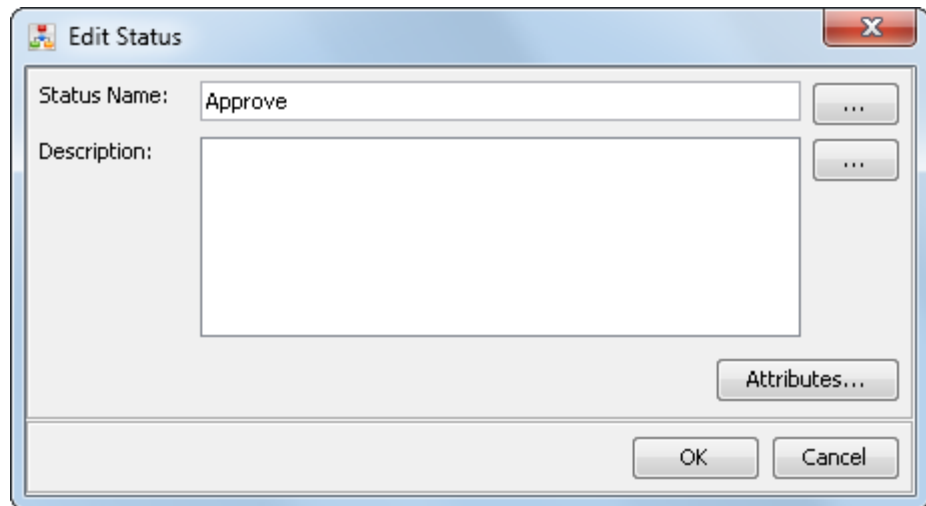
4. Enter **MilestoneID** for the data object label.
Note: In previous versions of SAS Model Manager the data object label of **MM_MilestoneID** was used and still works.
5. Select **Short Text** from the type of data object.
6. Enter a name for the milestone ID in the **Text** property. The name can be the same as the task name.
7. Click **OK**.
8. Repeat steps 3 through 7 for each task that you want to associate a milestone ID so that it appears on the Workflow Milestones report.

How to Add the Approval Attribute to a Status

The **Approval** attribute allows a workflow designer to signify that a specific task approves the associated version for a model project. This attribute then notifies the users of the version that a project is approved.

To add the **Approval** attribute to a status:

1. Expand the **Statuses** folder in the **Workflow Tree**.
2. Right-click a status and select **Edit**.



3. Click **Attributes**.
4. Click **Add** and enter the following values for the new attribute.

Key

Approval

Note: This key is case-sensitive.**Value**

true

5. Click **OK** twice to save.

How to Make Workflow Definitions Available to SAS Model Manager

After you have created a workflow definition in the SAS Workflow Studio, you must make the workflow definition available to SAS Model Manager.

To save the workflow definition to the Workflow repository:

1. Save the workflow definition to your local drive.
2. [Log on to the server](#).
3. [Add the tag attribute](#) of **mmapi** to the workflow definition file properties.
4. [Upload the workflow definition](#).
5. [Verify that the workflow definition](#) is available in the Workflows category.

For more information, see “Deploying and Maintaining Workflows” in Chapter 5 of *SAS Workflow Studio: User's Guide*.

Log On to the Server

With SAS Workflow Studio, you are limited to managing locally stored workflow definitions on your system until you have logged on to the SAS Content Server. After you are connected, you can access additional workflow definitions that are stored in the SAS Content Server.

To log on to the server:

1. Select **Server** ⇒ **Log On**.

2. In the Log On window, select the host-name from the **SAS environment** drop-down list.

Note: For more information, see Appendix 1, “Configuring the SAS Environment File,” in *SAS Intelligence Platform: Middle-Tier Administration Guide*.

3. Enter a user ID and password, and click **Log On**.
4. Click **OK** if a confirmation message appears.

Add Tag Attributes to a Workflow Definition

Only those workflow definitions in the Workflow repository that contain the **mmapi** tag attribute in the file properties are available to SAS Model Manager.

To add a tag attribute to the file properties of a workflow template in SAS Workflow Studio:

1. Select **File** ⇒ **Properties** and click **Add**.
2. Enter the tag value of **mmapi**.

Note: The file properties are case sensitive. This value must be lowercase.

3. Click **OK** twice.

Upload a Workflow Definition

To upload a workflow:

1. From the **Server** menu, select the **Save to Repository** menu option. The Save to Workflow Repository window appears.
2. (Optional) Enter relevant comments to associate with the workflow definition.
3. Select the **Activate** option if you want to activate the current version in the Workflow repository.
4. Click **OK**.
5. Click **OK** if confirmation messages appear.

Verify That the Workflow Definitions Are Available In SAS Model Manager

To verify that the workflow definitions are available in the Workflows category view of SAS Model Manager:

1. Enter the URL `http://hostname:port/SASDecisionManager` in your web browser.
2. Enter the user ID and password for a user that is in the Decision Manager Common Administrators Group or a user group that is associated with the Decision Manager Common: Administration role.
3. Verify that the uploaded workflow definition is available in the Workflows category view. From the Workflows category view, select **Actions** ⇒ **Set Mappings**. The Set Mappings window appears with a list of the available workflow definitions.

For more information, see “Set Mappings” in Chapter 19 of *SAS Model Manager: User's Guide*.

Configuring Alert Notifications for SAS Workflow

To enable workflow participants to receive alert notifications from SAS Workflow, you must configure the **E-mail** notification type in SAS Management Console. After you have configured the alert notifications, you can then use the Notify Participant policy and other workflow notification policies for workflow tasks in SAS Workflow Studio. The notifications setting in SAS Management Console is a global setting. Preferences and notifications can also be configured for individual users.

