SAS® Inventory Optimization Workbench 5.3: Administrator's Guide, Second Edition

SAS® Documentation

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SAS Institute Inc., SAS Campus Drive, Cary, NC 27513-2414

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Welcome to SAS Inventory Optimization Workbench

What is SAS Inventory Optimization Workbench?

SAS Inventory Optimization Workbench is an analytical solution that uses demand data to optimize the inventory of products. By optimizing the inventory, you can perform downstream planning that can help you achieve the following results:

- manage a variety of products efficiently
- accommodate product life cycles in a better way
- develop a cohesive understanding of a fragmented supply chain network
- manage a globalized supply chain
- successfully execute supply chain strategies

Users within your organization can access different parts of SAS Inventory Optimization Workbench based on their permissions. Users can view, review, interpret, and analyze the results of the optimization process.

Functional Components of SAS Inventory Optimization Workbench

SAS Inventory Optimization Workbench includes the following main functional components:

data warehousing
: the ongoing ETL jobs update the data warehouse with changes from the source system

Analytics
: the analytical procedures that are required for optimization processes

Client applications
: the SAS Inventory Optimization Workbench web application that is available through a web browser

These components are seamlessly integrated to offer a true end-to-end solution. SAS Inventory Optimization Workbench can take data from several source systems and provide information for advanced business decisions.

Using SAS Inventory Optimization Workbench: Administrator's Guide

The *SAS Inventory Optimization Workbench: Administrator's Guide* provides you with the following information:

- installing and configuring SAS Inventory Optimization Workbench
- performing post-installation tasks
- running the ETL jobs by using SAS Data Integration Studio
- updating the configuration tables
- integrating SAS Inventory Optimization Workbench with other applications such as SAS Forecast Analyst Workbench and SAS Visual Analytics

You can use *SAS Inventory Optimization Workbench: Administrator's Guide* along with *SAS Inventory Optimization Workbench: Data Reference Guide* in order to start using SAS Inventory Optimization Workbench. You and your consulting team will use the *SAS Inventory Optimization Workbench: Data Reference Guide* to plan the structure of the database and the manner in which the data is stored, organized, and manipulated. This planning and data preparation must take place before using the instructions to load data into your deployment. The *SAS Inventory Optimization Workbench: Data Reference Guide* contains details about the required tables that must be created in the Stage library for loading your data into SAS Inventory Optimization Workbench. The Stage library tables and their content are customized to meet the requirements of your deployment.

After you install and configure SAS Inventory Optimization Workbench and load data into it, inventory analysts can start using the user interface of SAS Inventory Optimization Workbench. In order to obtain more information about the user interface of SAS Inventory Optimization Workbench and the tasks that you can complete in the user interface, see *SAS Inventory Optimization Workbench: User's Guide*, embedded user assistance, and How-To topics.

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SAS Inventory Optimization Workbench Architecture

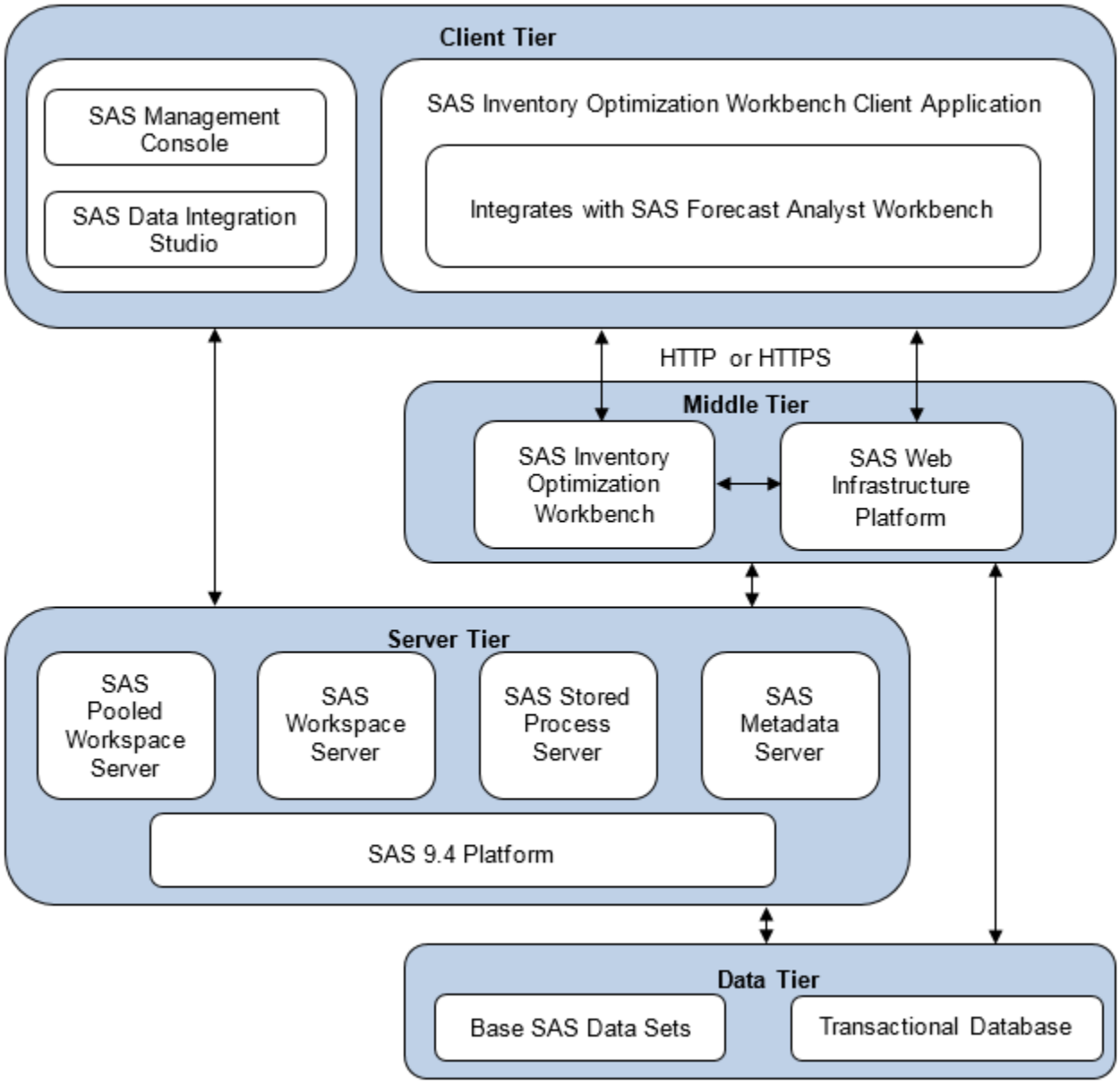
Overview of the Architecture of SAS Inventory Optimization Workbench

SAS Inventory Optimization Workbench uses an n-tier architecture that consists of the following tiers:

- client tier
- middle tier
- server tier
- data tier

The following figure shows the products and solutions that comprise each tier and how the tiers interact.

Figure 2.1 SAS Inventory Optimization Workbench Architecture



Client Tier

The client tier is responsible for user interaction and navigation flows, and for displaying computational results.

SAS Inventory Optimization Workbench requires the following applications:

- **SAS Management Console**: Enables you to perform metadata administration activities.
- **SAS Data Integration Studio**: Provides the ability to manage ETL jobs for the extraction, transformation, and loading of data.

- **SAS Inventory Optimization Workbench Client**: Enables you to view the inventory performance for products and facilities that are associated with the inventory analysts and buyers, to perform scenario analysis, and to work with the replenishment orders.
- **SAS Forecast Analyst Workbench**: Enables you to use the capabilities of SAS Forecast Analyst Workbench for forecasting the demand. Depending on the license that your organization has purchased, SAS Forecast Analyst Workbench might be included in the order.

Middle Tier

The middle tier is responsible for receiving the client request and for providing an execution environment to the client. The middle tier of SAS Inventory Optimization Workbench was developed over SAS Intelligence Platform middle-tier technologies such as SAS Web Infrastructure Platform and SAS Foundation Services. These services make it possible for the middle-tier application to run requests over SAS servers.

SAS Inventory Optimization Workbench requires the following middle-tier components:

- **SAS Inventory Optimization Workbench Services**: Takes adequate server-side actions based on client-side actions.
- **SAS Web Infrastructure Platform Services**: Used for standard operations, such as configuration, authentication, scheduler for batch processing, and so on.

The client tier communicates with the middle tier by using an HTTP-based or HTTPS-based communication model.

Server Tier

The server tier hosts various SAS servers that run the requests that are made by clients. Topological support might include support for non-functional requirements, such as fail-over, pooling, and load balancing.

SAS Inventory Optimization Workbench requires the following server-tier components:

- **SAS Pooled Workspace Server**: Enables the middle tier to connect to SAS data sets in order to access the data.
- **SAS Workspace Server**: Executes SAS code for one client at a time.
- **SAS Stored Process Server**: Runs a registered stored process.
- **SAS Metadata Server**: Controls access to a central repository of metadata that is shared by all of the SAS applications in the deployment. The SAS Metadata Server enables centralized control so that all users access consistent and accurate data.

Data Tier

The data tier consists of the following data storage types:

- **Base SAS data sets**: Stored in Base SAS formats, using different libraries.
- **Transactional database**: Stores the transactional data that is used for optimization. You use PostgreSQL as a transactional database for SAS Inventory Optimization Workbench.

Part 2

Application Management

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Performing Pre-installation Tasks

Overview of Pre-installation Tasks

Before you install SAS Intelligence Platform and SAS Inventory Optimization Workbench, you must complete the following pre-installation tasks:

- verify the operating system requirements
- complete the pre-installation tasks that are required for installing SAS Intelligence Platform
- create a SAS Inventory Optimization Workbench user
- create a software depot
- obtain a deployment plan

Verifying System Requirements

Before you install SAS Inventory Optimization Workbench, ensure that you meet the minimum system requirements that are described in *SAS Inventory Optimization Workbench 5.3: System Requirements*. System requirements are unique for each operating system. Items that are addressed as system requirements include software requirements, hardware requirements, space requirements, specific product requirements, and graphics hardware and software compatibility.

The detailed system requirements are available at http://support.sas.com/documentation/installcenter/en/ikinvoptofrndmsr/69171/HTML/default/index.html.

You should specifically check the following settings:

- Set the screen resolution for SAS Inventory Optimization Workbench no lower than 1024 x 768.
- Set your browser's pop-up blocker to allow pop-ups for your applications.

For more requirements information, see “SAS 9.4 System Requirements” at http://support.sas.com/resources/sysreq/index.html.

Completing the Pre-installation Tasks for the SAS Intelligence Platform

Before you install the SAS Intelligence Platform and SAS Inventory Optimization Workbench, read *SAS Intelligence Platform: Overview*. The overview is available at http://support.sas.com/documentation/cdl/en/biov/69018/HTML/default/viewer.htm. SAS Inventory Optimization Workbench is designed to work with the SAS Intelligence Platform. The overview helps you understand pre-installation tasks and guides you through a typical installation.

The pre-installation tasks include installing third-party components, confirming that your operating system requirements are met, creating the required user accounts, and obtaining your SAS software. For more information, see *SAS Intelligence Platform: Installation and Configuration Guide*. This document is available at http://support.sas.com/documentation/onlinedoc/intellplatform/.

You must use the Pre-Installation Checklist that accompanies the Deployment Plan that was prepared for deployment of SAS Inventory Optimization Workbench at your site. Complete the work in the checklist before beginning the deployment at your site. The list includes tasks that are specific to your deployment, information about the third-party software required on each tier in your deployment, the required operating system accounts and groups needed on each machine, and port numbers needed on each machine before starting the deployment.

Creating a SAS Inventory Optimization Workbench User

You must create an operating system user account that will be used to prepare SAS Inventory Optimization Workbench for use by running a series of ETL jobs. You can use an existing user account if one already exists. This user is different from the user account that installs and configures SAS Inventory Optimization Workbench and the SAS Spawned Servers account (sassrv). You can use the SAS Demo User account that is suggested in the Pre-Installation Checklist.

For more information about users and groups, see “Setting Up Users, Groups, and Ports” in *SAS Intelligence Platform: Installation and Configuration Guide*.

SAS Software Order and SAS Software Depot

Your SAS Software Order E-Mail (SOE) provides you with information about how to download your SAS Software Depot. Follow those instructions to download your software and create a SAS Software Depot. An instructional video for 9.4 Software Depots is at this location:

http://support.sas.com/documentation/installcenter/gettingstarted/94/index.html

Obtaining a Deployment Plan

Before you can install SAS Inventory Optimization Workbench, you must obtain a deployment plan. The deployment plan is a summary of the software that you install and configure during the deployment. The deployment plan file, named plan.xml, contains information about what software you should install and configure on each machine in your environment. This plan serves as input to the SAS installation and configuration tools. You should use the deployment plan that is created for your site. The deployment plan is accompanied by the pre-installation checklist. For more information, see “About Deployment Plans” in *SAS Intelligence Platform: Installation and Configuration Guide*. The guide is available at http://support.sas.com/documentation/onlinedoc/intellplatform/.

When the application context of SAS Inventory Optimization Workbench is on a different machine, select **Data Step Batch Server** option for SAS Inventory Optimization Workbench SASApp tier while you are creating a plan file.

Confirming the Deployment for SAS Visual Analytics Administration and Reporting

SAS Visual Analytics Administration and Reporting is included in your order. Determine whether your deployment will include distributed or non-distributed SAS LASR Analytic Server, and then complete the appropriate additional pre-installation tasks. For more information, see the Solution-Specific System Requirements and Installation Instructions section of the Pre-Installation checklist.

Determining the Location of the SAS Environment URL

During the deployment process, the SAS Deployment Wizard prompts you to specify the URL of the SAS environment file, which is named sas-environment.xml (for example, http://<*your HTTP server*>:<port>/SASLogon/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 URL location that you specify in the SAS Deployment Wizard before you begin the SAS installation. However, it is important for you to know the value of this URL because every client installation is prompted for this value. If you do not specify the URL when you install SAS Inventory Optimization Workbench, then you must manually edit a file on every client machine as a post-installation task. Therefore, you should decide on a value for this URL during your planning process so that you can provide it to administrators who might perform an installation.

For more information about the structure of this file, see “Configuring the SAS Environment File” in *SAS Intelligence Platform: Middle-Tier Administration Guide*. This guide is available at http://support.sas.com/documentation/onlinedoc/intellplatform/.

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Installing SAS Inventory Optimization Workbench

Select a Single-Tier or Multi-Tier Installation

You can install SAS Inventory Optimization Workbench on one or on several machines. This choice is determined when you order SAS Inventory Optimization Workbench and is detailed in the deployment plan. You must first install SAS Inventory Optimization Workbench on the server tier, which can consist of multiple machines. You can then install SAS Inventory Optimization Workbench on your middle tier, which can also consist of multiple machines. For guidelines on installing SAS on multiple machines, see “Installation Order Rules for Multiple Machine Deployments” in *SAS Intelligence Platform: Installation and Configuration Guide*.

The server tier consists of a set of SAS servers that you install as a part of the SAS Intelligence Platform. These servers host (and can be used to load) the reporting data. In addition, they execute SAS analytical and reporting processes. The SAS Workspace Server, SAS Stored Process Server, and SAS Metadata Server enable this capability.

The middle tier hosts SAS web applications, including the SAS Inventory Optimization Workbench web application. These web applications are deployed on a Java web application server. The web application sends data to and receives data from the web browsers on the client machines. It then organizes the data for storage on the data tier and for use on the server tier.

The client tier is also part of the SAS Inventory Optimization Workbench configuration. On the client tier, users collect and load data and perform day-to-day operational tasks via the web application.

Deploy SAS Inventory Optimization Workbench on a Grid

You might want to use SAS Grid Manager to distribute SAS computing tasks among multiple computers on a network. You can deploy SAS Inventory Optimization Workbench on the grid.

For more information about using SAS Grid Manager and about a deployment on a grid, see *Grid Computing in SAS 9.4* at http://support.sas.com/documentation/cdl/en/gridref/69583/HTML/default/viewer.htm.

SAS Deployment Wizard Tasks

You use the SAS Deployment Wizard to install and configure the SAS software, PostgreSQL database, and related products that are included in your deployment plan. When you execute the SAS Deployment Wizard, you select the deployment type that you are performing. You can choose to install and configure the software immediately, or you can configure the software at a later time.

Depending on your SAS software order, the SAS installation data file, and the deployment plan, the SAS Deployment Wizard prompts you to perform a variety of tasks, including the following items:

- specify the location of the deployment plan and the SAS software products that you are installing and configuring
- specify the email address to which SAS Inventory Optimization Workbench should send emails when an ad hoc scenario has completed running in the background
- specify required machine information
- specify server information for any SAS servers that you are installing
- specify user account information

  Note: Specify the spawned server user to access and perform tasks related to stored processes.
- specify the credentials for using the PostgreSQL database
- specify whether you want to assign SAS users permissions on a UNIX system

Note: Do not include spaces in the directory name.

For more information, see “Preparing to Install and to Configure” in *SAS Intelligence Platform: Installation and Configuration Guide*. This document is available at http://support.sas.com/documentation/onlinedoc/intellplatform/index.html.

Reviewing the Instructions.html Document

After you have installed and configured your SAS software, the SAS Deployment Wizard writes the Instructions.html document to the `Documents` directory in your SAS configuration directory. The document contains additional information and details for configuring your installation. You should perform the additional steps that are included in the document.

