Introduction to SAS®
IT Resource Management 3.1.1

Contents

C H A P T E R

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Using This Guide

Accessibility

SAS IT Resource Management 3.1.1 includes the following accessibility and compatibility features that improve usability of the product for users with disabilities. These features are related to accessibility standards for electronic information technology that were adopted by the U.S. Government under Section 508 of the U.S. Rehabilitation Act of 1973, as amended.

SAS IT Resource Management 3.1.1 addresses two areas of 508 compliance:

□ Web accessibility compliance applies to browser-based content and Web-based applications.

□ Software accessibility compliance applies to software. In SAS IT Resource Management 3.1.1, software accessibility compliance applies to the SAS Data Integration Studio user interface. SAS IT Resource Management 3.1.1 uses the functionality of SAS Data Integration Studio and as such has the same accessibility features as that product. For information about these features, see *SAS Data Integration Studio: User's Guide*. This documentation is located at this address: **http://support.sas.com/documentation/onlinedoc/index.html**.

If you have questions or concerns about the accessibility of SAS products, send e-mail to **accessibility@sas.com**.

Accessing SAS IT Resource Management 3.1.1 Documentation

SAS IT Resource Management 3.1.1 uses the data integration and business intelligence functionality of the SAS Intelligence Platform. It supports a flexible multi-tier architecture. Like earlier versions of the software, the SAS IT Resource Management server runs on z/OS, UNIX, and Windows servers and the client components run in Windows desktop operating systems. The new SAS IT Resource Management middle tier runs on Windows and UNIX server environments.

SAS IT Resource Management provides other resources to assist you in using this product and in managing your IT resources. For information about these resources, see "Other Resources" on page 53.

Documentation about SAS IT Resource Management 3.1.1 is available in the form of online Help and also as Web-based, PDF documentation.

□ Online Help

This documentation is available for anyone who performs tasks with the user interface:

□ *SAS IT Management Solutions Help* and *SAS IT Resource Management Help*

In addition, as with all SAS products and solutions, online Help is available for all SAS technology products on which SAS IT Resource Management 3.1.1 is built.

□ The following Web-based PDFs can be accessed from `http://support.sas.com/itrm`.

This documentation consists of the following:

□ *Introduction to SAS IT Resource Management*

This document provides an overview of SAS IT Resource Management 3.1.1. It contains general information about the architecture of the software, the software components included, and the personas who use the software. It introduces the reader to the IT data mart, the adapters that stage the resource data, and the aggregation transformations that aggregate the data and prepare it for reporting. It also provides a general description of the reporting function.

The audience for this introductory document is anyone who works with SAS IT Resource Management 3.1.1 or who uses the reports that are generated by the software.

□ *SAS IT Management Solutions: Administrator's Guide*

This document contains detailed information about the tasks that are required to set up and manage the IT data mart. It also describes how to set up the IT Resource Management adapters so that they can process the IT resource data that is stored in the IT data mart. This guide provides information about how to work with simple and summarized aggregations.

The *Administrator's Guide* provides information about the other functional components of the software, such as the SAS Metadata Repository (SMR), information maps, and the like.

The audience for the *Administrator's Guide* consists of anyone who works with SAS IT Resource Management 3.1.1 as a data administrator or capacity planner.

□ *SAS IT Resource Management: Migration Documentation*

This document provides a description of the steps that are performed in order to move a site's processing from the earlier version of the software (SAS IT Resource Management 2.7) to the current version.

Documentation is available for the business intelligence and data integration components of the SAS Intelligence Platform and all the SAS products that are referenced in this product. To access this documentation, navigate to the Web site at this location: `http://support.sas.com/documentation/onlinedoc/index.html`. On this page, use the `Select a Product` drop-down menu to choose the documentation for the product or solution that you want to view. Then click `Go`.

SAS IT Resource Management Users

SAS IT Resource Management documentation is intended to address the needs of particular groups of people, based on their roles and on the tasks that they perform. Some organizations have different individuals performing the duties of each of these roles; others are organized so that one person handles several roles.