The Send Notification By Data Object policy in SAS Workflow Studio integrates with the SAS Web Infrastructure Platform's Notification Service. Recipients are notified according to their preferences (e-mail or portlets).

1. Log on to SAS Management Console as an administrator.
2. On the **Plug-ins** tab, navigate to **Application Management** ⇒ **Configuration Manager** ⇒ **SAS Application Infrastructure**.
3. Right-click **SAS Application Infrastructure** and select **Properties**.
4. Click the **Settings** tab.
5. Select **Notifications** in the left panel. Use the menus or text fields to set the property.
6. Select the **E-mail** notification type.
7. Click **OK**.
8. To apply this setting and make it available, restart the SAS Web Infrastructure Platform Services, SAS Shared Services, and applications using SAS Workflow.

For more information about the notification properties, see “Setting Global Properties for SAS Applications” in Chapter 7 of *SAS Intelligence Platform: Middle-Tier Administration Guide*. For more information about setting the notification policies for SAS Workflow, see the SAS Workflow Studio Help or *SAS Workflow Studio: User's Guide*.

Chapter 7

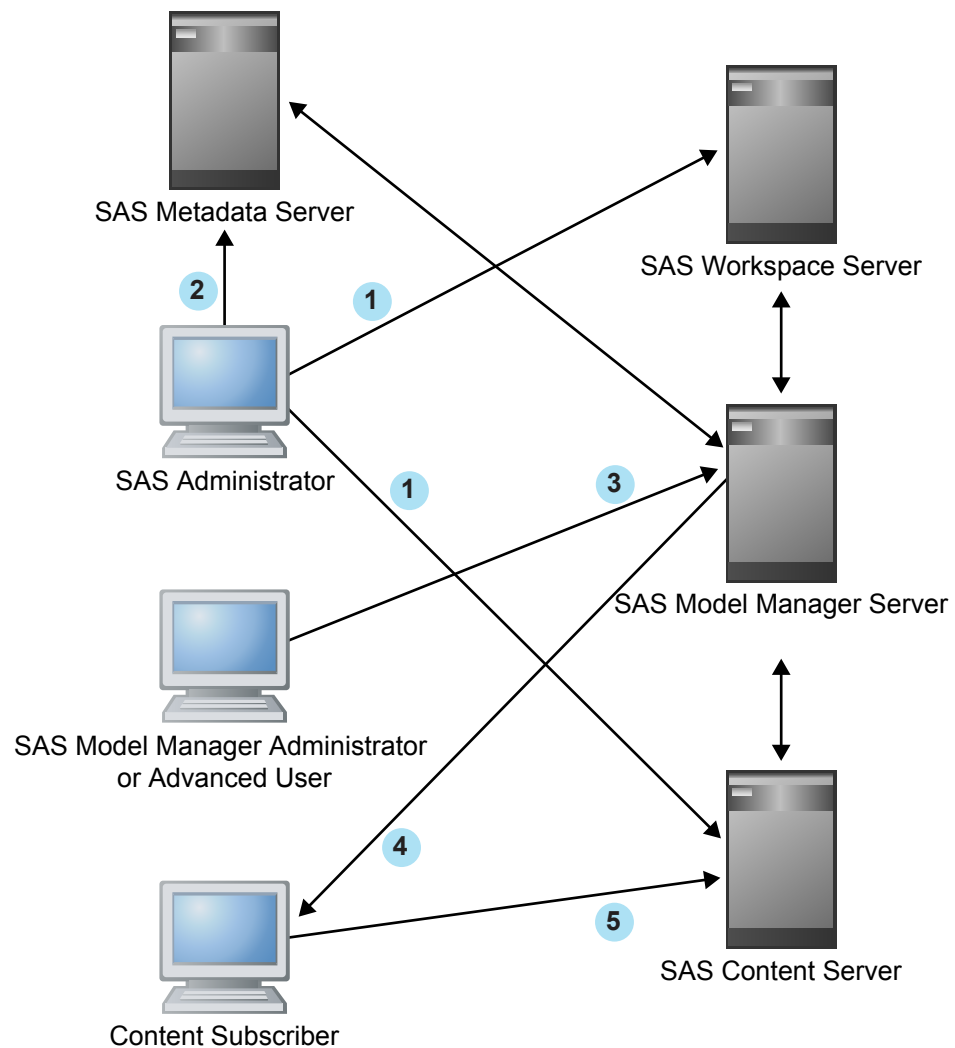
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Overview of Creating and Configuring Publication Channels

SAS Model Manager uses the SAS Publishing Framework to publish model updates to an operational environment for testing and production. The SAS Administrator creates and configures definitions for channels, content subscribers, and group subscribers. Then the user can use the SAS Model Manager model extraction macros or user-written SAS code to retrieve and deploy the updated models to the operational environment.

As shown in the following figure, several tasks are necessary to configure and use the SAS Model Manager publishing functionality.

Figure 7.1 Configuring SAS Model Manager to Enable Publishing Models

Here are the tasks.

- 1 The application administrator creates either an archive or a WebDAV persistent storage location for channels that is accessible from the SAS Workspace Server.
- 2 The application administrator creates users, HTTP servers, content subscribers, and channels using SAS Management Console.
- 3 The application administrator or an advanced user publishes models using SAS Model Manager.
- 4 The content subscriber (for example, Scoring personnel) receives an e-mail notification from the server that contains a channel content update.
- 5 The content subscriber extracts models from a channel (for example, on a SAS Content Server) to prepare them for scoring.