When you are performing additional steps that are mentioned in the instructions.html, you might see the following warnings in the logs when you perform the Server Validation Steps on the SAS Application Server machine:

```
WARNING: User does not have appropriate authorization to access
Software component SAS Inventory Optimization Config
WARNING: Apparent symbolic reference GL_SHORT_YES not resolved.
WARNING: iotrans Libraray reference not found
```

To prevent these warnings, ensure that you run the script as the SAS Demo User if you chose to create it when you were prompted in the SAS Deployment Wizard.

Installing Hot Fixes for the Third Maintenance Release of SAS 9.4 and SAS Inventory Optimization Workbench

Ensure that you install all hot fixes for the third maintenance release of SAS 9.4 and for SAS Inventory Optimization Workbench 5.3 if any. Installing all required hot fixes ensures that SAS Inventory Optimization Workbench is functioning correctly.:

- SAS Inventory Optimization Workbench hot fixes and hot fixes associated with the third maintenance release of SAS 9.4 are available at http://ftp.sas.com/techsup/download/hotfix/hotfix.html.
- Use the tool at http://ftp.sas.com/techsup/download/hotfix/HF2/SASHFADD.html to create a customized report that lists hot fixes available for the installed SAS products and to generate scripts that automate the download of the hot fixes.
- You install SAS 9.4 hot fixes by using SAS Deployment Manager. For more information about applying hot fixes, see the section about SAS Deployment Manager tasks in *SAS Deployment Wizard and SAS Deployment Manager 9.4: User's Guide*.

To receive e-mail notifications for new hot fixes:

1. Navigate to http://ftp.sas.com/techsup/download/hotfix/hotfix.html.
2. Select **Subscribe to TSNEWS-L**, and follow the prompts to subscribe to the TSNEWS-L listserv.

Default File Locations

The SAS Deployment Wizard installs and configures your SAS software. The application installation files are installed in a default location referred to as **<SAS Home>**. For example, on Windows systems, **<SAS Home>** is **C:/Program Files/SASHome**.

The configuration files are stored in a default location referred to as **<SAS configuration directory>**. For example, on Windows systems, the SAS configuration directory is **C:/SAS/Config/Lev1**.

Note: You can deploy up to 10 configurations of the SAS products. For example, you can create an environment that consists of separate levels for development, test, and production. The SAS Deployment Wizard specifies each configuration in a **<Level>** folder. For example, if you deploy a level 2 configuration, the default configuration directory is **C:/SAS/Config/Lev2**. For more information about multiple-level configuration, see *SAS Intelligence Platform: System Administration Guide*.

The following table lists the default locations of the installation and configuration files for SAS Inventory Optimization Workbench.

Table 4.1 *Default Locations*

Location	Example Path on Windows Systems	Example Path on UNIX Systems
SASHome	**C:\Program Files\SASHome**	**../SASHome**
SAS-configuration-directory	**C:\SAS\Config\Lev<*n*>**	**../SAS/Config/Lev<*n*>**

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Performing Post-installation Tasks

Set the Secure Attribute for Session Cookies

The secure attribute for cookies directs a web browser to send the cookie only through an encrypted HTTPS connection.

To configure the SAS Web Application Server to return the session ID with the secure attribute:

1 Edit the ***SAS-configuration-directory*\Levn\Web\WebAppServer\SASServern_m\conf\server.xml** file. Add **secure="true"** to the existing `Connector` element.

2 Edit the ***SAS-configuration-directory*\Levn\Web\WebAppServer\SASServern_m\conf\web.xml** file. Add the following `session-config`:

```
<session-config>
                    <session-timeout>30</session-timeout>
                    <cookie-config>
                        <secure>/true</secure>
                    </cookie-config>
                </session-config>
```

For more information, see “Configuring SAS Web Server Manually for HTTPS” at http://support.sas.com/documentation/cdl/en/bimtag/68217/HTML/default/viewer.htm#n0nakjyj6hlqmvn11p9p04l25j9n.htm.

Verify SASApp Server Context

Immediately after you deploy SAS Inventory Optimization Workbench, verify the context of SASApp servers.

To verify the context of SASApp servers:

1 Log on to SAS Management Console as an unrestricted user (sasadm) or as a user who has the capability to verify the SASApp server context.

2 On the **Plug-ins** tab, select **Application Management** ▸ **Configuration Management** ▸ **SAS Application Infrastructure** ▸ **Web Infra Platform Services 9.4** ▸ **JobExecutionService**.

3 Right-click **JobExecutionService** and select **Properties**. The JobExecutionService Properties dialog box appears.

4 On the **Settings** tab, verify that all SASApp server contexts are selected.

5 Click **OK**.

Update PostgreSQL Configuration

Immediately after you deploy SAS Inventory Optimization Workbench, update the PostgreSQL database configuration.

To configure PostgreSQL:

1 Open the postgresql.conf file at the following location: ***SAS-configuration-directory*\Levn\WebInfrastructurePlatformDataServer\data**

2 Change the value of shared_buffers to `4GB` and the value of max_connections to `500`.

3 Save the file.

4 Restart the data servers.

Verifying Permissions Granted to Users

Assigning Permissions to Users

Assign Permissions to the SAS Server Users Group on Windows Systems

You must assign the SAS Server Users group Read, Write, and Modify permissions for the following folders on a Windows SAS Application Server machine:

- the SAS Inventory Optimization Workbench data folder located at ***SAS-configuration-directory*/AppData/SASInventoryOptimizationWorkbench/**
- the generic logs for SAS Inventory Optimization Workbench located at ***SAS-configuration-directory*/Levn/AppData/SASInventoryOptimizationWorkbench/Logs**

For more information, go to http://support.sas.com/documentation/cdl/en/biig/62611/HTML/default/viewer.htm#n02014intelplatform00install.htm.

Assign SAS Users Permissions on UNIX Systems

In a UNIX operating environment, you need to update some SAS script files. Updating the files ensures that SAS users have the necessary Write permissions to the tables that the SAS Workspace Server and the SAS Stored Process Server create.

Specify the umask setting of at least `002` in the following SAS scripts:

- ***SAS-configuration-directory*/Levn/SASApp/BatchServer/sasbatch_usermods.sh**
- ***SAS-configuration-directory*/Levn/SASApp/PooledWorkspaceServer/PooledWorkspaceServer_usermods.sh**
- ***SAS-configuration-directory*/Levn/SASApp/StoredProcessServer/StoredProcessServer_usermods.sh**
- ***SAS-configuration-directory*/Levn/SASApp/WorkspaceServer/WorkspaceServer_usermods.sh**

The following code is a code snippet of the SAS script file

```
USERMODS_OPTIONS=
umask 002
```

If you assign SAS users permissions on a UNIX system while you are installing and configuring SAS Inventory Optimization Workbench, do not specify the umask settings that are described in this section.

Working with Groups, Roles, and Users

Overview of Groups, Roles, and Users

In order to use SAS Inventory Optimization Workbench, you must configure groups, roles, and users.

Groups
: A group consists of users who are classified by common traits or by common data access levels. Groups are typically used for granting users access to data. Groups can also be used within workflows to allow a restricted set of users to perform an activity.

Roles
: Roles determine what a user can do within the application. Roles can also be used within workflows to allow a restricted set of users to perform an activity.

Users
: Every user who needs to log on to the SAS Inventory Optimization Workbench web application must be defined in the SAS Metadata Repository. The user must be associated with one or more roles that permit one or more capabilities within SAS Inventory Optimization Workbench.

You define groups, roles, and users by using the User Manager function in SAS Management Console.

Note: For specific information about defining users, groups, and roles, see *SAS Management Console: Guide to Users and Permissions*.

Capabilities can be associated with roles in SAS Management Console.

Groups, roles, and users can be referenced in user interface definitions.

Verify Roles in SAS Management Console

Roles in SAS Inventory Optimization Workbench are activity based. You assign roles to groups, and those role assignments are cumulative. For example, if a group is assigned to more than one role, that group does not lose any capabilities if the capabilities of the roles are different. For example, suppose a group is associated with Role 1 and Role 2. If Role 1 grants a group a specific capability but Role 2 does not, the group retains that capability.

After you deploy SAS Inventory Optimization Workbench, ensure that the following roles have been created in SAS Management Console:

- Inventory Opt Workbench: Analysis
- Inventory Opt Workbench: Buying

SAS Inventory Optimization Workbench generates different values of metrics for each user that is assigned to the one role. For example, suppose Users U1 and U2 are Analyst for Facilities F1 and F2 respectively. Considering the input KPIs (such as location of F1 and F2, current opening stock, demand, and so on), SAS Inventory Optimization Workbench generates different values of output KPIs (such as service level, lead time, and so on).

In addition to the roles that are created after you deploy SAS Inventory Optimization Workbench, you can create roles that are based on your business requirements. For more information about creating roles, see *SAS Management Console: Guide to Users and Permissions*.

Verify Groups in SAS Management Console

Groups in SAS Inventory Optimization Workbench are based on the area of the work that is associated with the users in that particular group. You can add users to the groups based on their area of work. For example, a database administrator can be a member of the database users group. You can add a user to multiple groups. Every group is associated with a role and thus, the capabilities of that role are inherited to the group.

After you deploy SAS Inventory Optimization Workbench, ensure that the following groups are created in SAS Management Console:

- Inventory Opt Workbench Database Users
- Inventory Opt Workbench ETL Users
- Inventory Opt Workbench: Analysts
- Inventory Opt Workbench: Buyers

Associate the Inventory Opt Workbench ETL Users group with the user who runs the ETL jobs. Ensure that the Inventory Opt Workbench ETL Users group contains the following groups and roles:

- Inventory Opt Workbench Database Users
- Visual Analytics Data Administrators
- Visual Data Builder Administrators

Associate the Inventory Opt Workbench: Analysts group with the user who understands and analyzes the inventory performance of products. Ensure that the Inventory Opt Workbench: Analysts group contains the following groups and roles:

- Inventory Opt Workbench: Analysis
- Web Report Studio: Advanced
- Visual Analytics Data Administrators
- Visual Data Builder Administrators

Associate the Inventory Opt Workbench: Buyers group with the user who places base orders and promotional orders. Ensure that the Inventory Opt Workbench: Buyers group contains the following groups and roles:

- Inventory Opt Workbench: Buying
- Web Report Studio: Advanced
- Visual Data Builder Administrators

In addition to the groups that are created after you deploy SAS Inventory Optimization Workbench, you can create groups that are based on your business requirements. For more information about adding a group, see *SAS Management Console: Guide to Users and Permissions*.

Define Users

You can create users who can access SAS Inventory Optimization Workbench. When you define users who can access SAS Inventory Optimization Workbench, you must conform to the following guidelines:

- on Windows, the user must be a user of your operating system user group SAS Server Users
- on UNIX, the user must be a part of the group that the installation user belongs to
- the user must be defined SAS Management Console
- after you add the user, you must assign appropriate groups to that user
- an entry for the user or for a group of users that you are defining must be present in the STG_EMPLOYEE table

  For more information about the STG_EMPLOYEE table, see *SAS Inventory Optimization Workbench: Data Reference Guide*.

For more information about creating users and assigning groups and roles to them, see *SAS Management Console: Guide to Users and Permissions*.

Capabilities in SAS Inventory Optimization Workbench

View and Assign Capabilities

Capabilities in SAS Inventory Optimization Workbench are arranged in the following categories: inventory performance, general, scenarios, orders, promotional orders, and reports. Depending on the role of the user in your organization, you can assign capabilities to that user. For example, if a user is a buyer in your organization, you can assign buying capabilities. You can also assign capabilities to a group so that all users in that group share the same capabilities.

To view the capabilities:

1. Log on to SAS Management Console as an administrative user (sasadm) or as a user who has the capability to view roles.
2. On the **Plug-ins** tab, select **Environment Management** ▸ **User Manager**.
3. Right-click on one of the SAS Inventory Optimization Workbench roles, and select **Properties**. The Properties dialog box appears.
4. Click the **Capabilities** tab.
5. On the **Capabilities** tab, expand **Inventory Opt Workbench Mid**. The general, inventory performance, scenarios, reports, and order capabilities appear.

You can select the capabilities for the user and groups according to your business requirements.

General Capability

The general capability enables a user to export the data into Microsoft Excel. The following table describes the general capability.

Table 5.1 *General Capability*

Capability	Description	User Interface Impact
Export to Microsoft Excel	Enables a user to export the data table information to Microsoft Excel.	The  button is visible in all categories of the Inventory Performance workspace, Orders workspace, and Reports workspace.

Inventory Performance Capability

The inventory performance capability enables a user to comment on the products or facilities. The following table describes the inventory performance capability.

Table 5.2 *Inventory Performance Capability*

Capability	Description	User Interface Impact
Comment Manager	Enables a user to enter comments about products and facilities.	The **Comments Manager** pane in the Inventory Performance workspace is visible.

Scenarios Capabilities

The Scenarios capabilities enable a user to perform tasks related to scenario analysis, such as create a scenario, run a scenario, and so on. The following table describes the scenarios capabilities.

Table 5.3 *Scenarios Capabilities*

Capability	Description	User Interface Impact
View Workspace	Enables a user to view the Scenarios workspace.	The Scenarios category of the Inventory Performance workspace is visible.
Create Scenario	Enables a user to create a scenario in order to perform analysis.	The  button is visible in the Scenarios category.

Capability	Description	User Interface Impact
Run Scenario	Enables a user to run the scenario in order to generate the scenario results.	The button is visible in the Scenarios category.
Delete Scenario	Enables a user to delete a scenario.	The button is visible in the Scenarios category.
Edit Scenario	Enables a user to edit a scenario.	The button is visible in the Scenarios category.
Copy Scenario	Enables a user to create a copy of an existing scenario.	The button is visible in the Scenarios category.
Promote Scenario	Enables a user to promote the results of a scenario.	The button is visible in the results of the scenario.
View Scenario Results	Enables a user to view the results of a scenario.	The results of the scenario analysis are visible after the user double-clicks an executed scenario.
Comments Manager	Enables a user to comment on a scenario.	The **Comments Manager** pane is visible in the scenario analysis.
Create Forecast in SAS Forecast Analyst Workbench	Enables a user to create a forecast in SAS Forecast Analyst Workbench by using an ad hoc scenario.	The button is visible in the results of the scenario analysis.

Reports Capability

The reports capability enables a user to generate reports, and view and analyze the business information. The following table describes the reports capability.

Table 5.4 *Reports Capability*

Capability	Description	User Interface Impact
Create Reports	Enables a user to create reports in SAS Inventory Optimization Workbench.	The Reports workspace is visible.

Base Orders Capabilities

The base orders capabilities enable a user to perform tasks related to base order. The following table describes the base orders capabilities.

Table 5.5 Base Orders Capabilities

Capability	Description	User Interface Impact
Edit Base Orders	Enables a user to edit base orders.	The button is visible in the Base Orders category.
Create Ad hoc Base Orders	Enables a user to manually add a base.	The button is visible in the Base Orders category.
Lock Base Orders	Enables a user to lock base orders.	The button is visible in the Base Orders category.
Promote Base Orders	Enables a user to promote base orders.	The button is visible in the Base Orders category.
Cancel Base Orders	Enables a user to cancel base orders.	The button is visible in the Base Orders category.

Promotional Orders Capabilities

The promotional orders capabilities enable a user to perform task related to promotional orders. The following table describes the promotional orders capabilities

Table 5.6 Promotional Orders Capabilities

Capability	Description	User Interface Impact
Edit Vendor Orders	Enables a user to edit the promotional orders that are suggested for vendors.	The button is visible in the Vendors subcategory of the Promotional Orders category.
Lock Vendor Orders	Enables a user to lock promotional orders that are suggested for vendors.	The button is visible in the Vendors subcategory of the Promotional Orders category.
Promote Vendor Orders	Enables a user to promote promotional orders that are suggested for a vendor.	The button is visible in the Vendors subcategory of the Promotional Orders category.
Cancel Vendor Orders	Enables a user to cancel promotional orders that are suggested for a vendor.	The button is visible in the Vendors subcategory of the Promotional Orders category.

Capability	Description	User Interface Impact
Edit Store Orders	Enables a user to edit the promotional orders that are suggested for a customer-facing facility.	The button is visible in the Promotional Orders category.
Lock Store Orders	Enables a user to lock promotional orders that are suggested for a customer-facing facility.	The button is visible in the Promotional Orders category.
Promote Store Orders	Enables a user to promote a promotional order that is suggested for a customer-facing facility.	The button is visible in the Promotional Orders category.
Cancel Store Orders	Enables a user to cancel a promotional order that is suggested for a customer-facing facility.	The button is visible in the Promotional Orders category.

Configuring SAS Inventory Optimization Workbench Parameters

Configure Parameters

SAS Inventory Optimization Workbench enables you to configure parameters related to ETL and the transactional database. You should configure these parameters once to meet your business requirements. The ETL and all analytical processes use these parameters for the following purposes:

- extracting data from the stage area and solution data layer (SDL) correctly
- acquiring correct paths for logs and other purposes
- accessing the transactional database
- improving performance

You must configure these parameters before you start any SAS Inventory Optimization Workbench processes.

To configure the parameters:

1. Open SAS Management Console as an unrestricted administrator (sasadm) or as a user who has the capability to configure the parameters.
2. On the **Plug-ins** tab, select **Application Management** ▸ **Configuration Manager** ▸ **Inventory Opt Workbench Config**.
3. Right-click **Inventory Opt Workbench Config**, and click **Properties**. The Inventory Opt Workbench Config Properties dialog box appears.
4. Click the **Advanced** tab and configure the parameters by entering information in the **Property Value** column.