The documentation for this product is written for the following types of users:

Data Administrators
These users are responsible for building and managing the IT data marts, setting up adapters, handling the extract, transform, and load (ETL) processes, and preparing the data for reports. They often function as IT performance managers and capacity planners.

In general, data administrators work with the following products: Base SAS, SAS Management Console, SAS Data Integration Studio, SAS Information Map Studio, and SAS Information Delivery Portal. In addition, data administrators work with the job scheduler for their operating environments.

Power Analysts
These users are the people who understand how to analyze the IT resource measurement data that is managed by data administrators. They analyze this data in order to best benefit the business and to improve the utilization, availability, and performance of IT resources and the IT enterprise. They often function as capacity planners, system administrators, and business analysts. Their job responsibilities require them to design, generate, and view reports.

In general, power analysts work with Base SAS, SAS Enterprise Guide, SAS Information Map Studio, SAS Web Report Studio, and SAS Information Delivery Portal.

Information Consumers
These users are high-level business people who are interested in the overall performance aspects of IT at a company. They often function as corporate IT executives. They use the reports that are generated by SAS IT Resource Management to support executive-level decision-making. They need to access the reports from the office as well as from remote locations.

In general, information consumers work with Web Report Studio, SAS Add-In for Microsoft Office, and SAS Information Delivery Portal.

The following table summarizes each role and the documentation that is applicable to support the functions that are associated with that role.

Table 1.1 Documentation That Is Useful per Role

This Person	Uses This Documentation
Data Administrator	Introduction to SAS IT Resource Management
	SAS IT Resource Management: Administrator's Guide
	Online Help for SAS IT Resource Management
	Online Help for SAS IT Management Solutions
	Online Help for SAS Data Integration Studio
	SAS Data Integration Studio: User's Guide
	SAS Information Map Studio documentation
	SAS Information Delivery Portal documentation
	SAS Intelligence Platform: Administration Guide, which contains information about SAS Web Report Studio
	SAS Management Console: User's Guide
	Other SAS documentation as required
Power Analyst	Introduction to SAS IT Resource Management
	Online Help for SAS Enterprise Guide
	SAS Enterprise Guide documentation
	SAS Information Map Studio documentation
	SAS Intelligence Platform: Administration Guide, which contains information about SAS Web Report Studio
	SAS Web Infrastructure Kit: Developer's Guide, which includes documentation about SAS Information Delivery Portal
	Other SAS documentation as required
Information Consumer	Introduction to SAS IT Resource Management
	SAS Intelligence Platform: Administration Guide, which contains information about SAS Web Report Studio
	SAS Web Infrastructure Kit: Developer's Guide, which includes documentation about SAS Information Delivery Portal
	Other SAS documentation as required
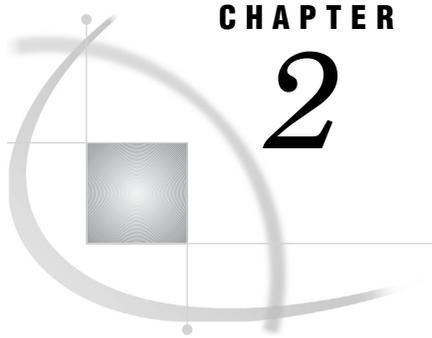
CHAPTER
2

About SAS IT Resource Management

Overview of SAS IT Resource Management

The effective management of IT resources is a critical function for today's businesses. An IT department must manage and plan the usage of its resources so that it can provide a stable yet scalable information processing environment for its current and future operations. An IT department must also provide enough information about the performance of IT resources so that the enterprise's decision makers can make the right decisions, keeping the business competitive and responsive to its customers. To accomplish these objectives, IT managers need to access, manage, integrate, manipulate, and analyze large quantities of performance data about many resources, such as hardware, operating system software, networks, Web servers, databases, and applications. The IT performance data is generated by the logging mechanisms that are inherent to IT resources or is created by the Enterprise Systems Management tools that are used to manage the IT infrastructure. IT performance evaluation software requires technology that can work with performance data from these many different sources, summarize and analyze that data, and provide reports that permit quick and accurate analyses of a company's IT resources from both current, historical, and forecasted perspectives.