Note: SAS Management Console Help provides details for your SAS Model Manager publishing configuration options.

It is recommended that at first you use channels that have the Archive File type for the persistent storage option. This is the simplest channel definition and configuration to use to publish directly to your operational testing or production scoring servers. For example, during the installation of SAS Model Manager, a channel called **MMChannel**

is created that has a persistent store Archive File type. For more information, see [“Create a New Channel” on page 60](#).

Define an HTTP or HTTPS Server

The SAS Model Manager installation process by default defines a SAS Web Server and a SAS Content Server. Use this process to add additional HTTP or HTTPS servers. A WebDAV-enabled HTTP or HTTPS content server must be defined in SAS Management Console before you can publish to channels from SAS Model Manager. The server is usually a third-party server such as Microsoft Internet Information server or an Apache server.

Note: You must have WriteMetadata permission for a repository in order to define an HTTP or HTTPS content server for that repository.

To define your HTTP or HTTPS content server:

1. Start SAS Management Console. Open your existing connection profile for your server. If your connection profile is not available in the list, see SAS Management Console Help.
2. From the **Plug-ins** tab, right-click **Server Manager**, and then select **New Server**.
3. Select **Resource Templates** ⇒ **Servers** ⇒ **Content Servers** ⇒ **Http Server**, and then click **Next**.

Note: If the HTTP server template is not available, then you must add the resource template. For more information, see the SAS Management Console Help.

4. Enter the name and the description of your HTTP server. Click **Next**.
5. (Optional) On the server properties page, enter the software version and vendor information for the third-party HTTP or HTTPS server that you are defining.
6. Click **New** to create a base path or paths on your server.

Note: If you have not defined the base path for your HTTP server, see [“Define Publish Locations for the SAS Content Server” on page 56](#).

7. In the **Base Path** field, specify the location of the top-level directory where report content items such as report definitions or image files are stored. (This path must be set up as an alias on the web server.) The **Description** field is optional.
8. Select the **Supports WebDAV** option and then click **OK** to save your settings. The new base path appears in the **Base Path(s)** field of the server properties page.
9. Click **Next**.
10. Enter the connection properties for your HTTP server:
 - a. Select **DefaultAuth** from the list. When you click **New** to create a new domain, a dialog box appears. Enter the name and description of your domain.
 - b. Enter the fully qualified name or the IP address of your server.
 - c. Enter a port number (for example, 8080 for a web application server).
11. Click **Next**. The New Server Wizard window displays a summary of the settings for the new server and indicates that you have successfully completed the definition of a new server.
12. Click **Finish**. Your new server is displayed under the **Server Manager** node in the SAS Management Console Navigation Tree.

See Also

- SAS Management Console Help
- *SAS Intelligence Platform: Middle-Tier Administration Guide*

Define Publish Locations for the SAS Content Server

During the SAS Model Manager installation process, the **ModelManager**, **sasfolders**, and **sasdav** WebDAV folders are automatically created on the SAS Content Server. You can use the SAS Content Server Administration Console (SCS Admin Console) to create a new publishing location for the WebDAV folder or to control access to an existing WebDAV folder. If you need to define a new WebDAV-enabled HTTP content server after the initial installation of SAS Model Manager, then you must define a publishing location. For more information, see “[Define an HTTP or HTTPS Server](#)” on page 55.

Note: Although you can add a folder to the **sasfolders** location, the folder that you add is not added to the SAS Metadata Server.

TIP The best practice is to add folders to metadata using SAS Management Console.

To define a new publishing location:

1. Access the SAS Content Server Administration console by entering the following URL in your web browser and substituting the server name and port number of your SAS Content Server: **http://server-name:port/SASContentServer/dircontents.jsp**.

Note: The default port number for the SAS Web Application Server is 80.

2. Log on to the console as an unrestricted user (for example, SAS Administrator). The SCS Admin Console window appears.

The screenshot shows the SCS Admin Console interface. At the top, there's a header bar with 'SCS Admin Console' on the left and 'sasadm@saspw | Logout' on the right. Below the header is a table with columns: Item name, Primary type, Date created, Date modified, Delete, and Permissions. The table lists four folders: ModelManager, sascontent, sasdav, and sasfolders. Each folder has a 'Delete' button and a permissions icon. Below the table is a text input box and an 'Add folder' button. At the bottom, there's a footer bar with '©2012 SAS Institute Inc.'

Item name	Primary type	Date created	Date modified	Delete	Permissions
<u>ModelManager</u>	nt:davcollection	2013-06-17T09:09:21.099-04:00	2013-06-17T09:09:21.157-04:00		
<u>sascontent</u>	nt:davcollection	2013-06-17T08:03:18.902-04:00	none		
<u>sasdav</u>	nt:davcollection	2013-06-17T08:03:18.887-04:00	none		
<u>sasfolders</u>	nt:davcollection	2013-06-17T08:03:18.902-04:00	none		

Input box:
Add folder

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3. Enter a name for the folder in the text box and then click **Add folder** to create a new location for publishing channels.
4. (Optional) To create a subfolder, select the folder that you created in the previous step, enter a name for the subfolder in the text box, and click **Add folder**.

Note: Use the breadcrumb trail above the list to return to a parent folder.

5. To set permissions for a folder:
 - a. Click the permission icon next to the item that you want to modify. The Permissions page appears.