Note: The properties have default values. You can change these values if the default values are not suitable for your environment.

For more information about configuration parameters, see "About the Configuration Parameters" on page 29.

5 Click **OK**.

The configuration parameters are defined.

Configuring the parameters is a one-time activity. If you are required to change the parameters after deployment, you must restart the object spawner so that the latest values of the configuration parameters take effect.

About the Configuration Parameters

The following table describes each configuration parameter and provides an example value.

Table 5.7 *Configuration Parameters*

Parameter	Description	Example of the Parameter Value
GL_IOW_BACK ORDER_IND	Specifies whether to add the back order quantity when the forecasted demand is calculated. The value `1` indicates to add the back order quantity. The value `0` indicates not to use the back order quantity.	1
GL_IOW_BASE_ PERIOD_IND	Specifies the frequency with which the optimization process should run. The value `0` indicates daily, `1` indicates weekly, `2` indicates monthly, and `3` indicates quarterly.	1
GL_IOW_BATCH _CURRENT_DA TE	Specifies the date on which the inventory optimization process is to be executed. By default, this is the current date.	today()
GL_IOW_BATCH _IND	Specifies whether to create batches for inventory optimization by using the discrete model or the continuous model. The value `1` indicates that SAS Inventory Optimization Workbench creates the batch. The value `0` indicates that you create the batches.	1
GL_IOW_CAL_N O_OF_YRS	Specifies the number of years for which the calendar should be generated.	20
GL_IOW_CAL_T YPE_IND	Specifies the type of calender to be generated for the optimization process. The value `1` indicates to use the Gregorian calendar, `2` indicates to use a 445 type of retail calendar, and `4` indicates to use the custom calendar.	1
GL_IOW_CAL_Y R_START_DT	Specifies the starting date for the calendar. The format of the date must be DDMMMYYYY (for example, 01JAN2000).	"01JAN2000"

Parameter	Description	Example of the Parameter Value
GL_IOW_COMP_FCST_ACT_IND	Specifies whether to compare actual demand with forecasted demand. The value `1` indicates to compare the actual demand with the forecasted demand. The value `0` indicates not to compare the actual demand with forecasted demand.	1
GL_IOW_DC_ORDER_REVIEW_PERIODS	Specifies the number of periods during which orders that are received at vendor-facing facilities are to be reviewed before finalizing them.	2
GL_IOW_DEMAND_MODEL_THRESHOLD	Specifies the average demand threshold. If the expected average demand is less than this value, the discrete model is assumed while calculating the policy parameters. Otherwise, the continuous model is assumed.	1.5
GL_IOW_DEMAND_THRESHOLD_COEFF	Specifies the demand threshold coefficient for percent high and percent low values. The demand threshold coefficients are used to compute the KPIs for inventory performance. This value must be less than or equal to 3.	1.96
GL_IOW_EXCESS_INV_TO_PROMO_IND	Specifies whether to transfer the excess inventory of base stock to the promotional inventory. The value `0` indicates not to transfer the excess inventory. The value `1` indicates to transfer the excess inventory.	0
GL_IOW_IP_HISTORY_PERIOD	Specifies the number of periods of historical data to be displayed in the Inventory Performance workspace.	2
GL_IOW_IP_RECEIPT_TYPE_IND	Specifies the Receipt Control Type that is used to determine the period boundaries for calculating the service level. The value `1` indicates tight receipt control. The value `0` indicates loose receipt control.	1
GL_IOW_LOAD_PARALLEL	Specifies whether the data is to be loaded to the solution data layer in parallel or in a sequential manner. The value `1` indicates to load the data in parallel. The value `0` indicates to load the data in a sequential manner.	1
GL_IOW_LOG_CREATION_IND	Specifies whether logs should be created at the location that is specified by the GL_IOW_LOG_DIR_PATH. The value `1` indicates to create the log. The value `0` indicates not to create the log.	1
GL_IOW_LOG_DIR_PATH	Specifies the path in the environment where all logs that are specific to SAS Inventory Optimization Workbench are created.	`D:\SAS\Config\Lev1\AppData\SASInventoryOptimizationWorkbench\Logs`
GL_IOW_MAX_BUDGET	Specifies a high value for the inventory cost budget to be used for performing customer-facing facility analysis.	1E15
GL_IOW_MAX_CV	Specifies the maximum value for coefficient of variation. The coefficient of variation is related to demand forecast.	1

Parameter	Description	Example of the Parameter Value
GL_IOW_MAX_ORDER_QTY_IND	Specifies whether the maximum order quantity constraint is to be used in the inventory optimization process. The value `1` indicates to use the maximum order quantity constraint. The value `0` indicates not to use the maximum order quantity constraint.	1
GL_IOW_MIN_CV	Specifies the minimum value of coefficient of variation that is related to demand forecasting.	0.01
GL_IOW_MIN_DECREASE_COST_PCT	Specifies the maximum percentage up to which the unit cost of a product can be decreased while performing ad hoc analysis. SAS Inventory Optimization Workbench uses this parameter (while calculating the results) if you do not specify any value in the **Unit Cost** field of the Ad Hoc Scenario.	10
GL_IOW_MIRP_ALGORITHM	Specifies the algorithm to be used in the inventory optimization process. You can specify the **`NETWORK`** or **`CLOSEFORM`** algorithm.	NETWORK
GL_IOW_MIRP_DEFAULT_MODEL	Specifies the model to be used by the inventory optimization procedure for calculating the demand forecast.	CONTINUOUS
GL_IOW_MIRP_PBROVERRIDE	Specifies whether to use the period between replenishments (PBR) that is recommended by SAS Inventory Optimization Workbench. The value **`YES`** indicates to use the period between two replenishments recommended by SAS Inventory Optimization Workbench. The value **`NO`** indicates not to use that period.	YES
GL_IOW_MIRP_PUSH_PULL_IND	Indicates whether to use the push mechanism or the pull mechanism to generate promotional orders. The value `1` indicates to use the push mechanism. The value `0` indicates to use the pull mechanism. The push mechanism pushes the promotional orders from vendor-facing facilities to customer-facing facilities by considering the forecasted demand. The pull mechanism pulls promotional orders from vendor-facing facilities from customer-facing facilities, based on the demand.	1
GL_IOW_MIRP_REPLICATIONS	Specifies the number of simulation replications to be used in policy optimization and KPI prediction.	200
GL_IOW_PLANNING_HORIZON	Specifies the number of planning periods to be considered while optimizing inventory.	6
GL_IOW_PROD_LIST_DIV_NUM	Specifies the number of products and network combinations to be considered in a single sub-batch in order to optimize the inventory in a single batch run.	1000

Parameter	Description	Example of the Parameter Value
GL_IOW_PROD_SUCCESSION_IND	Specifies whether the inventory of a predecessor product is to be added to the inventory of the successor product when optimizing the inventory. The value `1` indicates to add the inventory of the predecessor product to the successor product. The value `0` indicates not to use product succession.	0
GL_IOW_PROMO_PLANNING_HORIZON	Specifies the planning horizon for calculating promotional orders.	12
GL_IOW_PROMO_WORKFLOW_IND	Specifies whether to generate the promotional orders. The value `1` indicates to generate the promotional orders. The value `0` indicates not to generate the promotional orders.	1
GL_IOW_RUN_TRANSSHIPMENT_IND	Specifies whether the transshipment process is to be run. The value `1` indicates to run the transshipment process. The value `0` indicates not to run the transshipment process.	1
GL_IOW_SERVICE_THRESHOLD_OFFSET	Specifies the threshold for calculating the lower and upper bounds of service level. The service threshold offset is used to compute the metrics that are related to the service level. These metrics are shown on the Inventory Performance workspace in the user interface.	0.02
GL_IOW_SERVICE_TYPE	Specifies the service type that is used to calculate the service level. The value **`FR`** indicates to use the fill rate. The value **`RR`** indicates to use the ready rate.	RR
GL_IOW_SET_MISSING_VARIANCE	Specifies the function of mean to be used for setting the value of variance when the variance value is missing.	mean
GL_IOW_SHORT_BOTH	Specifies a short value for indicating BOTH.	B
GL_IOW_SHORT_EXTERNAL	Specifies a short value for indicating a customer-facing facility.	E
GL_IOW_SHORT_INTERNAL	Specifies a short value for indicating an internal or vendor-facing facility.	I
GL_IOW_SHORT_NO	Specifies a short value for indicating NO.	N
GL_IOW_SHORT_YES	Specifies a short value for indicating YES.	Y
GL_IOW_SINGLE_ECHELON_IND	Specifies whether all networks within your organization are single-echelon networks. The value `0` indicates that at least one network is not a single-echelon network. This value must always be `0`.	0
GL_IOW_STORE_ORD_REVIEW_PERIODS	Specifies the number of base periods during which the store orders can be reviewed before finalizing them.	2

Parameter	Description	Example of the Parameter Value
GL_IOW_THREADS_NO	Specifies the number of threads to be considered in a batch for the inventory optimization process. When SAS Inventory Optimization Workbench is deployed on a grid, ensure that the number of slots on the grid setup is at least 16. The value of this parameter must always be less than the number of slots defined for the grid environment. For more information about using slots on a grid setup, *Grid Computing in SAS 9.4* at http://support.sas.com/documentation/cdl/en/gridref/69583/HTML/default/viewer.htm.	2
GL_IOW_TRANSSHIPMENT_RUN_FREQ	Specifies the frequency with which the transshipment process is run. The value `0` indicates to run the transshipment process for every base period. The value `1` indicates to run the transshipment process for alternate base period.	0
GL_IOW_USE_OPENING_INV_IND	Specifies whether to use the opening stock of the current period or the closing stock of the previous period in calculating the inventory values. The value `0` indicates to use the closing inventory of previous period. The value `1` indicates to use the opening inventory of the current period.	0
GL_IOW_USE_WOS_AS_SL_IND	Specifies whether to use the value of weeks of supply for the service level. The value `1` indicates to use the value of weeks of supply as service level indicator. The value `0` indicates not to use the value of weeks of supply as service level indicator. If this parameter is set to `1`, the ready rate is used as the service type and weeks of supply is converted to the ready rate.	0
GL_IOW_GRID_APPLICATION_SERVER	Specifies the name of a SAS Application Server that has been defined in the SAS Metadata Repository. If you use SAS Grid Manager, the SAS Application Server contains the definition for the logical grid server that defines the grid environment.	SASApp
GL_START_DAY_OF_WEEK	Specifies the start day of the week. The values range from `0` to `6`, where `0` indicates Sunday, `1` indicates Monday, and so on.	1
GL_IOW_LASRLIBNAME	Specifies the name of the library on the SAS LASR Analytic Server from which data is uploaded to SAS Visual Analytics.	SAS Visual Analytics LASR
GL_IOW_BL_PSQL_PATH	Specifies the full path to the PSQL executable file of the PostgreSQL database. This file lets the SAS/ACCESS interface call the PostgreSQL PSQL utility.	`C:\Program Files\SASHome\SASWebInfrastructurePlatformDataServer\9.4\bin\psql.exe`

Enabling a User to Edit and Delete Comments

When you are using SAS Inventory Optimization Workbench, you can provide a capability to a role so that the role can edit and delete comments in the user interface.

To provide capabilities to edit and delete comments:

1. Log on to SAS Management Console as an unrestricted administrator (sasadm) or as a user who can change the capabilities of a user.
2. On the **Plug-ins** tab, select **Environment Management** ▸ **User Manager**. The right pane of the SAS Management Console shows all users, groups, and roles.
3. Select a role, right-click it, and select **Properties**. The Properties dialog box appears.
4. On the **Capabilities** tab of the Properties dialog box, select **SAS Application Infrastructure** ▸ **Comments**.
5. Select the **Edit Comments** and **Delete comments** check boxes to provide edit and delete comments capabilities to the selected role.

Provide Data Permission to a Group of Users

You can create a group of users and provide permission to the group to access a data. By providing permission to a group to access a data, all users in that group can work on the products and facilities that belong to the data. For example, suppose buyer 1, buyer 2, and buyer 3 belong to Laptop Users group. By providing permission to the Laptop Users group to access the Europe data, buyer 1, buyer 2, and buyer 3 can work on all replenishment orders for laptop that belong to Europe.

You can create multiple groups, add users to those groups, and then provide permissions to the groups to access different sets of data. For example, suppose you created Europe Laptop Users and Asia Laptop Users groups. Users in the Europe Laptop Users group can work on all replenishment orders for laptop that belong to Europe and users in the Asia Laptop Users group can work on all replenishment orders for laptop in the Asia.

To provide data access permission to a group of users:

1. Ensure that the EMPLOYEE_NM column of the STG_EMPLOYEE table contains the names of the groups for which you want to provide permissions.

   For more information about STG_EMPLOYEE table, see the chapter about the data dictionary in *SAS Inventory Optimization Workbench 5.3: Data Reference Guide*.
2. Enable using groups in SAS Inventory Optimization Workbench.

a In SAS Management Console, on the **Plug-ins** tab, select **SAS Management Console** ▸ **Application Management** ▸ **Configuration Manager** ▸ **SAS Application Infrastructure** ▸ **Inventory Opt Workbench Mid**.

b Right-click the **Inventory Opt Workbench Mid** folder, and select **Properties**. The Inventory Opt Workbench Properties dialog box appears.

c On the **Advanced** tab in the Inventory Opt Workbench Properties dialog box, set the GL_GROUP_DATA_ACCESS_IMPLEMENTATION parameter to `True`.

3 In SAS Management Console, create groups, and then add users to those groups based on your business requirements.

For more information about creating groups and adding users, see *SAS 9.4 Management Console: Guide to Users and Permissions* at http://support.sas.com/documentation/cdl/en/mcsecug/64770/PDF/default/mcsecug.pdf.

Note: The name of the groups in SAS Management Console much match the name of the groups that are present in the STG_EMPLOYEE table.

4 Log on to SAS Inventory Optimization Workbench as a user of a group, and then start using SAS Inventory Optimization Workbench.

Provide Permissions Related to SAS Visual Analytics

In order for users to work with SAS Visual Analytics, you must provide specific permissions to the Inventory Opt Workbench: Analysts and Inventory Opt Workbench: Buyers groups.

To provide these permissions:

1 In SAS Management Console, on the **Folders** tab, select **SAS Folders** ▸ **Products** ▸ **SAS Inventory Optimization Workbench** ▸ **Visual Analytics LASR**.

2 Right-click the **Visual Analytics LASR** folder, and select **Properties**. The Visual Analytics LASR Properties dialog box appears.

3 On the **Authorization** tab in the Visual Analytics LASR Properties dialog box, in the **Users and Groups** section, select **Inventory Opt Workbench: Analysts** and **Inventory Opt Workbench: Buyers** groups and then grant all permissions.

Note: If the Inventory Opt Workbench: Analysts and Inventory Opt Workbench: Buyers groups are not present in the Users and Groups section, add them.

4 Click **OK**.

Running ETL Jobs

After you define the configuration parameters to meet the business requirement, you can run the ETL jobs in order to load the data into the solution database. The ETL jobs are located in SAS Data Integration Studio. The ETL jobs include the jobs that are related to SAS Inventory Optimization Workbench, SAS Forecast Analyst Workbench, SAS Visual Analytics, and so on.

For more information about ETL jobs, see Chapter 7, “ETL Tasks,” on page 45.

Verifying the Default Path of Log Files

SAS Inventory Optimization Workbench generates different log files. You can view the log files to obtain detailed information about the tasks that you have performed. SAS Inventory Optimization Workbench creates the following log files:

- SAS Inventory Optimization Workbench log file, which is located at ***SAS-configuration-directory*/Levn/Web/Logs/SASServer8_1/SASInvOptWorkbench5.3.log**

  Note: If you deployed SAS Inventory Optimization Workbench in a multi-machine environment, this log file is created on the middle-tier machine.

- the stored process logs and ETL-related logs are stored at the location that is specified in the GL_IOW_LOG_DIR_PATH parameter.

Using SAS Inventory Optimization Workbench in a Locked-Down State

You can limit the reach and activities of a SAS server by putting it in a locked-down state. When SAS Inventory Optimization Workbench enables you to navigate the server file system, there is a limited view of the server file system when the server is in a locked-down state.

SAS Inventory Optimization Workbench uses pre-assigned libraries for all library assignments except for the temporary library assignments. The pre-assigned libraries are automatically added to the whitelist for the lockdown feature so that they are available to the product when SAS server is in a locked-down mode. However, because the folders that are related to ETL and STP logs are not in the pre-assigned libraries, these folders are not included in the whitelist.

To ensure access to these folders, you must add the following path to the lockdown path list: **SAS-configuration-directory/AppData/SASInventoryOptimizationWorkbench**.

For more information about the locked-down state, see *SAS Intelligence Platform: Security Administration Guide*.

Note: When you integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench, you cannot use the lockdown feature because SAS Forecast Analyst Workbench does not support the lockdown feature.

Authorize Users to Access SAS Inventory Optimization Workbench Application Data Directory

When you deploy SAS Inventory Optimization Workbench on a grid, ensure that you authorize users with Read and Write permissions to access the **`SAS-configuration-directory/Levn/AppData/SASInventoryOptimizationWorkbench`** directory and its all subdirectories. You must also ensure that the **`SAS-configuration-directory/Levn/AppData/SASInventoryOptimizationWorkbench`** directory is accessible by all grid nodes.