The SAS solution to this critical business challenge is SAS IT Resource Management. SAS IT Resource Management can be used to resolve a variety of systems management challenges within an organization. It provides the functionality to do the following tasks:

☐ Establish IT data marts that contain all the resource management data that is associated with an enterprise.

☐ Define aggregation transformations that are specific to a site's reporting requirements.

☐ Create common references to common measurements that are available in disparate data sources in order to ensure that the IT data mart provides an independent set of measurements that can be analyzed across the IT enterprise.

☐ Provide graphical and textual reports that contain all the information that is needed to manage current day IT operations.

☐ Use SAS IT domain knowledge for performance management, capacity planning, IT resource forecasting, peak period and seasonality analysis, workload analysis, and enterprise IT performance summaries that complement existing IT utilization, availability, and performance analysis capabilities.

□ Provide a variety of report output mediums to accommodate the needs of the data administrators, power analysts, and high-level information consumers.

To satisfy these requirements, SAS IT Resource Management supports many popular network and systems management tools across the Windows, UNIX, and z/OS operating environments. It also takes advantage of SAS®9 and the enterprise-class solutions that SAS®9 provides, such as:

□ SAS Data Integration Studio

This solution provides flexible data integration services for most data sources. These services perform most of the data preparation and aggregation work that is needed to analyze and report on resource performance. These services enable you to perform the following tasks:

□ Create and maintain the IT data marts that are the containers for the information maps, the extract, transform, and load (ETL) jobs, the tables, the templates, the data, and the libraries that are created by or used by SAS IT Resource Management.

□ Create and run the processes that stage data in preparation for use by the aggregation transformations.

□ Calculate new fields of data from the input data.

□ Create and run the processes that aggregate the data.

□ SAS Statistics and Econometric Time Series

This solution provides a complete set of SAS statistical methods for IT data analysis.

□ SAS Enterprise Guide

This solution provides comprehensive reporting definition services. Report definitions that are created in this solution can be run interactively within SAS Enterprise Guide, or they can be scheduled to run in batch mode.

□ SAS Business Intelligence Platform

This platform uses the SAS Foundation technology, which includes the following software: Base SAS, SAS/GRAPH, SAS/STAT, the Output Delivery System (ODS), and other technologies. It also uses the following components:

□ SAS Information Map Studio: This product provides the functionality that is necessary to design reports using business-oriented terminology.

□ SAS Metadata Repository: This repository of centralized metadata stores information about the objects that are created and used by SAS IT Resource Management, such as IT data marts, ETL jobs, information maps, report jobs, and more.

□ SAS Web Report Studio: This Web-based, interactive query and analysis tool simplifies and standardizes access to and reporting of performance evaluation information.

□ SAS Information Delivery Portal: This open Java portal is a customizable portal that provides corporate decision makers with easy access to the data that is most pertinent to them by means of reports and dashboards, such as key performance indicators (KPIs), filter reports, and more. SAS Information Delivery Portal enables the selective and secure dissemination of information throughout an organization.

□ SAS Add-In for Microsoft Office: This product enables integration with commonly used Microsoft products such as Microsoft Word and Microsoft Excel.

For a more detailed list of the components that constitute SAS IT Resource Management, see Appendix 3, "Required Components," on page 59.

Stepping through the SAS Solution

SAS IT Resource Management provides the processes and the supporting technology that are required to regularly collect, aggregate, and report on the IT performance evaluation data that is vital to the health of an enterprise. A general description of these processes and the technology that supports these processes is available in the remainder of this document. More detailed information about how to manipulate the supporting technology is available in the *SAS IT Management Solutions: Administrator's Guide*.

To start SAS IT Resource Management 3.1.1 from the Windows Start menu, select **Programs ▶ SAS ▶ SAS Data Integration Studio**.

In general, the processes that gather and monitor IT performance evaluation data consist of these steps:

1 *Collect the raw data about a resource.*

IT performance data is information about IT resources, such as hardware, operating system software, networks, Web servers, databases, and applications. Raw (or unprocessed) data about the usage or performance of these resources is generated by the logging mechanisms that are inherent to IT resources or is created by the Enterprise Systems Management tools that are used to manage the IT infrastructure. The raw data is input to SAS Data Integration Studio transformations that are supplied with SAS IT Resource Management software.