- b. For each principal that is listed, modify the permissions by changing each permission to **Yes** or **No**.
- c. To add more principals to the page, do one of the following:
 - If you know the principal's name, enter it in the field and click **Save changes**.
 - Click **Search for Principals** to search for a name. When you find the principal that you want to add, select the check box that is next to the principal's name and then click **Return**.

After the principal's name appears on the permission page, you can set permissions for the principal.

Note: For more information about administering the SAS Content Server, see *SAS 9.4 Intelligence Platform: Web Application Administration Guide*.

Configuring Channels and Subscribers for SAS Model Manager

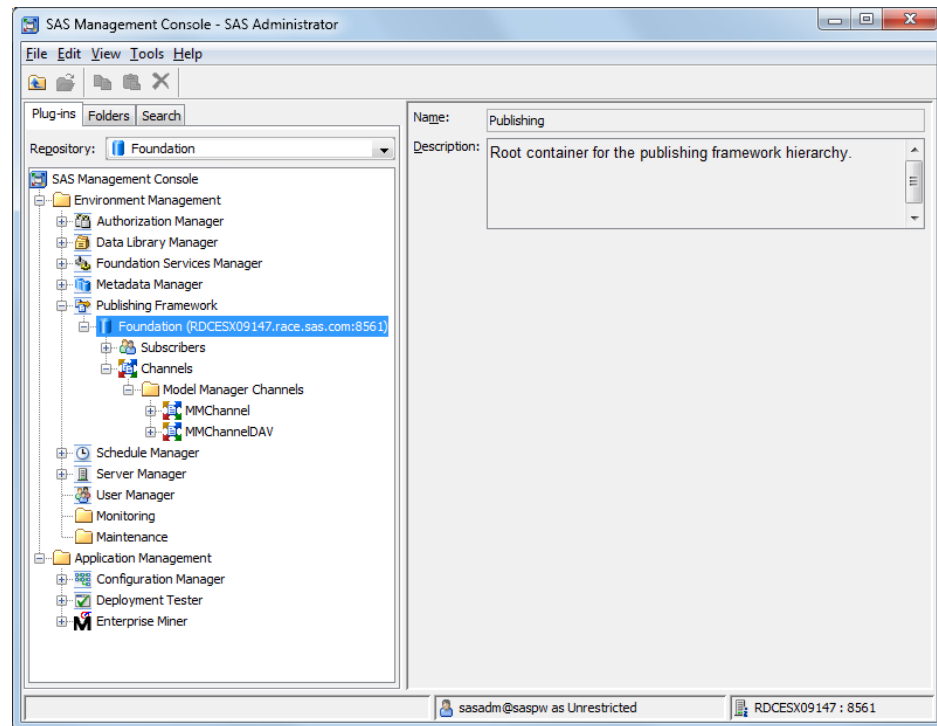
Overview of Configuring Channels and Subscribers

The Publishing Framework plug-in to SAS Management Console enables you to administer the Publishing Framework.

Note: You need to verify that Publishing Framework plug-ins are available in your SAS Management Console navigation tree. If the plug-in is not available, you need to install SAS Foundation Services 1.3 or later so that you can configure your channels and subscribers for SAS Model Manager.

With the Publishing Framework plug-in, you can manage subscribers and channels. For more information, see the Help.

When the Publishing Framework plug-in is available, the SAS Management Console Project Tree should look as follows:



The SAS Metadata Server (for example, **Foundation**) that is shown under the Publishing Framework plug-in contains the **Subscribers** folder and the **Channels** folder.

The Publishing Framework plug-in to SAS Management Console provides wizards that enable you to create subscribers. When you create a subscriber with a wizard, the subscriber object that has the specified attributes is stored on the SAS Metadata Server.

For more information about Publishing Framework, see the *SAS 9.4 Publishing Framework: Developer's Guide*.

Channel to Subscriber Configuration

There are several ways to configure channels to publish your models to the channel subscribers.

Choose one of these options to define the method to use for publishing channels:

1. **None** - specifies to publish all content that is published to the channel directly to the subscribers (through e-mail). The content is not persisted.
2. **Archive** - specifies a path and an optional logical server for the location of the persistent storage. The **Archive File** option is recommended for publishing model packages. Publishing Framework publishes the content as an archive (binary) SPK (SAS package) file to the persistent storage location.
3. **WebDAV** - specifies the WebDAV server location.

TIP The best practice is to use the **Archive File** type for channel persistent storage and **e-mail** for subscriber notification.

Before publishing models using SAS Model Manager, you must create channels and subscribers to publish your model updates.

Creating Channels and Subscribers

The channel sends the information from the publishers to the subscribers who want it.

A subscriber is a person or a program that has a need for information that is published. To receive information from a channel, the user must be defined as a subscriber.

The Publishing Framework plug-in provides wizards that enable you to create subscribers. Information about the subscriber is stored on the SAS Metadata Server.

Note: Channel subscribers must be users of the SAS Metadata Server and their e-mail addresses must be specified.