Part 3

Data Management

6

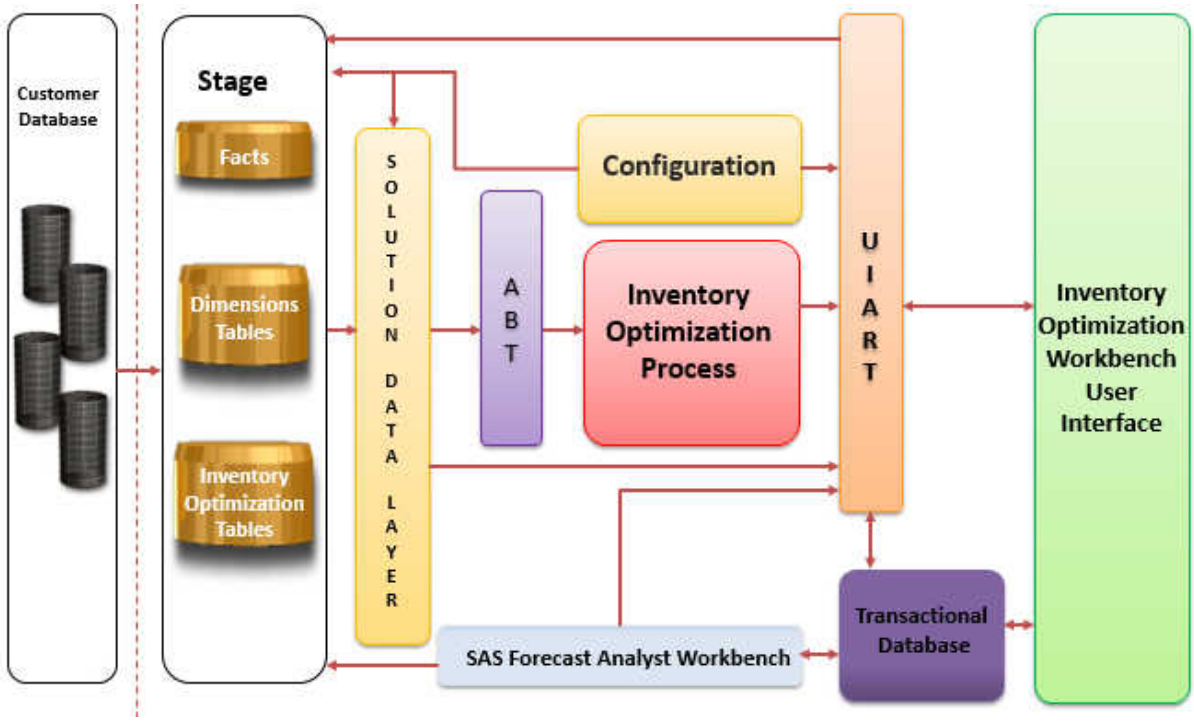
Flow of Data in SAS Inventory Optimization Workbench

Loading and Accessing Data

The data moves from its source, through the staging area, to solution data layer, to the user interface analytical result tables (UIART). This section explains the flow of the data throughout the SAS Inventory Optimization Workbench environment.

The following figure shows the data flow:

Figure 6.1 *Data Flow Diagram*



The complete path that the data follows consists of the following main steps:

1. Extract the data from your source system, and load it into the staging area and then to solution data layer. In order to load the data into the stage area, perform the following tasks.

   For more information about Stage tables, see *SAS Inventory Optimization Workbench: Data Reference Guide*.

   a. As an administrator, after you deploy SAS Inventory Optimization Workbench and enter information in the configuration parameters, run the configuration jobs. The configuration jobs create the configuration tables.

      For more information about the configuration jobs, see "Running Configuration Jobs" on page 47.

   b. Enter information in the configuration tables to meet your business requirements and data availability.

   c. After you update the configuration tables, run the initial jobs. The initial jobs use the information that you entered in the configuration tables to create the following tables:

      - data mart
      - solution data layer (SDL)
      - time dimension tables
      - application or user interface analytical result tables (UIART)

      For more information about initial jobs, see "Running Initial Jobs" on page 48.

2. Run the ongoing ETL jobs in order to perform the following tasks:

   - load the solution data layer tables with the latest data from the stage tables
   - create analytical base tables (ABTs) and load promotional and other customer data from the SDL into the ABTs
   - generate policy orders, promotional policy orders, and promotional constraint orders data and other inventory optimization process data
   - generate and load the inventory performance, order tables, and other application tables into the UIART and the transactional database

   Whenever the stage tables are refreshed or updated, update the SDL, ABT, UIART, and IOTRANS by running the ongoing jobs. After the UIART tables are loaded, the user interface for SAS Inventory Optimization Workbench is ready to use.

   For more information about ongoing jobs, see "Running Ongoing Jobs" on page 49.

3. Use SAS Inventory Optimization Workbench to analyze inventory performance, create and analyze scenarios, and review and promote replenishment orders. The following list explains how the data flows through the solution when you are working in the user interface:

   - view the actual and optimized data in the Inventory Performance workspace

- when you create scenarios, run them, and promote the values, data is selected from the UIART and from the transactional database. The promoted values of the scenario must be loaded to the stage tables in order to use them for the next run of the inventory optimization process.
- when you review the replenishment orders, SAS Inventory Optimization Workbench uses the data from the UIART and ABTs. When you promote the replenishment orders, SAS Inventory Optimization Workbench loads the data into a transactional database. You can use the promoted orders data to load into the external system (for example, ERP) for further processing.
- (optional) integrate the forecasted demand output of SAS Forecast Analyst Workbench with SAS Inventory Optimization Workbench in order to load the forecasted demand data into the stage area.

  You can also create an ad hoc scenario in order to create a forecast in SAS Forecast Analyst Workbench to obtain the demand data.
- (optional) integrate the forecasted demand, replenishment order details, and inventory performance of SAS Inventory Optimization Workbench with SAS Visual Analytics in order to create reports

Libraries in SAS Inventory Optimization Workbench

SAS Inventory Optimization Workbench organizes the files in different libraries according to the subject area that they belong to. SAS Inventory Optimization Workbench contains the following libraries:

IOW Analytical Base Tables
contains tables that are created in the form that is required for inventory optimization processes. The analytical base tables (ABTs) are created by transforming, filtering, and aggregating the data that is in the solution data layer tables. The ABTs are used as input to the analytical procedures.

IOW Configuration Tables
contains tables that consist of configuration-related information. You can update the configuration tables with business-specific information.

IOW Integration Data Layer Tables
contains tables that are to be sent to another SAS product in order to integrate SAS Inventory Optimization Workbench with that product (such as SAS Forecast Analyst Workbench).

IOW Internal Temporary Tables
contains intermediate or temporary tables that are used in various processes

IOW Solution Data Layer Tables
contains the dimensions, facts, and other data tables that are related to the inventory optimization process. These tables need to be loaded from IOSTAGE.

IOW UI Related Analytical Result Tables
contains the SAS data set tables that are required to display the SAS Inventory Optimization Workbench user interface.

IOW Staging Data Layer Tables
contains tables of business-specific source data. This data mart contains the information in the format that is required by SAS Inventory Optimization Workbench.

IOW Scenario Analysis Tables
contains scenario-related input tables and output tables.

IOW Source Data-Visual Analytics Tables
contains tables with data for generating SAS Inventory Optimization Workbench reports in SAS Visual Analytics.

IOW Transactional Tables
contains transactional tables that are required to display the SAS Inventory Optimization Workbench user interface. These tables contain information that is required to be displayed on the user interface of SAS Inventory Optimization Workbench. These tables reside in PostgreSQL.

IOW Batch Tables
contains tables (such as NODE, DEMAND, ARC, INVENTORY, and configuration tables) that are used during the inventory optimization process.

IOW Error Tables
when the data is loaded from the stage area into the SDL, the following types of records are put into this library:

- records that have duplicate entries in the primary key
- non-null columns that are either missing or do not contain a valid value

7

ETL Tasks

Overview

After you complete the post-installation tasks, you can perform the following tasks in order to prepare SAS Inventory Optimization Workbench data:

1. run configuration jobs
2. update configuration tables
3. run initial jobs
4. load data from the customer source database into the stage area
5. run ongoing jobs

Configuring Parameters

After you install SAS Inventory Optimization Workbench, you must configure the parameters that are related to SAS Inventory Optimization Workbench. The administrator can configure parameters related to ETL, transactional database, and calendar. Configure these parameters to meet your business requirements.

For more information about configuring parameters, see “Configuring SAS Inventory Optimization Workbench Parameters” on page 28.

Preparing SAS Inventory Optimization Workbench Data

Overview of Preparing Data

Data in SAS Inventory Optimization Workbench flows from its source (a customer database) to the stage area, and then through the solution data layer (SDL) to a destination data mart called the user interface analytical result tables (UIART).

The source of the data can be transactional systems or databases that are outside the SAS Inventory Optimization Workbench environment. The table structures in the stage area and in the SDL are created based on the information that you entered in the configuration parameters. You must load the data from the source system (the customer system) to the stage area and then into the SDL. This process is ongoing.

Run Jobs to Load Data

When you are running the ETL jobs, the following prerequisite applies:

- You must be a member of the Inventory Opt Workbench ETL Users group, which was created in metadata during the configuration process.

To prepare the data for SAS Inventory Optimization Workbench:

1. Run the configuration jobs that are in SAS Data Integration Studio at the following location: **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave00 (Configuration)`**

   You must run the configuration jobs only once immediately after you deploy SAS Inventory Optimization Workbench. The configuration tables (for example, DIM_TABLE_LIST) are created when you run the configuration jobs. After the configuration tables are created, enter information that meets your business requirements in the configuration tables.

2. Run the initial one-time jobs that are in SAS Data Integration Studio at the following location: **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave01 (Initial One Time)`**

   You must run the initial one-time jobs only once immediately after you deploy SAS Inventory Optimization Workbench and edit configuration tables. After you run the initial one-time jobs, the following steps are performed:

   a. The table structures in the following libraries are created based on the information that you entered in the configuration tables:

      - IOSTAGE
      - IOSDL
      - IOABT
      - IOUIART
      - IOTRANS

b the calendar is created based on the information that you entered in the configuration parameter

c UIART tables are loaded with the metrics-related information

3 Run the ongoing jobs that are in the following directories through SAS Data Integration Studio in order to load data from the stage area into the SDL, and then load the required UIART tables:

- **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave02`**

  Before you run this job, you must ensure that the customer data is loaded into the stage tables. When you run the **`Wave02`** jobs, SAS Inventory Optimization Workbench loads the data from the stage area into the SDL.

- **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave03`**

  When you run this job, SAS Inventory Optimization Workbench creates analytical base tables (ABTs) and then loads the data from the SDL into the ABT. SAS Inventory Optimization Workbench uses the data in the analytical base tables to calculate and derive various metric of inventory optimization.

- **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave04`**

  The **`Wave04`** jobs optimize the policy parameters.

- **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave05`**

  The **`Wave05`** jobs load the UIART tables with the required information.

Running Configuration Jobs

The configuration jobs create configuration tables. You must run the following configuration jobs that are in SAS Data Integration Studio at **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave00 (Configuration)`**:

1 iow_0001_create_dim_table_list

2 iow_0002_create_kpi_list

3 iow_0003_create_dim_var_disp_list

After you run the configuration jobs, the configuration tables are created. Before you can run the initial jobs and the ongoing jobs, you must enter the information in the configuration tables to meet your business requirements. The initial jobs and the ongoing jobs use the information that you specify in the configuration tables.

The following table describes the configuration jobs in detail.

Table 7.1 Configuration Jobs

Job Name	Job Description	Required Inputs
iow_0001_create_dim_table_list	Creates the DIM_TABLE_LIST configuration table. You must enter information in the configuration table to create the PRODUCT and LOCATION dimensions in the solution data layer library. This job loads the default values in the DIM_TABLE_LIST table. You can update these values. For more information about the DIM_TABLE_LIST table, see "DIM_TABLE_LIST" on page 55.	None
iow_0002_create_application_tables	Creates the following tables in the IOCONFIG library: ■ KPI_LIST ■ IOW_UI_CONFIG ■ NEXT_TRANSSHIPMENT_RUN_DT You can update the table to edit the display name of the key performance indicator. For more information about the KPI_LIST table, see "KPI_LIST" on page 60.	None.
iow_0003_create_dim_var_disp_list	Creates the DIM_VAR_DISP_LIST table in the IOCONFIG library. This table stores the information about the relation between the physical name of the column and display name of the column. For more information about the DIM_TABLE_LIST table, see "DIM_TABLE_LIST" on page 55.	None.

Note: Before you run the initial jobs, you must edit the values in the editable columns of the tables that are created by the configuration jobs.

Running Initial Jobs

Immediately after you deploy SAS Inventory Optimization Workbench, you must run the initial jobs only once. The initial jobs create and load the initial tables.

You can access the initial jobs in SAS Data Integration Studio at the following location: **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave01 (Initial One Time)`**

The following table explains the initial jobs in detail. You must run the initial jobs in the sequence in which they appear in the table.

Table 7.2 *Initial Jobs*

Job Name	Job Description	Required Inputs
iow_0101_generate_datamart	Creates the empty table structures in all libraries of SAS Inventory Optimization Workbench.	Wave00 jobs
iow_0102_load_sdl_time_dim	Creates the TIME_DIMENSION table, based on the information that is set in the configuration parameter GL_IOW_CAL_TYPE_IND. If the GL_IOW_CAL_TYPE_IND parameter specifies `1`, SAS Inventory Optimization Workbench creates the Gregorian calendar. If the GL_IOW_CAL_TYPE_IND parameter specifies `0`, SAS Inventory Optimization Workbench creates the custom calendar. **Note:** You can add a custom calendar that is supported by SAS. For more information about time periods that are supported by SAS, see “Date Intervals, Formats, and Functions” in *SAS/ETS: User's Guide*.	When you are generating the Gregorian calendar, the following configuration parameters are required: ■ GL_IOW_CAL_TYPE_IND ■ GL_IOW_CAL_NO_OF_YRS ■ GL_IOW_CAL_YR_START_DT When you are generating the custom calendar, the following information is required: ■ GL_IOW_CAL_TYPE_IND configuration parameter ■ The time_period and time_period_assoc tables in the stage area
iow_0103_load_application_tables	Creates the application UIART tables.	Information specified in the configuration tables.

Running Ongoing Jobs

Whenever the customer data is populated and refreshed in the stage library, you must run the ongoing jobs. By running the ongoing jobs, the data is loaded from the stage library to the SDL tables and then into UIART tables. The ongoing jobs are located in SAS Data Integration Studio at the following locations:

- `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave02`
- `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave03`
- `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave04`
- `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave05`

The following table describes the jobs that are present in the Wave02, Wave03, Wave04, and Wave05 ongoing jobs.

Table 7.3 Ongoing Jobs

Job Name	Job Description	Required Input
iow_0201_load_stage_to_sdl	Loads the customer data into all tables in the SDL in the following sequence: 1 dimension tables 2 control tables 3 attribute tables 4 promotion-related tables 5 fact tables 6 tables related to an optimization override scenario	Data in the stage tables
iow_0301_load_sdl_to_abt	Loads the orders-related data into the following analytical base tables: ■ IOW_ARC_DATA_ABT ■ IOW_DEMAND_DATA_ABT ■ IOW_INVENTORY_DATA_ABT ■ IOW_NODE_DATA_ABT ■ IOW_PROMO_ARC_DATA_ABT ■ IOW_PROMO_DEMAND_DATA_ABT ■ IOW_PROMO_INVENTORY_DATA_ABT ■ IOW_PROMO_NODE_DATA_ABT ■ other tables required for the inventory optimization process	SDL tables

Job Name	Job Description	Required Input
iow_0302_transfer_excess_inv_to_promo	Transfers data related to the excess inventory of base stock over to promotional stock, based on the value specified in the GL_IOW_EXCESS_INV_TO_PROMO_IND parameter. If the GL_IOW_EXCESS_INV_TO_PROMO_IND parameter specifies `1`, SAS Inventory Optimization Workbench transfers the excess inventory of base stock to the promotional stock. If the GL_IOW_EXCESS_INV_TO_PROMO_IND parameter specifies `0`, SAS Inventory Optimization Workbench does not transfer the excess inventory of base stock to the promotional stock.	Information specified in the GL_IOW_EXCESS_INV_TO_PROMO_IND parameter.
iow_0303_create_batch_abts	Creates the batches to run the inventory optimization process. The batches are created based on the GL_IOW_PROD_LIST_DIV_NUM configuration parameter.	■ ABTs for base stock and promotional stock ■ information specified in the GL_IOW_PROD_LIST_DIV_NUM parameter
iow_0401_policy_order_kpi	Generates the policy parameters and metrics, such as the reorder level, order up to level, and safety stock for base stock, for each combination of product and facility.	ABTs for base stock
iow_0402_promo_policy_order_kpi	Generates the policy parameters and metrics, such as the reorder level, order up to level, and safety stock for promotional stock, for each combination of product and facility.	ABTs for promotional stock

Job Name	Job Description	Required Input
iow_0403_transshipment	Executes the transshipment process and generates policy parameters, and orders from alternate sources for each combination of product and facility. You must run this job even though the transshipment process is optional. **Note:** While you are running this job, you might receive integer variable warnings. You can ignore the warnings.	None.
iow_0501_load_application_tables	Performs the following functions: ■ loads the following UIART tables: ATTRIBUTE_MASTER, ATTRIBUTE_VALUES, DIM_MEMBER_SELECTION, and SCENARIO_SUMMARY ■ loads the actual and target values for all metrics that are displayed in the Inventory Performance workspace in the user interface. ■ loads the data into the tables that are required for the Orders workspace in the user interface.	SDL and ABT tables

Note:

- Instead of running the Wave02, Wave03, Wave04, and Wave05 jobs, you can run **`/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave06 (ETL Batch)/IOW_601_ETL_BATCH`**. The IOW_0601_ETL_BATCH job performs all activities that are performed by Wave02, Wave03, Wave04, and Wave05 jobs in a batch.
- Whenever the stage is refreshed with the latest customer data, you must run the ongoing jobs.