2 *Process (stage) the raw data.*

The raw data is processed (or staged) by adapters that are tailored to the data sources that they process. The adapter's staging code performs functions such as normalizing measurement units, generating computed columns from the raw data, and checking for duplicate data. Staging is performed by *transformations* that are set up in SAS Data Integration Studio. The job that actually executes the transformation can run interactively or can be scheduled to run in batch mode, depending on the requirements of your enterprise.

A unique staging transformation is supplied for each adapter that is supported by SAS IT Resource Management. It contains the code and the associated templates that are needed to process and load the raw data into staged tables that can be used as input to an aggregation transformation or other SAS Data Integration Studio transformations.

For a list of the adapters that are supported by SAS IT Resource Management 3.1.1, see "Types of Adapters" on page 32.

Note: For more information about user-written adapters, see *SAS IT Management Solutions: Administrator's Guide* that is located here: **http://support.sas.com/itrm**. △

3 *Aggregate the staged tables.*

After the raw data is staged, it can be input to the aggregation step. *Aggregation transformations* can generate summarized aggregation tables or simple aggregation tables. Simple aggregations read data from the staged table and append that new data to an existing table without undergoing any summarization. Summarized aggregations read data from the staged table and then categorize and aggregate that data according to the specifications of the aggregation transformation. Aggregation transformations are created, updated, and scheduled for execution in SAS Data Integration Studio.

An aggregation transformation can contain multiple aggregations that each generate an aggregated table of data. SAS IT Resource Management provides the ability to customize aggregations based on a site's requirements. Aggregations can be customized to perform multi-step calculations that calculate additional columns of data or support any time periods that are needed. An unlimited number of aggregations can be created for each staged table. For example, the same data source can be input to both a daily aggregation and a weekly aggregation within the same or separate aggregation transformations.

After the performance data has been aggregated, it is ready for the reporting processes.

4 *Generate information maps.*

For a supported adapter, SAS Data Integration Studio generates transformations that create information maps that reference the tables of data that are generated by that adapter's aggregation transformations. Information maps provide clearly labeled references for all data fields that are used to create and view reports. Information maps can be used in SAS Enterprise Guide and SAS Enterprise Business Intelligence applications such as SAS Web Report Studio in order to generate reports that provide domain intelligence about the adapters, such as CPU utilization, threshold analysis, and peak period analysis.

5 *Define the reports for the summarized data.*

SAS Enterprise Guide can generate tabular and graphic reports by using information maps or by directly accessing data in the aggregation tables. SAS Enterprise Guide can also be used to create stored processes. Stored processes are SAS programs that can contain instructions for rendering report elements as part of a larger report. They can also render complete reports that include queries, prompted filters, titles, images, and statistical analyses. Stored processes can be executed by client applications such as SAS Web Report Studio.

Report definitions can be run from SAS Enterprise Guide and the resulting reports can be viewed interactively from the SAS Enterprise Guide Project window.

6 *Use ad hoc reporting.*

Ad hoc reporting of a company's performance data is provided through SAS Web Report Studio, which is a Web-based interface that can access data directly or that can use information maps to select and report on data. Information maps are generated by the information map transformations. They present to the information consumer and power analyst a logical, business-oriented representation of data. In other words, by using SAS Web Report Studio with an information map, an information consumer or a power analyst does not have to understand the physical table names and fields that are associated with the data that is being manipulated. Instead, these people can quickly and easily create and view reports that communicate utilization, availability, and performance intelligence for IT resources and the IT enterprise.

7 *Use Microsoft Office products.*

SAS Add-In for Microsoft Office enables SAS functionality to be accessed directly from the menus and toolbars of Microsoft Office word processing and spreadsheet products.

Power analysts and information consumers who frequently work with Microsoft Office products such as Microsoft Word and Microsoft Excel can use SAS to access, analyze, and report on IT performance data that is available in information maps, and then distribute the results to other people in the enterprise.