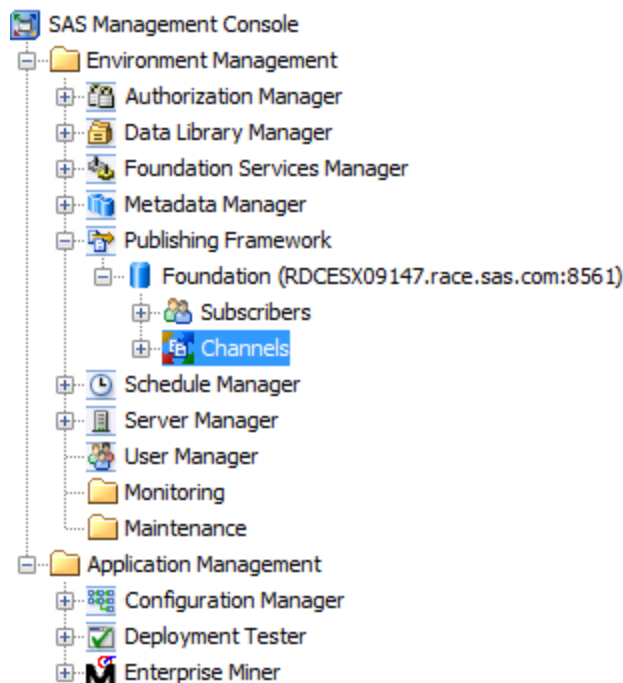
Create a Channel Folder

If you expect to create a large number of channels, then consider grouping related channels into channel folders. You can create subfolders within folders, thereby creating a folder hierarchy to which access controls can be applied. For more information, see the SAS Management Console Help.

Note: Currently it is not possible to move an existing channel into a folder or from one folder to another. Plan ahead to avoid deleting and re-creating channels.

To create channel folders:

1. From the SAS Management Console navigation tree, expand the **Publishing Framework** node.
2. Select and expand the desired metadata repository node.
3. If you are creating a top-level folder, then select **Channels**. If you are creating a subfolder, then navigate to and select the desired parent folder.



4. Right-click **Channels** and then select **New Folder**.
5. Enter a name for the new channel folder and then click **Next**. The new folder is created and the metadata definition information is displayed.
6. Click **Finish**.

Create a New Channel

To create a new channel:

1. From the SAS Management Console navigation tree, expand the **Publishing Framework** node.
 2. Select and expand the desired metadata repository node.
 3. If you are creating a channel within a folder, select the **Channels** node and navigate to the desired folder.
 4. Right-click **Channels** or the desired channel folder and select **New Channel**.
 5. Specify the name of your channel and click **Next**.
 6. Use the arrow button to associate content subscribers with this channel to be notified at publish time. Click **Next**.
 7. Select **Archive**.
 8. Select **File** for **Archive Type** and enter the path of your publish location. Click **Next**.
The information window appears, providing a summary of the input and status of successful completion of the channel creation.
- Note:* Two other types, HTTP and FTP, are available for you to select from the list.
9. Click **Finish**. The new channel name is displayed under the **Channels** node of SAS Management Console.

For more information, see the SAS Management Console Help or *SAS 9.4 Publishing Framework: Developer's Guide*.

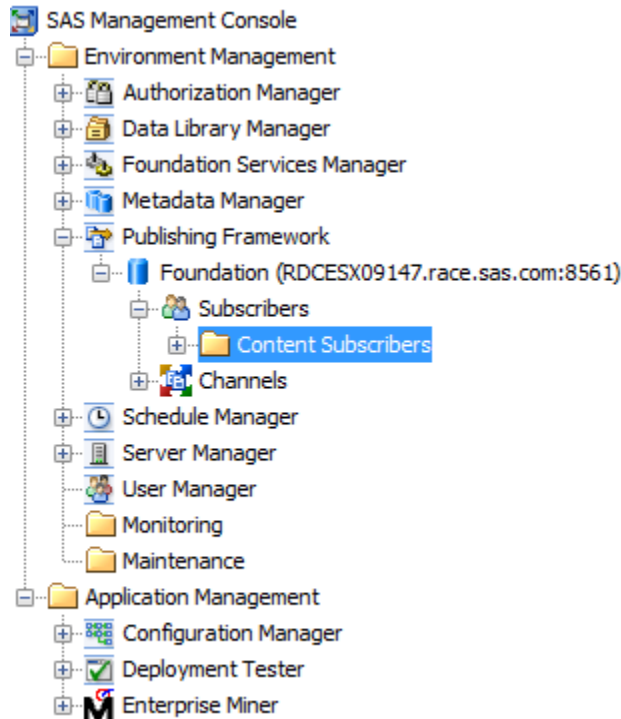
Create a New Subscriber

SAS Model Manager supports only the content subscriber and the Name/Value pair filter for filtering. You can publish to a channel even when the channel does not have any associated subscribers. SAS Model Manager users can extract contents from a channel if they are not subscribers of the channel. However, only subscribers of a channel can receive notifications. You can also create a subscriber group that contains individual subscribers or other subscriber groups. For more information, see the SAS Management Console Help.

To create a new content subscriber:

1. Expand the **Publishing Framework** node in the SAS Management Console navigation tree.
2. Select the desired metadata repository node.

3. Select **Subscribers** ⇒ **Content Subscribers**.



4. Right-click **Content Subscribers** and select **New Content Subscriber**.
5. Specify a name and a description for this subscriber. The name must be unique within its parent folder. The description is optional. Click **Next**.
6. Click **Select** to associate a person with this subscriber.
7. The search filter enables you to search the repository for users whose names either contain or are equal to a string that you specify. Enter the string in the text field, select either **contains** or **equals** from the list, and click **Search**. A list of users whose names meet your search criteria appears in the **Available People** list.
8. If the desired user does not exist in the repository, then click **New User** to define that user. Then, select the desired user from the **Available People** list and click **OK**.
9. Click **Next**.
10. Select the subscriber's delivery transport and then specify the attributes. Click **Next**.
11. Specify one or more filters to eliminate content that the subscriber does not want to receive. To add a filter, click the tab that corresponds to the type of filter (Name/Value, Entry, or MIME Type). Select **Inclusion** or **Exclusion** and then click **Add** to specify the filter criteria.
12. Click **Next**.
13. Review the subscriber specifications. Click **Back** to make any corrections. Click **Finish** when you are satisfied with your selections.