8

SAS Inventory Optimization Workbench Configuration Tables

Overview of the Configuration Tables

This chapter describes the configuration tables that are created after you run the configuration jobs. You must edit the configuration tables to meet your business requirements. The initial one-time jobs use the information that is in these tables to create the stage tables.

BATCH_CONFIG

The BATCH_CONFIG table is created with default values after you edit the configuration parameters and run the ETL jobs. The BATCH_CONFIG table contains information about the batch that is created for base stock of products in order to run the inventory optimization process. The BATCH_CONFIG table is created based on the information that you specified in the GL_IOW_BATCH_IND parameter. For more information about the GL_IOW_BATCH_IND parameter, see “About the Configuration Parameters” on page 29.

Note: If the GL_IOW_BATCH_IND parameter is set to 1, do not update any column other than the REPLICATIONS column of this table.

Table 8.1 *Description of the BATCH_CONFIG Table*

Table Name	Description	Data Type	Editable?	Sample Value
BATCH_NO	Unique number of the batch.	Number	Yes	0
DEMAND_MODEL	Demand model that is to be used for the inventory optimization process. By default, SAS Inventory Optimization Workbench provides continuous and discrete models. For more information about the GL_IOW_MIRP_DEFAULT_MODEL parameter, see "About the Configuration Parameters" on page 29.	Char (10)	Yes	CONTINUOUS
MINCV	Minimum value of the variance.	Number	Yes	0.01
MAXCV	Maximum value of the variance.	Number	Yes	1
REPLICATIONS	The number of simulation replications to be used in policy optimization and KPI optimization. The IOW_0401_POLICY_ORDER_KPI ETL job uses the value that is present in this column. You might want to enter a different value before running the IOW_0401_POLICY_ORDER_KPI ETL job.	Number	Yes	200
KIT_PRODUCT_IND	Indicates whether the batch contains assembled products. Do not change the value of this column.	Number	Yes	0

BATCH_DETAILS

The BATCH_DETAILS table contains detailed information about the batch that is created for base stock of product.

Note: If the GL_IOW_BATCH_IND parameter is set to 1, then you do not update any columns in this table.

Table 8.2 Description of the BATCH_DETAILS Table

Table Name	Description	Data Type	Editable?	Sample Value
NETWORK_MODEL_RK	Unique number of the network model.	Number	Yes	1
PRODUCT_RK	Unique number of the product.	Number	Yes	36
BATCH_NO	Unique number of the batch.	Number	Yes	0

DIM_TABLE_LIST

The DIM_TABLE_LIST table is created with default values after you run the ETL jobs. Keep the following information in mind when you enter information in the columns that are editable:

- the dimension display name
- the hierarchy levels that the dimension should contain
- the common attributes at the leaf level that the dimension supports
- the valid language code
- the description of the dimensions

The DIM_TABLE_LIST table is used to create the dynamic data model. The table also helps create stage tables that contain the mandatory columns with respect to the customer source data.

Table 8.3 Description of the DIM_TABLE_LIST Table

Table Name	Description	Data Type	Editable?	Sample Value
DIM_RK	Unique serial number of the dimension.	Number	No	1
DIM_ID	Unique identifier for the dimension.	Char (32)	No	PRODUCT

Table Name	Description	Data Type	Editable?	Sample Value
DIM_NM	Unique name for the dimension.	Char (32)	No	PRODUCT
DIM_ADK	Additional description key column name for the dimension.	Char (32)	No	PRODUCT
PRIMARY_RK_NM	Unique name of the retained key column of the dimension.	Char (40)	No	PRODUCT_RK
VALID_DIM_FLG	Flag that indicates whether the dimension is applicable. Valid values are **Y** or **N**. These values must be in sync with the value that is specified in the configuration parameters for short names, GL_SHORT_YES, or GL_SHORT_NO. For more information about the configuration parameters, see "About the Configuration Parameters" on page 29.	Char (3)	No	Y
DIM_DESC	Description of the dimension. This column is optional.	Char (255)	Yes	Information about all items that include finished goods, assemblies, subassemblies, and parts.
DIM_DISPLAY_NM	The display name of the dimension. This name is shown in the user interface of SAS Inventory Optimization Workbench.	Char (40)	Yes	PRODUCT

Table Name	Description	Data Type	Editable?	Sample Value
HIER_LVL_NO	Number of hierarchy levels that are required for the dimension. The value that you specify in this column determines the number of hierarchy levels that are created in the dimension table. If a dimension does not contain any hierarchy levels, enter `2` in this column, and then enter a value in the DIMENSION_LVL_ID1 column of the dimension table in the Stage table. For example, suppose you specify `2` in the HIER_LVL_NO column for LOCATION dimension, you can enter `ALL` in the LOCATION_LVL_ID1 column in the STG_LOCATION table.	Number	Yes	1
COMMON_ATTRIB_NO	Number of attributes that are required for the dimensions. If attributes are not required, enter `0`. The value that you specify in this column determines the number of attributes that are created in the dimension table.	Number	Yes	6
LANGUAGE_CD	Required language codes.	Char (10)	Yes	en

DIM_VAR_DISP_LIST

The DIM_VAR_DISP_LIST table stores the information about the relation between the physical column name and the display name. You can use your business terminology for the display names.

SAS Inventory Optimization Workbench displays in the user interface all labels that are configured in this table.

Table 8.4 *Description of the DIM_VAR_DISP_LIST Table*

Column Name	Description	Data Type	Editable?	Sample Value
DIM_RK	Unique serial number of the dimension.	Number	No	1
DIM_NM	Unique name for the dimension.	Char (40)	No	PRODUCT
DIM_ID	Unique identifier for the dimension.	Char (32)	No	PRODUCT_ID
LVL_ATTRIB_IND	Indicates whether the variable is a hierarchy level or an attribute. Enter 1 to indicate that the variable is a hierarchy level. Enter 0 to indicate that the variable is an attribute.	Number	No	1
HIER_ORDER_NO	Specifies the order of the hierarchy level for the variable of the dimension.	Number	No	1
LEAF_NODE_IND	Indicates whether the variable of the dimension is a leaf-level node for the hierarchy level columns. Enter 1 to indicate that the variable of the dimension is a leaf-level node.	Number	No	0
VARIABLE_NM	Name of the attribute or hierarchy level of the dimensions. This value is the column name of the dimension table.	Char (40)	No	PRODUCT_LVL_NM1
VARIABLE_DESC	Description of the variable attributes or of the dimension level. This column is optional.	Char (255)	Yes	Stored the first level of the product hierarchy.

Column Name	Description	Data Type	Editable?	Sample Value
DISPLAY_NM	Stores the names of the attributes and hierarchy columns of the dimensions. This name is displayed in the user interface. This column is mandatory. By default, this value is the same as the variable name. You must update the values to meet your business requirements.	Char (40)	Yes	ALL PRODUCTS
ATTRIB_DATATYPE	Indicates the type of data that is in this column if this variable is an attribute. Enter `0` to indicate that the data type is character, `1` to indicate that the data type is an integer, `2` to indicate that it is a double, or `3` to indicate that the data type is a date.	Number	Yes	1
ATTRIB_UOM_CD	The unit of measurement code for the attribute. This column is optional.	Char (10)	Yes	DZ – Dozen

IOW_UI_CONFIG

The IOW_UI_CONFIG table contains information about the currency that you are using. The currency information that you enter in this table is displayed in the user interface. You should change the value of only the PROPERTY_VALUE column.

Table 8.5 *Description of the IOW_UI_CONFIG*

Column Name	Description	Data Type	Editable?	Sample Value
PROPERTY_NM	Name of the currency.	Char (40)	Yes	CURRENCY_FORMAT

Column Name	Description	Data Type	Editable?	Sample Value
PROPERTY_DESC	Description of the currency.	Char (255)	Yes	Currency format.
PROPARTY_VALUE	Value of the currency.	Char (32)	Yes	DOLLAR

KPI_LIST

The KPI_LIST table is created with default values of the metrics that are to be shown in the user interface. You can edit the display names according to your business requirements. The display name that you enter for each KPI is displayed in the user interface of SAS Inventory Optimization Workbench.

Table 8.6 *Description of KPI_LIST Column*

Table Name	Description	Data Type	Editable?	Sample Value
KPI_RK	Unique surrogate key for the KPI.	Number	No	1
KPI_VAR_NM	Variable name of the KPI.	Char (40)	No	DEMAND
KPI_DISPLAY_NM	Display name of the KPI in the user interface.	Char (1200)	Yes	Demand
DECIMAL_ROUND_OFF_VAL	Decimal rounding value.	Number	Yes	2

NEXT_TRANSSHIPMENT_RUN_DT

The NEXT_TRANSSHIPMENT_RUN_DT table is created by the inventory optimization process. This table is an internal table. The NEXT_TRANSSHIPMENT_RUN_DT table stores the transshipment run date, the date on which the next run of the transshipment process will occur. Based on the value that is specified in the GL_IOW_TRANSSHIPMENT_RUN_FREQ parameter, the next date for the transshipment process is automatically set. For more information about the GL_IOW_TRANSSHIPMENT_RUN_FREQ parameter, see “About the Configuration Parameters” on page 29.

Table 8.7 Description of the NEXT_TRANSSHIPMENT_RUN_DT Table

Column Name	Description	Data Type	Editable?	Sample Value
TRANSSHIPMENT_RUN_DT	Date on which the transshipment process was last run.	Number	No	November 28, 2014
NEXT_TRANSSHIPMENT_RUN_DT	Date on which the next transshipment process is to be run.	Number	Yes	December 12, 2014

PROMO_BATCH_CONFIG

The PROMO_BATCH_CONFIG table is created with default values after you edit the configuration parameters and run the ETL jobs. The PROMO_BATCH_CONFIG table contains information about the batch that is created for the promotional stock of products in order to run the inventory optimization process. The PROMO_BATCH_CONFIG table is created based on the information that is entered in the GL_IOW_PROMO_WORKFLOW_IND parameter. For more information about the configuration parameter, see "About the Configuration Parameters" on page 29.

Note: Do not update any columns in this table.

Table 8.8 Description of the PROMO_BATCH_CONFIG Table

Column Name	Description	Data Type	Sample Value
PROMOTION_RK	Unique identifier for the promotion.	Number	7
HOLIDAY_RK	Unique identifier for the holiday.	Number	0
NETWORK_MODEL_RK	Unique identifier for the network model.	Number	2
HORIZON_NO	Planning horizon for the promotion.	Number	12

Column Name	Description	Data Type	Sample Value
MIRP_PUSH_PULL_IND	The push and pull mechanism indicator. The push mechanism pushes the promotional orders from vendor-facing facilities to customer-facing facilities by considering the forecasted demand. The pull mechanism pulls promotional orders from vendor-facing facilities to customer-facing facilities, based on the demand.For more information about the GL_IOW_MIRP_PUSH_PULL_IND parameter, see "About the Configuration Parameters" on page 29.	Number	1
MAX_ECHELON_LVL	The echelon level for the network.	Number	1
BATCH_NO	The batch number.	Number	1

PROMO_BATCH_DETAILS

The PROMO_BATCH_DETAILS table contains detailed information about the batch that is created for the promotional stock of a product.

Note: If the GL_IOW_PROMO_WORKFLOW_IND and GL_IOW_BATCH_IND parameters are set to `1`, then you do not need to update any columns in this table.

Table 8.9 *Description of the PROMO_BATCH_DETAILS Table*

Column Name	Description	Data Type	Editable?	Sample Value
BATCH_NO	The batch number.	Number	Yes	1
PROMOTION_RK	Unique identifier for the promotion.	Number	Yes	8
HOLIDAY_RK	Unique identifier for the holiday.	Number	Yes	0
NETWORK_MODEL_RK	Unique identifier for the network model.	Number	Yes	2

Column Name	Description	Data Type	Editable?	Sample Value
PRODUCT_RK	Unique identifier for the product.	Number	Yes	36

SET_MISSING_VARIANCE

The SET_MISSING_VARIANCE table is used to populate the missing variance. The variance is required for the inventory optimization process. After the ETL configuration jobs run, the blank table is created. You need to provide information in this table. If the variance is missing and you do not provide any information in this table, SAS Inventory Optimization Workbench uses the variance that is specified in the GL_IOW_SET_MISSING_VARIANCE parameter.

Specify a value of variance for a product and facility combination or for all locations for the specified product. In order to specify a missing variance for all locations, the value of LOCATION_ID must be null. SAS Inventory Optimization Workbench gives priority to the missing variance values for a product and facility combination pair.

Table 8.10 *Description of the SET_MISSING_VARIANCE Table*

Column Name	Description	Data Type	Editable?	Sample Value
PRODUCT_ID	Unique number of the product.	Char (32)	Yes	5
LOCATION_ID	Unique number of the location or facility.	Char (32)	Yes	4
SET_MISSING_VARIANCE	Mathematical function of mean. For example, mean, sqrt (mean), or a constant value (such as 10).	Char (40)	Yes	10

9

Integrating SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench

Introduction to SAS Inventory Optimization Workbench and SAS Forecast Analyst Workbench Integration

In the sales and operations planning process for your organization, you might want to use the predicted demand as an input to SAS Inventory Optimization Workbench in order to perform further analysis. You can use the predicted demand from a forecast created in SAS Forecast Analyst Workbench or from a plan in SAS Forecast Analyst Workbench as input for SAS Inventory Optimization Workbench.

You can integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench in the following ways:

- by using a batch process

  obtain the forecasted demand data or demand data resulting from collaboration planning from SAS Forecast Analyst Workbench on a periodical basis

- through an ad hoc scenario

  obtain the forecasted demand data or demand data resulting from collaboration planning that is generated for the specific scenario that you are analyzing.

This chapter also explains the ETL job, the guidelines for loading data, and the guidelines for creating a forecast and a plan in SAS Forecast Analyst Workbench.

Guidelines for Loading Data

Before you load the data, ensure that SAS Forecast Analyst Workbench and SAS Inventory Optimization Workbench are installed on the same metadata server.

Follow these guidelines when you load the data into SAS Forecast Analyst Workbench and SAS Inventory Optimization Workbench:

- The user who is loading the data must be a part of the Forecast Analyst ETL Users group and of the Inventory Opt Workbench ETL Users group.

  For more information about the Forecast Analyst ETL Users group, see *SAS Forecast Analyst Workbench: Administrator's Guide*.

  For more information about the Inventory Opt Workbench ETL Users group, see "Verify Groups in SAS Management Console" on page 23.

- The data in the stage tables for SAS Inventory Optimization Workbench and SAS Forecast Analyst Workbench is loaded separately from the same customer source data.

  When you load the data from the same customer source, the hierarchies and relationships that are defined in the data at the customer source are reflected in the stage tables of these solutions.

- The PRODUCT and LOCATION dimensions in SAS Inventory Optimization Workbench are called the PRODUCT and STORE_LOCATION dimensions, respectively, in SAS Forecast Analyst Workbench.

- Forecasted demand data for some PRODUCT and LOCATION dimension combinations is in SAS Forecast Analyst Workbench. For those combinations, you must specify `1` in the VALID_IND column of the STG_NODE table in SAS Inventory Optimization Workbench.

After you load the data, you must ensure that the value of the GL_FORECAST_DATE parameter in SAS Forecast Analyst Workbench is same as that of the GL_IOW_BATCH_CURRENT_DATE parameter in SAS Inventory Optimization Workbench.

Integrating SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench in Batch Mode

Steps to Integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench in Batch Mode

Based on your role, you perform different steps in the process of integrating SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench in batch mode..

Perform the following steps to integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench in batch mode:

1 As a planner in SAS Forecast Analyst Workbench, complete the following steps:

   a Create a forecast in SAS Forecast Analyst Workbench.

   For guidelines about creating a forecast, see "Guidelines for Creating a Forecast in SAS Forecast Analyst Workbench" on page 69.

   b Diagnose and accept the forecast in SAS Forecast Analyst Workbench.

2 (Optional) As a planner in SAS Forecast Analyst Workbench, complete the following steps:

   a Create a plan in SAS Forecast Analyst Workbench.

   For guidelines about creating a plan, see "Guidelines for Creating a Plan in SAS Forecast Analyst Workbench" on page 70.

   b Complete the collaboration planning phase in order to obtain the consensus of all stakeholders in SAS Forecast Analyst Workbench.

   Note: If you set the consensus_ind indicator in iow_0701_faw_batch_integration job to `1` in SAS Inventory Optimization Workbench, you must create the plan and perform collaboration planning in SAS Forecast Analyst Workbench. For more information about consensus_ind indicator, see Table 9.1 on page 68.

3 (Optional) As an analyst in SAS Forecast Analyst Workbench, create an analysis and then generate forecast results.

   For guidelines about creating an analysis, see "Guidelines for Creating an Analysis in SAS Forecast Analyst Workbench" on page 70.