8 *View the reports.*

The reports that have been generated can be viewed on the Web through SAS Information Delivery Portal.

For more detailed information about these procedures, see the *SAS IT Management Solutions: Administrator's Guide* that is located here: **http://support.sas.com/itrm**.
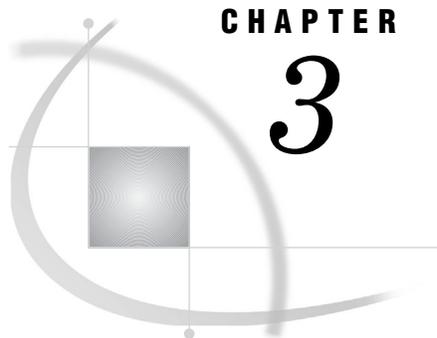
CHAPTER

3

The Architecture of SAS IT Resource Management 3.1.1

About the SAS Intelligence Platform

SAS IT Resource Management 3.1.1 runs on and uses the functionality of the data integration and business intelligence components of the SAS Intelligence Platform. The SAS Intelligence Platform is a comprehensive, end-to-end infrastructure for creating, managing, and distributing enterprise intelligence. It offers a fully integrated suite of software that can process input data from most sources, manage and analyze that data, and display the data by means of reporting and delivery tools.

It includes tools and interfaces that enable data administrators, information producers, and information consumers to do the following:

- extract data from a variety of operational data sources on multiple platforms and build a data collection that integrates the extracted data

- store large volumes of data efficiently and in a variety of formats

- give business users at all levels the ability to explore data from the warehouse in a Web browser, to perform simple query and reporting functions, and to view graphical and textual results of complex analyses

- provide business users with access to Microsoft Word and Microsoft Excel

- provide for the delivery and distribution of reports and other information by means of a customizable Web-based portal

- use high-end analytic techniques to provide capabilities for forecasting, optimization, simulation, and experimental design

- centrally control and administer the enterprise data to ensure its accuracy and consistency

- create and execute stored processes

The SAS Intelligence Platform also supports the requirements of the comprehensive SAS IT Resource Management application. To do so, it supplies additional processing capabilities to one of the standard SAS business intelligence applications, primarily SAS Data Integration Studio.

Note: For more information about the data integration and business intelligence components of the SAS Intelligence Platform, see the documentation that is available for this topic at this Web site:
http://support.sas.com/documentation/configuration/913admin.html. △

Using the Components of the SAS Intelligence Platform

## Overview of SAS IT Resource Management Architecture

SAS IT Resource Management uses data integration and business intelligence components that are provided by the SAS Intelligence Platform as well as additional software that was designed specifically for the processing of IT resource data. At installation time, users can deploy these components across multiple tiers. Using a multi-tier architecture to separate major software functions supports flexible processing schemes. The following functions can be supported on the tiers that SAS IT Resource Management uses:

- □ The client tier provides the interface between the user and SAS IT Resource Management. The client software enables you to perform data administration tasks, build reports, and view reports.
- □ The middle tier provides server support for Java applications.
- □ The server tier provides services that access data and perform background processing such as managing the metadata, executing stored processes, and performing resource aggregation calculations. In addition, the files and tables that are input to and generated by the software reside on the server.

With multi-tier processing, all tiers can run on a single machine. Alternatively, the tiers can be separated so that the processing can be done on multiple machines. Because the SAS IT Resource Management server can run in Windows, UNIX, or z/OS operating environments, its software components can be installed on different machines according to the site requirements of an enterprise. For example, in a Windows environment, all of the processes that are needed by SAS IT Resource Management can be installed on a single PC. Other sites might prefer to install the client applications and middle tier on a PC and install the remaining components on the mainframe. Another option is to install the components needed for Web-based functions on a UNIX processor. The SAS representative can discuss these options and ensure the most appropriate configuration for a site.

The following diagram displays the architectural components that constitute the clients, middle tier, and servers that are used by SAS IT Resource Management.