For more information, see the Help or *SAS 9.4 Publishing Framework: Developer's Guide*.

Modify an Existing Channel or Channels Node Location

Modify the Directory Location for the Channels Node

To change the location of the application channels directory:

1. From SAS Management Console, expand the **Application Management** node on the **Plug-ins** tab.
2. Select and expand **Configuration Manager** ⇒ **SAS Application Infrastructure** ⇒ **Model Manager JavaSvcs 13.1**.
3. Right-click **Model Manager JavaSvcs 13.1** and select **Properties**.
4. Click the **Advanced** tab to modify the application channels directory. Change the property value for **App.ChannelDir** to a directory that is accessible by the SAS Workspace Server.
5. Click **OK**.

Modify the Persistent Store Directory Location for a Channel

To modify the location of the persistent store directory path for a channel:

1. From the SAS Management Console navigation tree, expand the **Publishing Framework** node.
2. Select and expand the desired metadata repository node.
3. If you are modifying a channel within a folder, select the **Channels** node and navigate to the desired folder.
4. Right-click the name of the channel that you want to modify, and then select **Properties**.
5. Click the **Persistent Store** tab, and modify the archive file path and server location.
6. Click **OK**.

See Also

SAS Management Console Help

Recommended Reading

Here is the recommended reading list for this title:

- The online Help for the SAS Model Manager.
- *SAS Model Manager: User's Guide*
- *SAS Workflow Studio: User's Guide*
- *SAS In-Database Products: Administrator's Guide*
- *SAS Intelligence Platform: Installation and Configuration Guide*
- *SAS Intelligence Platform: Middle-Tier Administration Guide*
- *SAS Intelligence Platform: Desktop Application Administration Guide*
- *SAS Intelligence Platform: System Administration Guide*
- *SAS Intelligence Platform: Web Application Administration Guide*

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Glossary

analytical model

a statistical model that is designed to perform a specific task or to predict the probability of a specific event.

attribute

See “[variable attribute](#)”.

backtesting

a procedure for monitoring the quality of behavioral and application scoring models. Backtesting validates the accuracy of the model's predictions.

baseline

the initial performance prediction against which the output data from later tasks is compared.

bin

a grouping of predictor variable values that is used for frequency analysis.

candidate model

a predictive model that evaluates a model's predictive power as compared with the champion model's predictive power.

challenger model

a model that is compared and assessed against a champion model for the purpose of replacing the champion model in a production scoring environment.

champion model

the best predictive model that is chosen from a pool of candidate models in a data mining environment.

characteristic report

a report that detects and quantifies shifts in the distribution of input variables over time in data that is used to create predictive models.

classification model

a predictive model that has a categorical, ordinal, or binary target.

clustering model

a model in which data sets are divided into mutually exclusive groups in such a way that the observations for each group are as close as possible to one another, and different groups are as far as possible from one another.

component file

a file that defines a predictive model. Component files can be SAS programs or data sets, XML files, log files, SPK files, or CSV files.

data model training

the process of building a predictive model from data.

data object

an object that holds the business data that is required to execute workflow tasks.

data set

See [“SAS data set”](#).

data source (source)

a table, view, or file from which you will extract information. Sources can be in any format that SAS can access, on any supported hardware platform. The metadata for a source is typically an input to a job.

DATA step

in a SAS program, a group of statements that begins with a DATA statement and that ends with either a RUN statement, another DATA statement, a PROC statement, or the end of the job. The DATA step enables you to read raw data or other SAS data sets and to create SAS data sets.

DATA step fragment

a block of SAS code that does not begin with a DATA statement. In SAS Model Manager, all SAS Enterprise Miner models use DATA step fragments in their score code.

delta report

a report that compares the input and output variable attributes for each of the variables that are used to score two candidate models.

dynamic lift report

a graphical report that plots the sequential lift performance of one or more models over time, against test data.

file reference

See [“fileref”](#).

fileref (file reference)

a name that is temporarily assigned to an external file or to an aggregate storage location such as a directory or a folder. The fileref identifies the file or the storage location to SAS.

format

See [“SAS format”](#).

Gini coefficient

a benchmark statistic that is a measure of the inequality of distribution, and that can be used to summarize the predictive accuracy of a model.

holdout data

a portion of the historical data that is set aside during model development. Holdout data can be used as test data to benchmark the fit and accuracy of the emerging predictive model.

identity

See “[metadata identity](#)”.

index

a component of a SAS data set that enables SAS to access observations in the SAS data set quickly and efficiently. The purpose of SAS indexes is to optimize WHERE-clause processing and to facilitate BY-group processing.

informat

See “[SAS informat](#)”.

inner join

a join between two tables that returns all of the rows in one table that have one or more matching rows in the other table.

input variable

a variable that is used in a data mining process to predict the value of one or more target variables.