   Note: If you set the use_custom_analysis_output indicator in the iow_0701_faw_batch_integration job to `1` in SAS Inventory Optimization Workbench, you must create the analysis and generate forecast results by using custom analysis in SAS Forecast Analyst Workbench. For more information about the use_custom_analysis_output indicator, see Table 9.1 on page 68.

TIP Ensure that the value of the VALID_DOWNSTREAM_PROCESSES_IND column in the UIART.RPT_PROJECT_DEF_NO table for the analysis in SAS Forecast Analyst Workbench is `1` in order to integrate the output of analysis with SAS Inventory Optimization Workbench.

4 As an administrator in SAS Inventory Optimization Workbench, complete the following steps:

a Open the following job in the workspace of SAS Data Integration Studio:

```
/Products/SAS Inventory Optimization Workbench/5.3 Jobs/
Wave07 (IOW-FAW Integration)/
iow_0701_faw_batch_integration
```

b Right-click in the empty area of the workspace, and click **Properties**. The Properties dialog box appears.

c Click the **Precode and Postcode** tab, and enter the following information.

Table 9.1 Description of Job Parameters

Parameter	Description
plan_nm	Name of the forecast whose demand data you want to integrate with SAS Inventory Optimization Workbench **Note:** You can specify the name of only one forecast
include_faw_attributes	Specifies whether you want to load the attributes data from SAS Forecast Analyst Workbench into SAS Inventory Optimization Workbench. Enter `1` in order to load attributes data. Enter `0` if you do not want to load the attributes data. If you want to load the attributes data from any other SAS solution, such as SAS Demand Classification and Clustering, enter `0`. **Note:** Set this parameter to `0` if you set the use_custom_analysis_output parameter to `1`.
consensus_ind	Specifies whether you want to include the demand data that is obtained after performing collaboration planning in SAS Forecast Analyst Workbench. Enter `1` in order to load the collaboration planning data from SAS Forecast Analyst Workbench. Enter `0` if you do not want to include the collaboration data.
kpi_var_nm	Name of the demand variable that is present in the KPI_VAR_NM column of the CONFIG.KPI_CONFIG table in SAS Forecast Analyst Workbench.
use_custom_analysis_output	Specifies whether you want to include the demand data that is obtained after you have used custom analysis to generate forecast results in SAS Forecast Analyst Workbench. Enter `1` in order to load the output of custom analysis from SAS Forecast Analyst Workbench. Enter `0` if you do not want to include the output of custom analysis.

Parameter	Description
custom_analysis_nm	Name of the analysis whose output you want to integrate with SAS Inventory Optimization Workbench.

d (Optional) Use the attributes data from SAS Demand Classification and Clustering.

For more information, see "Using Attributes Data from SAS Demand Classification and Clustering" on page 71.

e Run the integration job that is located in SAS Data Integration Studio at the following location: `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave07 (IOW-FAW Integration)/iow_0701_faw_batch_integration`

After you run this job, the forecasted demand data, intermittent demand data, and attributes data is created in the `IOINT` library in the SAS Forecast Analyst Workbench environment and is loaded into the stage table of SAS Inventory Optimization Workbench.

f Run the ongoing jobs of SAS Inventory Optimization Workbench.

For more information about running the ongoing jobs, see "Running Ongoing Jobs" on page 49.

5 To obtain the demand data from SAS Forecast Analyst Workbench in batch mode, refresh the forecast and plan, and then run the ongoing jobs of SAS Inventory Optimization Workbench.

Guidelines for Creating a Forecast in SAS Forecast Analyst Workbench

When you are integrating the output of SAS Forecast Analyst Workbench with SAS Inventory Optimization Workbench, you must make the following selections in SAS Forecast Analyst Workbench. For detailed information about how to create a forecast, see *SAS Forecast Analyst Workbench: User's Guide*:

- Select **Demand** as the **KPI** value for the forecast.
- Select the **Product** and **Store Location** dimensions.
- Select the lowest leaf-level node as hierarchy levels for the Product dimension and the Store Location dimension.

  Note: When you select the lowest leaf-level node, SAS Forecast Analyst Workbench also selects the parent node of the lowest leaf-level node.
- Select all hierarchical values for the Product dimension and for the Store Location dimension.
- The leaf-level nodes of the Product dimension and Store Location dimension must be kept at the bottom of the hierarchy of the forecast.
- The lowest leaf-level node must be set as forecast leaf level and reconciliation level.
- Set the periodicity of the forecast to be the period at which you want to run the inventory optimization process.

In SAS Inventory Optimization Workbench, you can view and set the periodicity in the GL_IOW_BASE_PERIOD_IND parameter. You can view and set the calendar type in the GL_IOW_CAL_TYPE_IND parameter. For more information about the GL_IOW_BASE_PERIOD_IND and GL_IOW_CAL_TYPE_IND parameters, see "About the Configuration Parameters" on page 29.

- Set the number of periods in the planning horizon to be equal to the planning horizon for SAS Inventory Optimization Workbench.

  For more information about the GL_IOW_PLANNING_HORIZON parameter, see "About the Configuration Parameters" on page 29.

After you create the forecast, diagnose it, and then accept it. You can also edit the parameters and rediagnose the forecast until you are satisfied with the predicted values.

Guidelines for Creating a Plan in SAS Forecast Analyst Workbench

When you are integrating the demand data that is obtained from collaboration planning in SAS Forecast Analyst Workbench with SAS Inventory Optimization Workbench, you must make the following selections in SAS Forecast Analyst Workbench. For detailed information about how to create a plan, see *SAS Forecast Analyst Workbench: User's Guide*:

- Include the forecast that you created in SAS Forecast Analyst Workbench to generate the predicted demand. Do not include any other forecast in the plan.
- Create only one plan for each forecast.
- The periodicity of the plan must be same as the periodicity of the forecast.
- The aggregation level for the plan and forecast must be the leaf level.

Guidelines for Creating an Analysis in SAS Forecast Analyst Workbench

When you are integrating the output of a custom analysis that you created in SAS Forecast Analyst Workbench with SAS Inventory Optimization Workbench, you must follow these guidelines:

- The name of the output data set for analysis must be ca_outfor_`<prj_def_no>`.
- The ca_outfor_`<prj_def_no>` data set must contain the following columns:
  - BY variables
  - START_DT
  - ACTUAL
  - PREDICT
  - UPPER
  - LOWER
  - ERROR

- STD

Using Attributes Data from SAS Demand Classification and Clustering

You can use SAS Demand Classification and Clustering (if you have purchased it) when you integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench.

You integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench to obtain the predicted demand data, intermittent demand data, and attributes data from SAS Forecast Analyst Workbench. However, you can use attributes data from SAS Demand Classification and Clustering instead of from SAS Forecast Analyst Workbench.

The following prerequisites apply:

- You must enter `0` in the include_faw_attributes parameter of the iow_0701_faw_batch_integration job.

  For more information, see "Steps to Integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench in Batch Mode" on page 67.

- The following SAS products must be installed: Base SAS, SAS/ETS, SAS/STAT, and SAS/IML

To use the attributes data from SAS Demand Classification and Clustering:

1. Create the following folders inside the ***SAS-configuration-directory*****\Levn\AppData\SASInventoryOptimizationWorkbench\data\ioint** library, or inside the library that you are using for integration:
   - **temp**
   - **output**
2. Open a SAS session, and then define the following paths and library names:

```
OPTIONS CMPOPT = NOSHORTCIRCUIT;
%let
data_path=
%str(SAS-configuration-directory
\Lev<n>\AppData\SASInventoryOptimizationWorkbench\data\ioint);
%let temp_path = &data_path.\temp;
%let output_path = &data_path.\output;
libname data_lib "&data_path.";
libname temp_lib "&temp_path.";
libname outlib "&output_path.";
```

3. In the SAS session, define the following parameters in order to run SAS Demand Classification and Clustering:

```
/*** Macro input compulsory parameters*/
%let indata_table= data_lib.ddcf_leaf_actual_demand6;
%let time_id_var=start_dt;
%let demand_var=Demand_QTY;
%let hier_by_vars=%str
(plan_id PRODUCT_LVL_RK5 PRODUCT_RK STORE_LOCATION_LVL_RK4 STORE_LOCATION_RK );
%let class_low_by_var=STORE_LOCATION_RK;
```

```
%let class_high_by_var=plan_id;


/*** Macro Input optional parameters ***/
%let input_vars=;
%let process_lib=temp_lib;
%let use_package=0;
%let need_sort=1;
%let class_process_by_vars=;
%let class_time_interval=week;
%let short_reclass=0;
%let horizontal_reclass_measure=mode;
%let classify_deactive=1;
%let setmissing=0;
%let zero_demand_flg=1;
%let zero_demand_threshold_pct=;
%let zero_demand_threshold=0;
%let gap_period_threshold=4;
%let short_series_period=8;
%let low_volume_period_interval=year;
%let low_volume_period_max_tot=5;
%let low_volume_period_max_occur=3;
%let lts_min_demand_cyc_len=20;
%let lts_seasontest_siglevel=0.05;
%let intermit_measure=MEDIAN;
%let intermit_threshold=1.5;
%let deactive_threshold=;
%let deactive_buffer_period=4;
%let calendar_cyc_period=26;
%let out_arrays=1;
%let out_class=ALL;
%let out_stats=ALL;
%let out_profile=0;
%let profile_type=;
%let class_logic_file=;
%let debug=0;
%let _input_lvl_result_table=out_lib.all_class_result;
%let _input_lvl_stats_table=;
%let _class_merge_result_table=out_lib.merged_class_result;
%let _class_low_result_table=out_lib.low_class_result;
%let _class_high_result_table=out_lib.high_class_result;
%let _class_low_stats_table=low_stats;
%let _class_high_stats_table=high_stats;
%let _class_low_array_table=low_array;
%let _class_high_array_table=high_array;
%let _class_low_calib_table=low_calib;
%let _class_high_calib_table=high_calib;
%let _rc=;
%let syscc=0;
```

For more information about these parameters, see *SAS Demand Classification and Clustering: User's Guide*.

4 In the SAS session, run the %dc_class_wrapper macro.

The following code is an example of running the %dc_class_wrapper macro:

```
%dc_class_wrapper(
```

```
indata_table=&indata_table,
time_id_var=&time_ID_var,
demand_var=&demand_var,
input_vars=&input_vars,
process_lib=temp_lib,
use_package=&use_package,
need_sort=&need_sort,
hier_by_vars=&hier_by_vars,
class_process_by_vars=&class_process_by_vars,
class_low_by_var=&class_low_by_var,
class_high_by_var=&class_high_by_var,
class_time_interval=&class_time_interval,
short_reclass=&short_reclass,
horizontal_reclass_measure=&horizontal_reclass_measure,
classify_deactive=&classify_deactive,
setmissing=&setmissing,
zero_demand_flg=&zero_demand_flg,
zero_demand_threshold_pct=&zero_demand_threshold_pct,
zero_demand_threshold=&zero_demand_threshold,
gap_period_threshold=&gap_period_threshold,
short_series_period=&short_series_period,
low_volume_period_interval=&low_volume_period_interval,
low_volume_period_max_tot=&low_volume_period_max_tot,
low_volume_period_max_occur=&low_volume_period_max_occur,
lts_min_demand_cyc_len=&lts_min_demand_cyc_len,
lts_seasontest_siglevel=&lts_seasontest_siglevel,
intermit_measure=&intermit_measure,
intermit_threshold=&intermit_threshold,
deactive_threshold=&deactive_threshold,
deactive_buffer_period=&deactive_buffer_period,
calendar_cyc_period=&calendar_cyc_period,
out_arrays=&out_arrays,
out_class=&out_class,
out_stats=&out_stats,
out_profile=&out_profile,
profile_type=&profile_type,
class_logic_file=&class_logic_file,
debug=&debug,
_input_lvl_result_table=&_input_lvl_result_table,
_input_lvl_stats_table=&_input_lvl_stats_table,
_class_merge_result_table=&_class_merge_result_table,
_class_low_result_table=&_class_low_result_table,
_class_high_result_table=&_class_high_result_table,
_class_low_stats_table=&_class_low_stats_table,
_class_high_stats_table=_class_high_stats_table,
_class_low_array_table=&_class_low_array_table,
_class_high_array_table=&_class_high_array_table,
_class_low_calib_table=&_class_low_calib_table,
_class_high_calib_table=&_class_high_calib_table,
_rc=
);
```

After you run the macro, the following data sets are created in the **output** library: all_class_result, high_class_result, low_class_result, and merged_class_result.

5 Populate the attributes data from the merged_class_result data set into the STG_PRODUCT_X_LOCATION_ATTRIBUTE table.

The following code is an example of loading attribute data from the merged_class_result data set into the STG_PRODUCT_X_LOCATION_ATTRIBUTE table.

```
proc sql;
create table DC as
select a.*, b.Product_id, c.location_id from out_lib.Merged_class_result as a,
iosdl.product_lkp as b, iosdl.location_lkp as c
where a.PRODUCT_RK = b.PRODUCT_RK and
a.STORE_LOCATION_RK=c.location_rk;
quit;

proc sql;
delete from iostage.Stg_product_location_attributes ;
quit;

data iostage.Stg_product_location_attributes;
set Dc (rename = (DC_BY = ATTRIBUTE_VALUE));
informat ATTRIBUTE_ID $32.;
format ATTRIBUTE_ID $32.;
Length ATTRIBUTE_ID $32.;
ATTRIBUTE_ID="ATTRIBUTE8";
keep ATTRIBUTE_ID PRODUCT_ID LOCATION_ID ATTRIBUTE_VALUE;
run;

proc sort data = iostage.Stg_product_location_attributes nodupkey;
by PRODUCT_ID LOCATION_ID;
run;

PROC SQL noprint;
insert into iostage.stg_attribute values
("ATTRIBUTE8","DemandClass",0);
QUIT;
```

Note: If an attribute is already present in the STG_ATTRIBUTE_VALUES table in SAS Inventory Optimization Workbench, do not load data for the attribute again from SAS Demand Classification and Clustering when you integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench.

Integrating SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench through an Ad Hoc Scenario

Steps to Integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench through Ad Hoc Scenario

Perform the following steps to integrate SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench through an ad hoc scenario:

1 As an administrator of SAS Forecast Analyst Workbench, perform the following steps:

   a Run the following job through SAS Data Integration Studio: `/Products/SAS Forecast Analyst Workbench/5.3 Jobs/Wave07 (Integration - Other Solutions)/faw_0701_create_integration_config_tables`

   After you run this job, SAS Forecast Analyst Workbench creates the following tables:

   - PLAN_HIERARCHY_CONFIG
   - PLAN_KPI_CONFIG

   These configuration tables are created in the path that is specified in the GL_INT_LIB parameter in SAS Forecast Analyst Workbench.

   b Edit the configuration tables with your business-specific information.

   For more information about the faw_0701_create_integration_config_tables job, GL_INT_LIB parameter, and the configuration tables, see *SAS Forecast Analyst Workbench: Administrator's Guide*.

   For more information about editing the configuration tables, see "Guidelines for Editing the PLAN_HIERARCHY_CONFIG and PLAN_KPI_CONFIG Tables" on page 76.

2 As an inventory analyst in SAS Inventory Optimization Workbench, perform the following steps:

   a Create and execute an ad hoc scenario.

   b Create a forecast from the ad hoc scenario and then obtain the forecasted demand data for the scenario.

   For more information about an ad hoc scenario and about creating a forecast from that scenario, see *SAS Inventory Optimization Workbench: User's Guide*.

   c (Optional) Create a plan from the ad hoc scenario, and then obtain the demand data that is generated from collaboration planning.

Guidelines for Editing the PLAN_HIERARCHY_CONFIG and PLAN_KPI_CONFIG Tables

Use the following guidelines when you are editing the PLAN_HIERARCHY_CONFIG table:

- In the INPUT_COLUMN_NM column, you must include the lowest leaf-level node and the parent node for both the Location dimension and the Product dimension.
- The FAW_DIM_RK column contains the retain key of the dimension that you want to use for integration. You can refer to the CONFIG.DIM_TABLE table of SAS Forecast Analyst Workbench to identify the dimension retain key. For more information, see *SAS Forecast Analyst Workbench: Administrator's Guide*.
- The FAW_DIM_HIER_LEVEL column contains the hierarchy level of the dimension that you want to use for integration. You can refer to the CONFIG.DIM_VAR_DISP_LIST table of SAS Forecast Analyst Workbench to identify the dimension hierarchy level. For more information, see *SAS Forecast Analyst Workbench: Administrator's Guide*.
- The values that are present in the INPUT_COLUMN_NM, FAW_DIM_RK, and FAW_DIM_HIER_LEVEL columns must be in sync.
- Start the FAW_PLAN_ORDER column values at 1. The lowest level of the dimension must contain the highest value. Since SAS Inventory Optimization Workbench contains PRODUCT and LOCATION dimensions, the leaf levels of these dimensions must contain the highest values in the FAW_PLAN_ORDER column.
- Identify the level that contains the highest value in the FAW_PLAN_ORDER column. In the FAW_FORECAST_LVL_IND column, you must set the corresponding level to `1`.
- Identify the level that you set to `1` in the FAW_FORECAST_LVL_IND column. In the FAW_RECONCILIATION_LVL_IND column, you must set the corresponding level to `1`.
- The order that you use in the FAW_PLAN_ORDER column must be same as the order that you specified for the forecast that is used in batch mode.
- The values in the FAW_FORECAST_LVL_IND and FAW_RECONCILE_LVL_IND columns must be same as those of the forecast level and reconciliation level of the forecast that is used for batch integration.