Figure 3.1   Tiered Architecture of SAS IT Resource Management
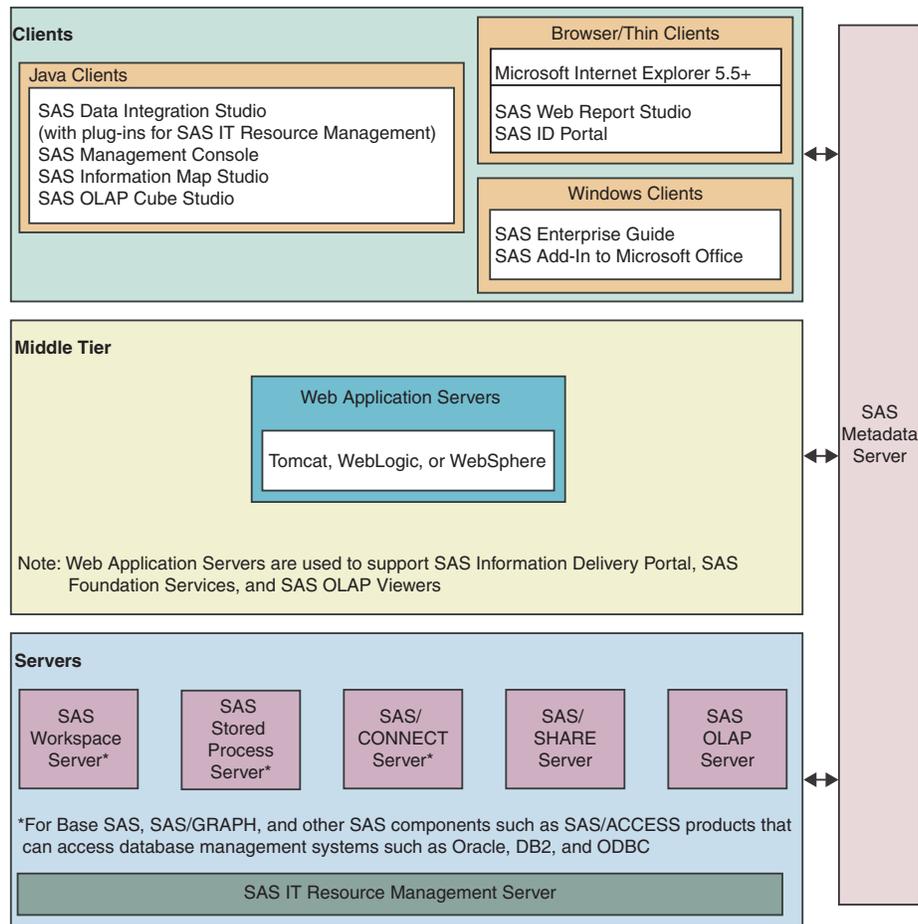
Note: The multiple tiers shown in this diagram represent categories of software that perform similar functions. They do not necessarily represent separate processors. In addition, your site might not need to use all of these software components. For example, if your site does not use the SAS Add-In for Microsoft Office, you do not need to install it. △

SAS IT Resource Management components are distributed across the client tier, middle tier, and server tier as shown in the following sections.

The Client Tier

For SAS IT Resource Management, the client tier runs in Windows desktop operating systems and hosts the following client applications:

☐ Browser Client applications

   ☐ *SAS Management Console* provides the data administrator with a single point of access to the system management tasks that are required by SAS IT Resource Management. It enables data administrators to perform the tasks that create and maintain an integrated environment, such as managing server, library, and user definitions. It also manages resource access controls, metadata repositories, SAS licenses, job schedules, and XML maps.

To perform these administrative tasks, SAS Management Console creates and maintains metadata definitions, which are stored in a repository on a SAS Metadata Server. From there, they can be accessed by other applications.

□ *SAS Data Integration Studio with SAS IT Resource Management plug-ins* is the primary interface for the data administrator. It is a visual design tool that enables data administrators or power analysts to construct, execute, maintain, and reuse processes that manipulate data.

SAS Data Integration Studio provides extensive transformations for data manipulation along with a single point of control for managing data integration processes. It enables the data administrator and the power analyst to define and execute jobs that process the raw data that has been collected by external third-party software. These jobs consist of transformations that input, stage, convert, and aggregate the data. SAS Data Integration Studio can generate SAS code so that these jobs can be scheduled and run in a batch environment.