Kolmogorov-Smirnov chart

a chart that shows the measurement of the maximum vertical separation, or deviation between the cumulative distributions of events and non-events.

library reference

See “[libref](#)”.

libref (library reference)

a SAS name that is associated with the location of a SAS library. For example, in the name MYLIB.MYFILE, MYLIB is the libref, and MYFILE is a file in the SAS library.

life cycle phase

a collection of milestones that complete a major step in the process of selecting and monitoring a champion model. Typical life cycle phases include development, test, production, and retire.

logistic regression

a form of regression analysis in which the target variable (response variable) represents a binary-level, categorical, or ordinal-level response.

macro variable (symbolic variable)

a variable that is part of the SAS macro programming language. The value of a macro variable is a string that remains constant until you change it.

metadata

descriptive data about data that is stored and managed in a database, in order to facilitate access to captured and archived data for further use.

metadata identity (identity)

a metadata object that represents an individual user or a group of users in a SAS metadata environment. Each individual and group that accesses secured resources on a SAS Metadata Server should have a unique metadata identity within that server.

milestone

a collection of tasks that complete a significant event. The significant event can occur either in the process of selecting a champion model, or in the process of monitoring a champion model that is in a production environment.

model assessment

the process of determining how well a model predicts an outcome.

model function

the type of statistical model, such as classification, prediction, or segmentation.

model input variable report

reports the frequencies that input variables are used in the models for an organizational folder, a project, or a version.

model profile report

reports the profile data that is associated with the model input variables, output variables, and target variables.

model scoring (scoring)

the process of applying a model to new data in order to compute outputs.

model target variable report

a report that indicates the frequency in which target variables are used in the models that exist in the selected folder.

monitoring report

a report that consists of assessment charts, a ROC chart, a Gini Trend chart, a KS (Kolmogorov-Smirnov) chart, and a KS trend chart that can be used to compare the model performance curves of several candidate models.

neural network

any of a class of models that usually consist of a large number of neurons, interconnected in complex ways and organized into layers. Examples are flexible nonlinear regression models, discriminant models, data reduction models, and nonlinear dynamic systems.

observation

a row in a SAS data set. All of the data values in an observation are associated with a single entity such as a customer or a state. Each observation contains either one data value or a missing-value indicator for each variable.

package

See “[package file](#)”.

package file (package)

a container for data that has been generated or collected for delivery to consumers by the SAS Publishing Framework. Packages can contain SAS files, binary files, HTML files, URLs, text files, viewer files, and metadata.

participant

a user, group, or role that is assigned to a task. These users, groups, and roles are defined in SAS metadata and are mapped to standard roles for the workflow.

performance table

a table that contains response data that is collected over a period of time. Performance tables are used to monitor the performance of a champion model that is in production.

PFD

See [“process flow diagram”](#).

PMML

See [“Predictive Modeling Markup Language”](#).

policy

a workflow element that associates event-driven logic with a task or subflow. Policies are usually triggered automatically by an event such as a status change or a timer event.

prediction model

a model that predicts the outcome of an interval target.

Predictive Modeling Markup Language (PMML)

an XML based standard for representing data mining results for scoring purposes. It enables the sharing and deployment of data mining results between applications and across data management systems.

process flow diagram (PFD)

a graphical sequence of interconnected symbols that represent an ordered set of steps or tasks that, when combined, form a workflow designed to yield an analytical result.

production models aging report

reports the number and the aging distribution of champion models.

profile data

information that consists of the model name, type, length, label, format, level, and role.

project

a collection of models, SAS programs, data tables, scoring tests, performance data, and reporting documents.

project tree

a hierarchical structure made up of folders and nodes that are related to a single folder or node one level above it and to zero, one, or more folders or nodes one level below it.

property

any of the characteristics of a component that collectively determine the component's appearance and behavior. Examples of types of properties are attributes and methods.

publication channel (SAS publication channel)

an information repository that has been established using the SAS Publishing Framework and that can be used to publish information to users and applications.

publish

to deliver electronic information to one or more destinations. These destinations can include message queues, publication channels, and so on.

Publishing Framework

a component of SAS Integration Technologies that enables both users and applications to publish SAS files (including data sets, catalogs, and database views), and other digital content to a variety of destinations. The Publishing Framework also provides tools that enable both users and applications to receive and process published information.

Receiver Operating Characteristic chart (ROC)

a chart used in signal detection theory to plot the sensitivity, or true positive rate, against the false positive rate ($1 - \text{specificity}$, or $1 - \text{true negative rate}$) of binary data values. An ROC chart is used to assess a model's predictive performance.

ROC

See [“Receiver Operating Characteristic chart”](#).

SAS code model

a SAS program or a DATA step fragment that computes output values from input values. An example of a SAS code model is the LOGISTIC procedure.

SAS Content Server

a server that stores digital content (such as documents, reports, and images) that is created and used by SAS client applications. To interact with the server, clients use WebDAV-based protocols for access, versioning, collaboration, security, and searching.

SAS data set (data set)

a file whose contents are in one of the native SAS file formats. There are two types of SAS data sets: SAS data files and SAS data views.

SAS format (format)

a type of SAS language element that is used to write or display data values according to the data type: numeric, character, date, time, or timestamp.

SAS informat (informat)

a type of SAS language element that is used to read data values according to the data's type: numeric, character, date, time, or timestamp.

SAS Metadata Repository

a container for metadata that is managed by the SAS Metadata Server.

SAS Metadata Server

a multi-user server that enables users to read metadata from or write metadata to one or more SAS Metadata Repositories.

SAS Model Manager repository

a location in the SAS Content Server where SAS Model Manager data is stored, organized, and maintained.

SAS publication channel

See [“publication channel”](#).