The following table is an example of the PLAN_HIERARCHY_CONFIG table:

Table 9.2 *Example of PLAN_HIERARCHY_CONFIG Table*

INPUT_COLUMN_NM	FAW_DIM_RK	FAW_DIM_HIER_LEVEL	FAW_PLAN_ORDER	FAW_FORECAST_LVL_IND	FAW_RECONCILE_LVL_IND
LOCATION_LVL_ID4	2	4	1	0	0

INPUT_COLUMN_NM	FAW_DIM_RK	FAW_DIM_HIER_LEVEL	FAW_PLAN_ORDER	FAW_FORECAST_LVL_IND	FAW_RECONCILE_LVL_IND
PRODUCT_LVL_ID5	1	5	2	0	0
PRODUCT_ID	1	6	3	0	0
LOCATION_ID	2	5	4	1	1

Note: None of the columns of the PLAN_KPI_CONFIG table can be blank.

Use the following guidelines when you are editing the PLAN_KPI_CONFIG table:

- The FAW_DEMAND_KPI_NM column must contain the exact name (including the case sensitivity) of the demand KPI that is specified in the CONFIG.KPI_CONFIG table in SAS Forecast Analyst Workbench.
- Enter a value in the NO_OF_FORECASTED_PERIOD column that is equal to the value that is specified in the GL_IOW_PLANNING_HORIZON parameter in SAS Inventory Optimization Workbench.

The following table is an example of the PLAN_KPI_CONFIG table.

Table 9.3 *Example of PLAN_KPI_CONFIG Table*

FAW_DEMAND_KPI_NM	LOW_HISTORY_THRESHOLD	FORECAST_PAST_PERIODS	NO_OF_FORECASTED_PERIOD
Demand_kpi	1	20	10

Note: None of the columns of the PLAN_HIERARCHY_CONFIG table can be blank.

Assigning Permissions to a User for a Forecast in SAS Forecast Analyst Workbench

When you are integrating SAS Inventory Optimization Workbench with SAS Forecast Analyst Workbench, you need to grant permissions to a user to create a forecast in SAS Forecast Analyst Workbench. For more information about providing permissions to a user for a forecast, see “Assigning Permissions to a User or Group for a Forecast, for a Modeling Project, or for a Plan” in *SAS Forecast Analyst Workbench: Administrator’s Guide*.

10

Integrating SAS Inventory Optimization Workbench with SAS Visual Analytics

Introduction to SAS Inventory Optimization Workbench and SAS Visual Analytics Integration

You can integrate the output of SAS Inventory Optimization Workbench into SAS Visual Analytics. Using SAS Inventory Optimization Workbench data in SAS Visual Analytics, you can create reports in order to analyze the data in the way that you want. You use SAS LASR Analytic Server along with SAS Visual Analytics to build and generate the reports.

Guidelines to Integrate SAS Inventory Optimization Workbench with SAS Visual Analytics

Use the following guidelines in order to integrate SAS Inventory Optimization Workbench with SAS Visual Analytics:

- Ensure that the SAS metadata contains the following SAS LASR Analytic Servers and corresponding libraries:

  Table 10.1 *SAS Metadata and Libraries*

SAS LASR Analytic Server	Associated LASR Library Name	Libref	SAS Visual Analytics Metadata Folder
LASR Analytic Server <*machine name*>	Visual Analytics LASR	`VALIBLA`	`/Products/SAS Visual Analytics Administrator` `/Products/SAS Inventory Optimization Workbench/Data Sources/Visual Analytics LASR`
Public LASR Analytic Server <*machine name*>	Visual Analytics Public LASR	`LASRLIB`	`/Shared Data/SAS Visual Analytics/ Public`

- Ensure that the following groups are already present in SAS Management Console:
  - Visual Analytics Data Administrators
  - Visual Data Builder Administrators
  - Visual Analytics Users
- The Visual Analytics Data Administrators group must be a member of the Inventory Opt Workbench ETL Users group of SAS Inventory Optimization Workbench.
- Ensure that the users who are using SAS Visual Analytics to generate the reports are associated with one of the above groups.

  Note: If no user is present for SAS Visual Analytics, you can create the users and associate them with the groups.

TIP If SAS LASR Analytic Server is distributed on a grid, then you must place the .ssh file in the user folder on the machine that is associated with SAS metadata.

- Start the SAS LASR Analytic Server from the Manage Environment view of SAS Visual Analytics. To start the SAS LASR Analytic Server:

  1 Log on to SAS Visual Analytics Hub as a user who is a member of the Visual Analytics Data Administrators group and of the Visual Data Builder Administrators group.

  2 On the **Common Actions** pane, click **Manage Environment**. The Manage Environment page appears on a new tab of the browser or in a new window based on the browser settings.

  3 In the Manage Environment page, select **LASR** ▸ **Manage Servers**. The **LASR Servers** tab appears in the right pane.

  4 Select a server, and click ▶.

Note: SAS Visual Analytics does not work on the AIX platform.

Preparing Data to Integrate with SAS Visual Analytics

When you are using SAS Visual Analytics, the data flows from SAS Inventory Optimization Workbench to a Base SAS library, to the SAS LASR Analytic Server library, and then to SAS Visual Analytics.

To use SAS Visual Analytics:

1 In the GL_IOW_LASRLIBNAME parameter, enter the name of the library to which you want to upload the data on SAS LASR Analytic Server.

By default, the name of the library is IOVA. You can change the name of the library.

For more information about the GL_IOW_LASRLIBNAME parameter, see "About the Configuration Parameters" on page 29.

Note: Enter the exact name of the library to which you want to upload the data on SAS LASR Analytic Server.

2 Run the following ETL jobs that located at `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave08 (VA integration - Data preparation)` in SAS Data Integration Studio:

- iow_0801_va_forecasted_demand
- iow_0802_va_order_details
- iow_0803_va_promotional_order_details
- iow_0804_va_inventory_performance

3 Run the iow_901_data_upload_to_LASR job that is located at the following location in SAS Data Integration Studio: `/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave09 (VA integration - Data Upload to LASR)`

When you run this job, the data from IOVA library is copied to the *SAS Visual Analytics LASR* library that is present in SAS LASR Analytic Server and is automatically registered with SAS metadata in the folder `Products/SAS`

Inventory Optimization Workbench/Data Sources/Visual Analytics LASR.

Note: The SAS LASR Analytic Server must be in the running state while it is executing this job so that the data is uploaded to the SAS LASR Analytic Server.

Integration Jobs for SAS Visual Analytics

In order to load the summarized data of a forecast into SAS Visual Analytics, you must run the integration jobs for SAS Visual Analytics. The integration jobs are in SAS Data Integration Studio at the following locations:

- **/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave08 (VA integration - Data preparation)**
- **/Products/SAS Inventory Optimization Workbench/5.3 Jobs/Wave09 (VA integration - Data Upload to LASR)**

The following table describes the integration jobs.

Table 10.2 *SAS Visual Analytics Data Preparation ETL Job Details*

Job Name	Description
iow_0801_va_forecasted_demand	Creates the FORECASTED_DEMAND table in the IOVA library and populates the table with the forecasted data for product and location combinations.
iow_0802_va_order_details	Creates the ORDER_DETAILS table in the IOVA library and populates the table with the base order details.
iow_0803_va_promotional_order_details	Creates the PROMO_VENDOR_ORDER_DTLS and PROMO_STORE_ALLOC_ORDER_DTLS tables in the IOVA library and populates these tables with the promotional order details. These tables contain data about promotional orders that are suggested for vendors and customer-facing facilities.
iow_0804_va_inventory_performance	Creates the INVENTORY_PERFORMANCE table in the IOVA library and populates the table with data that is related to inventory metrics.
iow_0901_data_upload_to_LASR	Uploads the data from the IOVA library to SAS Visual Analytics.

SAS Visual Analytics Integration Tables

Introduction to SAS Visual Analytics Integration Tables

The data that you extract from SAS Inventory Optimization Workbench is stored in the following tables:

- FORECASTED_DEMAND
- ORDER_DETAILS
- PROMO_VENDOR_ORDER_DTLS
- PROMO_STORE_ALLOC_ORDER_DTLS
- INVENTORY_PERFORMANCE

When the ETL jobs are run, the data in these tables is refreshed and reloaded.

This section provides detailed information about the data sets.

FORECASTED_DEMAND

The FORECASTED_DEMAND table contains information about the forecasted demand for product and location combinations.

The following table describes the columns of the FORECASTED_DEMAND table.

Table 10.3 *Description of the FORECASTED_DEMAND Table*

Column Name	Description	Type
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
LOCATION_ID	Unique business key for the facility.	Char
LOCATION_NM	Name of the facility.	Char
MEAN	Mean of the demand for each product and facility combination pair.	Number
VARIANCE	Variance of the demand for each product and facility combination pair.	Number
MAPE	Mean absolute percent error.	Number

Column Name	Description	Type
PERIOD_START_DT	Start date for the time period. This is the starting date for the selected base period. The start date can be one of the following: **`Day`**, **`Week`**, **`Month`**, or **`Quarter`**.	Date

ORDER_DETAILS

The ORDER_DETAILS table contains information about the base orders.

The following table describes the columns of the ORDER_DETAILS table.

Table 10.4 *Description of the ORDER_DETAILS Table*

Column Name	Description	Type
NETWORK_MODEL_ID	Unique business key for the network.	Char
NETWORK_MODEL_NM	Name of the network.	Char
PRODUCT_ID	Unique business key of the product.	Char
PRODUCT_NM	Name of the product.	Char
LOCATION_ID	Unique business key for the facility.	Char
LOCATION_NM	Name of the facility.	Char
EMPLOYEE_ID	Unique business key for the employee.	Char
EMPLOYEE_NM	Name of the employee.	Char
VENDOR_NM	Name of the vendor.	Variable
VENDOR_ID	Unique business key for the vendor.	Variable
ORDER_SOURCE_ID	Unique business key for the source.	Variable
ORDER_SOURCE_NM	Name of the source.	Variable
FROM_LOCATION_ID	Unique business key for the facility from which the base order is placed.	Char
FROM_LOCATION_NM	Name of the facility from which the base order is placed.	Char

Column Name	Description	Type
ORDER_TYPE	Type of the order, such as primary or alternate.	Char
REPL_PLAN_TYPE	Type of the replenishment, such as complete, incomplete, or ad hoc.	Char
ALTERNATE_ORDER_TYPE	Type of the alternate order, such as primary, primary and alternate, partial, or incomplete.	Integer
LEAD_TM_DAYS	Lead time, in days.	Integer
ORDER_QTY	Order quantity.	Variable
TRANSFER_MODE	Transfer mode, such as road, air, or train.	Double
TRANSFER_COST	Cost of transfer.	Double
ORDERING_COST	Cost of placing the base order.	Integer
INVENTORY_EXCESS	Excess inventory in hand.	Integer
INVENTORY_SHORTAGE	Shortage of inventory.	Integer
PRIMARY_VENDOR_ID	Unique business key of the primary vendor.	Integer
KIT_PROD_IND	Kit product indicator.	Integer
KITTING_POINT_IND	Kitting point indicator.	Integer
MAX_ORDER_QTY	Maximum order quantity.	Integer
SAFETY_STOCK	Safety stock.	Double
OPTIMAL_ONHAND	Optimal on-hand inventory.	Double

PROMO_VENDOR_ORDER_DTLS

The PROMO_VENDOR_ORDER_DTLS table contains the information about the promotional orders that are suggested for vendors.

The following table describes the columns of the PROMO_VENDOR_ORDER_DTLS table.

Table 10.5 *Description of the PROMO_VENDOR_ORDER_DTLS Table*

Column Name	Description	Type
EMPLOYEE_ID	Unique business key for the employee.	Char
EMPLOYEE_NM	Name of the employee.	Char
PROMOTION_ID	Unique business key for the promotion.	Integer
PROMOTION_NM	Name of the promotion.	Integer
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
FACILITY_ID	Unique business key for the facility.	Variable
FACILITY_NM	Name of the facility.	Variable
VENDOR_ID	Unique business key for the vendor.	Variable
VENDOR_NM	Name of the vendor.	Variable
ORDER_STATUS	Status of the order. The value 0 indicates that the order is open. The value 1 indicates that the order is locked. The value 2 indicates that the promotion is in progress. The value 3 indicates that the order has been promoted. The value 4 indicates that an error occurred while the order was being promoted. The value 5 indicates that the order has been canceled. The value 6 indicates that the order is being evaluated. The value 7 indicates that the order has been evaluated. The value 8 indicates that the order failed evaluation.	Integer
BATCH_SIZE_QTY	Lot size of the product and facility.	Integer
MIN_ORDER_QTY	Minimum order quantity for the product and facility.	Integer
MAX_ORDER_QTY	Maximum order quantity for the product and facility.	Integer
FINALIZE_BY_DT	Date by which the promotional order needs to be finalized.	Date

Column Name	Description	Type
RECEIPT_DUE_DT	Receipt due date.	Date
SUGGESTED_ORDER_QTY	Total suggested order quantity.	Integer
FINAL_ORDER_QTY	Final order quantity.	Integer
ACTION_REQUIRED	Action that is required. The value `0` indicates that the order is under review. The value `1` indicates that the order is to be finalized. The value `2` indicates that no action is required.	Integer
ORDER_GEN_DT	The date on which the order was generated.	Date

PROMO_STORE_ALLOC_ORDER_DTLS

The PROMO_STORE_ALLOC_ORDER_DTLS table contains the information about the promotional orders that are suggested for customer-facing facilities.

The following table describes the columns of the PROMO_STORE_ALLOC_ORDER_DTLS table.

Table 10.6 *Description of the PROMO_STORE_ALLOC_ORDER_DTLS Table*

Column Name	Description	Type
EMPLOYEE_ID	Unique business key of the employee.	Char
EMPLOYEE_NM	Name of the employee.	Char
PROMOTION_ID	Unique business key for the promotion.	Integer
PROMOTION_NM	Name of the promotion.	Integer
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
FACILITY_ID	Unique business key for the facility.	Variable
FACILITY_NM	Name of the facility.	Variable
FROM_FACILITY_ID	Unique business key of the source.	Variable
FROM_FACILITY_NM	Name of the source.	Variable

Column Name	Description	Type
ORDER_STATUS	Status of the promotional order. The value 0 indicates that the promotional order is open. The value 1 indicates that the promotional order is locked. The value 2 indicates that the promotional order has been promoted.	Integer
BATCH_SIZE_QTY	Lot size for the product and facility combination.	Integer
MIN_ORDER_QTY	Minimum order quantity for the product and facility.	Integer
MAX_ORDER_QTY	Maximum order quantity for the product and facility.	Integer
FINALIZE_BY_DT	Date on which the promotional order suggested for the customer-facing facility is to be finalized.	Integer
RECEIPT_DUE_DT	Receipt due date.	Integer
SUGGESTED_ORDER_QTY	Total suggested order quantity.	Integer
FINAL_ORDER_QTY	Final order quantity.	Integer
ACTION_REQUIRED	The action required for the promotional order. The value 0 indicates that the promotional order is under review. The value 1 indicates that the promotional order has been finalized. The value 2 indicates that no action is required for the promotional order.	Integer
ORDER_GEN_DT	Date on which the promotional order was generated.	Date

Inventory Performance-Related Tables

About Inventory Performance-Related Tables

The information about the inventory performance is stored in different tables, depending on the networks and products. The following tables are created:

- INV_METRIC_DTLS_NETWORK_ANALYST
- INV_METRIC_DTLS_NETWORK_BUYER
- INV_METRIC_DTLS_PRODUCT_ANALYST
- INV_METRIC_DTLS_PRODUCT_BUYER

INV_METRIC_DTLS_NETWORK_ANALYST

The INV_METRIC_DTLS_NETWORK_ANALYST table contains detailed information about all products across networks that are associated with an analyst.

Table 10.7 *Description of the INV_METRIC_DTLS_NETWORK_ANALYST Table*

Column Name	Description	Type
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
LOCATION_ID	Unique business key for the facility.	Char
LOCATION_NM	Name of the facility.	Char
NETWORK_MODEL_ID	Unique business key for the network.	Char
NETWORK_MODEL_NM	Name of the network.	Char
PERIOD_START_DT	Start date for the time period. This is the starting date for the base period selected. The start date can be one of the following: **`Day`**, **`Week`**, **`Month`**, or **`Quarter`**.	Number
metric	The labels of the following KPIs: ■ ACT_SERVICE_LVL ■ TGT_SERVICE_LVL ■ ACT_LEAD_TIME ■ TGT_LEAD_TIME ■ INTERNAL_SALES ■ EXTERNAL_SALES ■ SALES ■ DEMAND ■ SAFETY_STOCK ■ REORDER_LEVEL ■ PIPLELINE_INVENTORY ■ ORDER_UPTO_LEVEL ■ ACT_INVENTORY_COST ■ ACTUAL_INVENTORY_QTY ■ PROMO_TGT_SL ■ PROMO_TGT_LT ■ PROMO_TGT_DEMAND	Char
value	Value of the KPI.	Number

INV_METRIC_DTLS_NETWORK_BUYER

The INV_METRIC_DTLS_NETWORK_BUYER table contains detailed information about inventory performance for all products that are associated with a buyer. The table contains detailed information about products that are located at all facilities within a network.