SAS Data Integration Studio also enables the data administrator to create new repositories.

□ *SAS Information Map Studio* enables the data administrator and the power analyst to define information maps that describe the variables that can be used for analysis and reporting purposes. Information maps consist of metadata that translates physical data into informative terms that can be accessed and analyzed by business users.

Power analysts can use SAS Information Map Studio to modify the information maps that were generated by the SAS IT Resource Management plug-ins to SAS Data Integration Studio. By providing business users with a nontechnical method for working with physical data, SAS Information Map Studio enables them to create ad hoc reports without requiring assistance from the IT department.

□ *SAS OLAP Cube Studio* provides a user interface for data designers who design online analytical processing (OLAP) data sources. An OLAP cube provides a hierarchical, multidimensional database structure that stores summarized numerical information so that those values can be easily and quickly accessed for queries and reports.

□ Installed applications

□ *SAS Enterprise Guide* is the primary tool for creating report definitions. SAS Enterprise Guide is a Windows application that uses a wizard to provide power analysts and information consumers with quick and easy access to the SAS System. It enables users to create report definitions that access, manage, transform, analyze, aggregate, and report on their data. With its interface to SAS/GRAPH, SAS Enterprise Guide can generate definitions for both textual and graphic reports.

The report definitions can be run interactively. Alternatively, the SAS Enterprise Guide project or process flows within the project can be scheduled to run in batch on your Windows environment. In addition, the stored process server that is available in SAS®9 makes it possible for multiple users to share the definitions, programs, and processes that have been defined in SAS Enterprise Guide.

Note: SAS Enterprise Guide is an important part of the SAS Intelligence Platform; it is available as a stand-alone product. △

□ *SAS Add-In for Microsoft Office* enables power analysts and information consumers to access SAS functionality directly from Microsoft Office. By

means of toolbars and menus, information producers and consumers can access, analyze, and report on SAS data from toolbars and menus that are integrated with Microsoft Office, thus extending the processing capabilities of Microsoft Word and Microsoft Excel. In addition, stored processes that execute SAS code can be executed from the Microsoft Office applications.

Microsoft Office can also be used to distribute the documents to the relevant decision makers.

□ Browser applications

□ *SAS Web Report Studio* enables power analysts and information consumers to view, author, and share IT resource management reports on the Web. Users can also create new reports, edit existing reports, and filter the results. In addition, SAS Web Report Studio can execute stored processes that were created in SAS Enterprise Guide.

This tool in conjunction with information maps enables decision makers to create and view ad hoc reports without requiring the services of the IT staff.

□ *SAS Information Delivery Portal* provides power analysts and information consumers with the ability to access reports that were generated by SAS IT Resource Management and by the business intelligence components of the SAS Intelligence Platform products. SAS Information Delivery Portal can also execute stored processes that were created in SAS Enterprise Guide in order to report on IT data.

Using role-based security, the Web-based interface of the portal can be customized so that it supplies sensitive content only to authorized users. The information can be shared among users within an organization and among external customers, vendors, and partners. In addition, SAS Information Delivery Portal supports various languages that enable it to accommodate global and multinational enterprises.

The Middle Tier

The processes and applications on this tier can provide connections between the client and server tiers, if they are required. In particular, the role of the middle tier is to provide the functionality that is required for Web-based processing. Middle-tier applications include both third-party and SAS software elements. They are installed and configured as components of the SAS Intelligence Platform. SAS IT Resource Management users do not access these components directly.

The following products are components of the middle tier:

□ SAS Foundation Services

SAS Foundation Services provide the infrastructure that enables Java programmers to write distributed applications for the SAS platform. These services include connecting clients to SAS application servers, managing those connections, authenticating users, managing sessions and profiles, logging activity, and accessing metadata and content repositories.

□ SAS Web Infrastructure Kit

This kit contains a set of common Java infrastructure components and SAS Foundation Services components that can be used to create Web-based applications (or portlets) that use SAS Information Delivery Portal. Information consumers can use the components of this kit to customize SAS Information Delivery Portal.