SAS variable (variable)

a column in a SAS data set or in a SAS data view. The data values for each variable describe a single characteristic for all observations (rows).

scoring

See “[model scoring](#)”.

scoring function

a user-defined function that is created by the SAS Scoring Accelerator from a scoring model and that is deployed inside the database.

scoring input table

a table that contains the variables and data that are used as input in a scoring test.

scoring output table

a table that contains the output variables and data that result from performing a scoring test. Before executing a scoring test, the scoring output table defines the variables to keep as the scoring results.

scoring test

a workflow that executes a model's score code.

segmentation model

a model that identifies and forms segments, or clusters, of individual observations that are associated with an attribute of interest.

source

See “[data source](#)”.

stability report

a graphical report that detects and quantifies shifts in the distribution of output variables over time in data that is produced by a model.

subscriber

a recipient of information that is published to a SAS publication channel.

swimlane

a workflow diagram element that enables you to group tasks that are assigned to the same participant.

symbolic variable

See “[macro variable](#)”.

target event value

for binary models, the value of a target variable that a model attempts to predict. In SAS Model Manager, the target event value is a property of a model.

target variable

a variable whose values are known in one or more data sets that are available (in training data, for example) but whose values are unknown in one or more future data sets (in a score data set, for example). Data mining models use data from known variables to predict the values of target variables.

task

See “[workflow task](#)”.

task status

the outcome of a task in a workflow. The status of a task (for example, Started, Canceled, Approved) is typically used to trigger the next task.

test table

a SAS data set that is used as input to a model that tests the accuracy of a model's output.

training data

data that contains input values and target values that are used to train and build predictive models.

universally unique identifier (UUID)

a number that is used to uniquely identify information in distributed systems without significant central coordination. There are 32 hexadecimal characters in a UUID, and these are divided into five groups with hyphens between them as follows: 8-4-4-4-12. Altogether the 16-byte (128-bit) canonical UUID has 36 characters (32 alphanumeric characters and 4 hyphens). For example: 123e4567-e89b-12d3-a456-426655440000

user-defined report

a customized report. The customized report is a SAS program and its auxiliary files and is stored on the workspace server that is used by SAS Model manager. User-defined reports are accessible from the New Reports wizard.

UUID

See [“universally unique identifier”](#).

variable

See [“SAS variable”](#).

variable attribute (attribute)

any of the following characteristics that are associated with a particular variable: name, label, format, informat, data type, and length.

WebDAV server

an HTTP server that supports the collaborative authoring of documents that are located on the server. The server supports the locking of documents, so that multiple authors cannot make changes to a document at the same time. It also associates metadata with documents in order to facilitate searching. The SAS business intelligence applications use this type of server primarily as a report repository. Common WebDAV servers include the Apache HTTP Server (with its WebDAV modules enabled), Xythos Software's WebFile Server, and Microsoft Corporation's Internet Information Server (IIS).

workflow

a series of tasks, together with the participants and the logic that is required to execute the tasks. A workflow includes policies, status values, and data objects.

workflow definition

a workflow template that has been uploaded to the server and activated. Workflow definitions are used by the SAS Workflow Engine to create new workflow instances.

workflow instance

a workflow that is running in the SAS Workflow Engine. After a workflow template is uploaded to the server and activated, client applications can use the template to

create and run a new copy of the workflow definition. Each new copy is a workflow instance.

workflow task (task)

a workflow element that associates executable logic with an event such as a status change or timer event.

workflow template

a model of a workflow that has been saved to an XML file.

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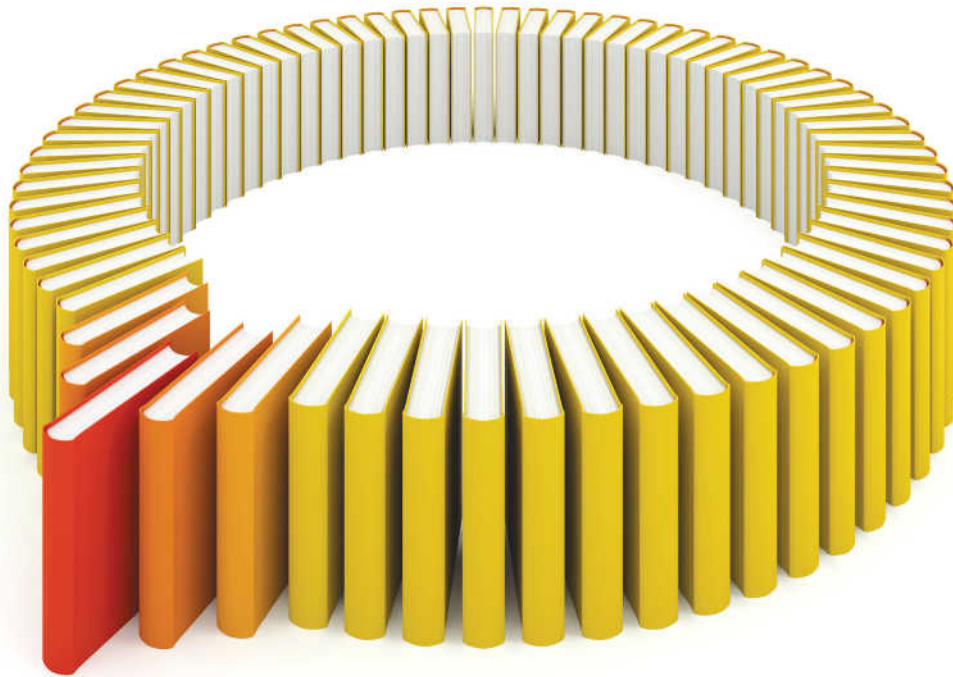
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