Table 10.8 *Description of the INV_METRIC_DTLS_NETWORK_BUYER Table*

Column Name	Description	Type
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
LOCATION_ID	Unique business key for the facility.	Char
LOCATION_NM	Name of the facility.	Char
NETWORK_MODEL_ID	Unique business key for the network.	Char
NETWORK_MODEL_NM	Name of the network.	Char
EMPLOYEE_ID	Unique business key for the employee.	Char
EMPLOYEE_NM	Name of the employee.	Char
PERIOD_START_DT	Start date for the time period. This is the starting date for the selected base period selected. The start date can be one of the following: **`Day`**, **`Week`**, **`Month`**, or **`Quarter`**.	Number

Column Name	Description	Type
metric	The labels of the following KPIs: ■ ACT_SERVICE_LVL ■ TGT_SERVICE_LVL ■ ACT_LEAD_TIME ■ TGT_LEAD_TIME ■ INTERNAL_SALES ■ EXTERNAL_SALES ■ SALES ■ DEMAND ■ SAFETY_STOCK ■ REORDER_LEVEL ■ PIPLELINE_INVENTORY ■ ORDER_UPTO_LEVEL ■ ACT_INVENTORY_COST ■ ACTUAL_INVENTORY_QTY ■ PROMO_TGT_SL ■ PROMO_TGT_LT ■ PROMO_TGT_DEMAND	Char
value	Value of the KPI.	Number

INV_METRIC_DTLS_PRODUCT_ANALYST

The INV_METRIC_DTLS_PRODUCT_ANALYST table contains detailed information about the inventory performance of all products that are associated with an analyst.

Table 10.9 *Description of the INV_METRIC_DTLS_PRODUCT_ANALYST Table*

Column Name	Description	Type
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
LOCATION_ID	Unique business key for the facility.	Char
LOCATION_NM	Name of the facility.	Char
PERIOD_START_DT	Start date for the time period. This is the starting date for the selected base period. The start date can be one of the following: **`Day`**, **`Week`**, **`Month`**, or **`Quarter`**.	Number

Column Name	Description	Type
metric	The labels of the following KPIs: ■ ACT_SERVICE_LVL ■ TGT_SERVICE_LVL ■ ACT_LEAD_TIME ■ TGT_LEAD_TIME ■ INTERNAL_SALES ■ EXTERNAL_SALES ■ SALES ■ DEMAND ■ SAFETY_STOCK ■ REORDER_LEVEL ■ PIPLELINE_INVENTORY ■ ORDER_UPTO_LEVEL ■ ACT_INVENTORY_COST ■ ACTUAL_INVENTORY_QTY ■ PROMO_TGT_SL ■ PROMO_TGT_LT ■ PROMO_TGT_DEMAND	Char
value	Value of the KPI.	Number

INV_METRIC_DTLS_PRODUCT_BUYER

The INV_METRIC_DTLS_PRODUCT_BUYER table contains detailed information about the inventory performance of all products that are associated with a buyer.

Table 10.10 *Description of the INV_METRIC_DTLS_PRODUCT_BUYER Table*

Column Name	Description	Type
PRODUCT_ID	Unique business key for the product.	Char
PRODUCT_NM	Name of the product.	Char
LOCATION_ID	Unique business key for the facility.	Char
LOCATION_NM	Name of the facility.	Char
EMPLOYEE_ID	Unique business key for the employee.	Char
EMPLOYEE_NM	Name of the employee.	Char

Column Name	Description	Type
PERIOD_START_DT	Start date for the time period. This is the starting date for the selected base period. The start date can be one of the following: **`Day`**, **`Week`**, **`Month`**, or **`Quarter`**.	Number
metric	The labels of the following KPIs: ■ ACT_SERVICE_LVL ■ TGT_SERVICE_LVL ■ ACT_LEAD_TIME ■ TGT_LEAD_TIME ■ INTERNAL_SALES ■ EXTERNAL_SALES ■ SALES ■ DEMAND ■ SAFETY_STOCK ■ REORDER_LEVEL ■ PIPLELINE_INVENTORY ■ ORDER_UPTO_LEVEL ■ ACT_INVENTORY_COST ■ ACTUAL_INVENTORY_QTY ■ PROMO_TGT_SL ■ PROMO_TGT_LT ■ PROMO_TGT_DEMAND	Char
value	Value of the KPI.	Number

Part 4

Appendix

Appendix 1

Metric Calculations

Calculations of Inventory Metrics and Thresholds

Lead Time

Overview

Lead time is the time required to physically deliver an order from the source location to the destination location. The different lead time values are explained in the following subsections.

Actual Lead Time

Actual lead time is the transit time (in days) between the supplying channel and the receiving location. An average of lead times is calculated over the period under consideration.

The derivation for the actual lead time is as follows:

Actual lead time = Average (Receipt date - Dispatch date) for the order for a facility and product pair

Consider the order receipts between the start date and end date of the previous period. If there is no delivery during that period, then the actual lead time is missing. Actual lead time values are also missing for current future periods.

Target Lead Time

Target lead time is the average transportation time (in days) that is measured over the past periods between the source facility and the destination facility. This value is obtained from the source system and is available in the arc data.

Percentage High Lead Time

The *percentage high lead time* is the percentage of the product-facility pairs for whom the actual lead time value is greater than the lead time maximum value.

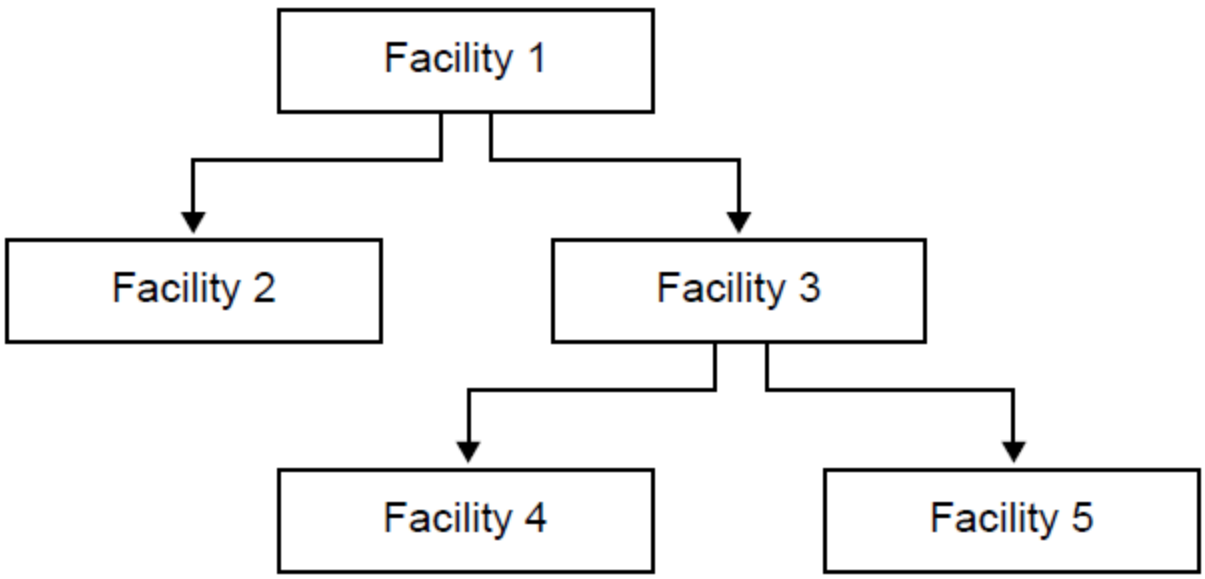
Percentage Low Lead Time

The *percentage low lead time* is the percentage of the product-facility pairs for whom the actual lead time is lower than the lead time minimum value.

Service Level

Overview

Service level is a measure of the fulfillment of customer demand. A facility fulfills the demand of internal facilities or of customer-facing facilities in a hierarchical network. For example, consider the network in the following figure:



In the above figure, consider the following points:

- Facility 1 is satisfying the demand of Facility 2 and Facility 3.
- Facility 3 is satisfying the demand of Facility 4 and Facility 5.
- Service level of Facility 1 is the service level that is delivered to Facility 2 and Facility 3.
- Service level of Facility 3 is the service level that is delivered to Facility 4 and Facility 5.

Actual Service Level

Actual service level is the observed service level. The average is calculated over the period under consideration. The actual service level values are missing for the current and future periods.

The derivation of the actual service level value is as follows:

- Consider all orders for a product in a facility for which the dispatch date exists in the previous period.
- The receipt type is used to determine the period boundaries for calculating the service level.
- For facility and product pairs with the LOOSE receipt control type, the dispatch date must be before or on the period end date of the previous period.
- For facility and product pairs with the TIGHT receipt control type, the dispatch date must be before or on the delivery due date.

To calculate the actual service level value for facility and product pairs for the period under consideration:

- If the dispatch quantity is greater than or equal to the customer order quantity, then the actual fill rate value = 1
- If the dispatch quantity is less than the customer order quantity, then the actual fill rate value equals the ratio of the dispatch quantity to customer order quantity.

The actual service level for a customer-specific service type (fill rate or ready rate) is calculated as follows:

- If the GL_IOW_SERVICE_TYPE parameter value is equal to the FR (fill rate), then the actual service level = fill rate.
- If service type = RR (ready rate) and if fill rate = 1, then actual service level = 1. For any other value of service level, the actual service level = 0.

Target Service Level

The *target service level* is the expected service level and is obtained from the customer data.

Percentage High Service Level

The *percentage high service level* is the percentage of the product-facility pairs for whom the actual service level is greater than the service level upper bound. The service level upper bound is calculated as (target service level) + (service level threshold defined in the GL_IOW_SERVICE_THRESHOLD_OFFSET parameter).

Percentage Low Service Level

The *percentage low service level* is the percentage of the product-facility pairs for whom the actual service level is less than the service level lower bound. The service level lower bound is calculated as (target service level) - (service level threshold defined in the GL_IOW_SERVICE_THRESHOLD_OFFSET parameter).

Demand

Sales

Sales is the total quantity of a product that is sold at a facility over the period under consideration. SAS Inventory Optimization Workbench calculates sales as the sum of internal sales and external sales.

Demand

Demand is the total order quantity that is forecasted over the period under consideration. The demand contains internal forecasted demand and external forecasted demand.

Percentage High Demand

The *percentage high demand* is the percentage of the product-facility pairs for whom the actual demand is greater than the upper bound of the forecasted demand. The upper bound of the forecasted demand is calculated based on the GL_IOW_DEMAND_THRESHOLD_COEF parameter.

Percentage Low Demand

The *percentage low demand* is the percentage of the product-facility pairs for whom the actual demand is less than the lower bound of the forecasted demand. The lower bound of the forecasted demand is calculated based on the GL_IOW_DEMAND_THRESHOLD_COEF parameter.

Inventory Quantity

Overview

Inventory quantity is calculated as follows:

Inventory quantity = Average [(daily opening stock of the facility-product pair + daily closing stock of the facility-product pair)/2]

Promotional Inventory Quantity

Promotional inventory quantity is calculated as follows:

Promotional inventory quantity = Average [(daily opening promotional stock of the facility-product pair + daily closing promotional stock of the facility-product pair)/2]

Actual Inventory Quantity

Actual inventory quantity is the sum of the inventory quantity and the promotional inventory quantity of the facility-product pair for the period under consideration.

Inventory Cost

Overview

Inventory cost is the cost of the inventory for the period under consideration. This value is the total aggregated cost of the inventory for a facility and product pair.

Actual Inventory Cost

The *Actual inventory cost* is calculated as follows:

Actual inventory cost = Cost * (actual inventory quantity for facility-product combination for the period under consideration)

Calculations of Replenishment Metrics

The replenishment metrics are displayed in the Orders workspace.

Here is a list of the metrics and their calculations:

Total Order Quantity
Total order quantity = Sum of suggested orders from primary channel and alternative channels

Total Number of Orders
Total number of orders = Total number of orders from primary channel and alternative channels

Total Cost
Total cost = Transfer cost + Holding cost + Penalty cost

Holding Cost
Holding cost = (Projected on-hand inventory + Projected future receipts) * Unit holding cost

Transfer Cost
Transfer cost = Total transfer cost from primary channel + Total transfer cost from alternate channels

where, transfer cost = fixed ordering cost per order + [lead time in multiples of base period * pipeline cost per unit * order amount]

Penalty Cost
Penalty cost = Inventory shortage * Unit penalty cost

Projected Service Level
Projected service level is based on the demand during protection intervals (DDPI).

DDPI = Lead time + Period between replenishments (PBR), if PBR > 1 and policy type is base stock

For other conditions, DDPI = Lead time + 1

If echelon = 1:
Projected service level = Average of the service level over the period DDPI, where the service level is not missing

If echelon > 1:

Projected service level = Average of the service level over the period DDPI excluding period 1, where the service level is not missing

Target Service Level

Target service level = Service level value as specified in the stage table

Service Level Upper Bound

Service level upper bound = Upper threshold value for the service level at a facility and product pair

Service Level Lower Bound

Service level lower bound = Lower threshold value for the service level at a facility and product pair

Calculations of the Scenario-Specific Metrics

The scenario-specific metrics are displayed in the Scenarios category.

Here is a list of the metrics and their calculations:

Inventory Units

Inventory Units = Order-up-to level

Inventory Cost

Inventory cost = Purchase cost

On-Hand Cost

On-hand cost = On-hand mean * product cost

On-Hand Holding Cost

On-hand holding cost = On-hand mean * Unit holding cost

Pipeline Cost

Pipeline cost = Pipeline mean * Pipeline cost amount

Total Cost

Total cost = On-hand cost + on-hand holding Cost + Pipeline cost

Average Forecast Demand Mean

Average forecast demand mean = External demand mean + Internal demand mean

Average Forecast Demand Variance

Average forecast demand variance = External demand variance + internal demand variance

Inventory Units

Inventory Units = Order up-to level

Appendix 2

Determining Inconsistencies in Stage Tables

SAS Inventory Optimization Workbench uses the Stage tables (including node, arc, demand, and inventory tables) for inventory optimization and replenishment. SAS Inventory Optimization Workbench provides you with a script to understand whether the data is consistent in the node, arc, demand, and inventory tables.

To determine whether there are inconsistencies in Stage tables:

1 In SAS Data Integration Studio, select **Tools** ▸ **Code Editor**. The Code Editor window appears.

2 In the Code Editor, type

```
%include "path of the script including file name";
```

Note: On Windows, the script is located at ***SASHome*\SASFoundation\9.4\invtoptsrv\sasmisc\iow_mirpdata_consistency_chks.sas**. On UNIX, the script is located at ***SASHome*/SASFoundation/9.4/misc/invtoptsrv/iow_mirpdata_consistency_chks.sas**.

For example, in the Code Editor window, type

```
%include "C:\Program Files\SASHome\SASFoundation\9.4\invtoptsrv\sasmisc
\iow_mirpdata_consistency_chks.sas";
```

3 Click **Run**.

After the script runs, the inconsistent records are reported in the ERR_INCONSISTENT_DATA table in the IOERROR library.

Recommended Reading

- *SAS Data Integration Studio 4.901: User's Guide*
- *SAS 9.4 Management Console: Guide to Users and Permissions*
- *Scheduling in SAS 9.4, Second Edition*
- *SAS Forecast Analyst Workbench 5.3: Administrator's Guide*

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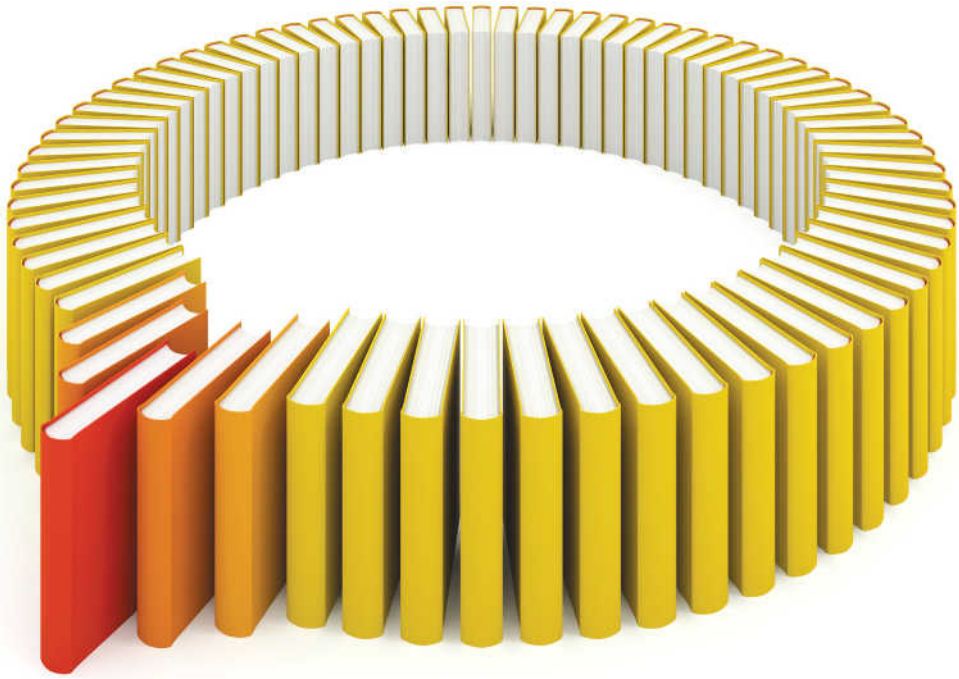

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