□ Java 2 Software Development Kit, Standard Edition (J2SE SDK)

The Java 2 Software Development Kit provides the software that is required to perform run-time compilations of the Java servlets that support products such as SAS Web Report Studio, SAS Information Delivery Portal, and other SAS solutions.

□ Java Servlet Container

The Java servlet container provides the technology to process Java Server Pages and servlets. Java Server Pages and Java Servlets perform tasks that support SAS Web applications.

□ SAS Application Services

SAS Application Services provide business-oriented query and reporting services to the applications that are running on the client tier.

Note: The services required by Web applications can be provided by any of the following products:

□ IBM Websphere (Web infrastructure kit)

□ BEA Weblogic (Java Servlet container)

□ Tomcat (Java Servlet container)

△

The Server Tier

The role of the server is to supply data access and the analytical and report processing that an application requires. Servers can be accessed directly by client applications or by Web-based applications on the middle tier in order to fulfill requests from client applications for data and services.

The following servers are required for the data integration and business intelligence components of the SAS Intelligence Platform:

□ SAS Metadata Server

This server provides centralized access to the metadata that is created by and used by the SAS applications. The SAS Metadata Repository (SMR) is a server that is accessed by all tiers in order to store, access, and manage enterprise metadata, including SAS IT Resource Management metadata objects. It manages the following information:

□ where SAS servers are deployed and how they are configured

□ the location of SAS data and how to access it

□ the attributes of the data, such as types, formats, and dimensions of the tables that contain the data

□ generic and deployed applications

□ documents, users, processes, and jobs, such as ETL processes

□ security issues, such as credentials, user identities, groups, and roles

□ SAS Workspace Server

This server provides access to SAS Foundation features such as the SAS programming language and SAS libraries.

□ SAS OLAP Server

This server provides access to multidimensional data.

□ SAS Stored Process Server

This server is used to fulfill client requests for SAS Stored Processes. A SAS Stored Process is a SAS program that is stored in a central location and can be executed as needed by other programs.

□ SAS/ACCESS

This set of products provides SAS software with direct access to the data in an external database management system (DBMS). They also make SAS data directly available to the DBMS.

□ SAS/CONNECT Server

This server provides computing services to a remote client. For example, SAS Data Integration Studio uses SAS/CONNECT software in order to submit its generated SAS code to remote computers for processing.

□ SAS/SHARE Server

This server controls and executes input and output requests to one or more SAS libraries. It runs in a separate SAS session.

□ Other SAS Foundation servers (as needed)

□ SAS Adapter for SAP

Note: The SAS Adapter for SAP is optional. It is needed only if SAP data is to be processed. △

For SAS IT Resource Management, all data resides on the server tier. The data on this tier includes IT resource data, staged tables and templates, summarized tables, IT data marts, and all data that is created by and used by SAS IT Resource Management.

Processing IT Resource Data

Introduction to Processing IT Resource Data

SAS IT Resource Management has the technical sophistication and flexibility to support customers whose usage of the product can range from the basic to the highly complex. Information consumers can work with specialized tools to access their IT data directly and generate ad hoc reports. Information consumers can use these reports to answer specific questions about the health and efficiency of the enterprise's IT resources. In all cases, the raw data for the resources that are being evaluated must be staged and aggregated. The resulting tables are input to the reporting processes.

The following information describes the preliminary tasks that must be performed in order to use SAS IT Resource Management 3.1.1. It also supplies several scenarios that show how this solution can be used to manage a site's IT resources:

□ *Preliminary Tasks*

Before the staging and aggregating processes can run, the data administrator uses SAS Management Console to perform the following setup tasks:

□ Connect to the metadata server.

□ Define new workspace servers.

□ Add users and groups to the online SAS metadata repository (SMR).

The data administrator can ensure the security of the data and the reports by creating user groups. These groups determine how members of the groups can access the various components of the system.

□ Modify the default Access Control Template (ACT) for users or groups.

Note: The Access Control Template consists of a list of users and groups and indicates, for each user or group, whether permissions are granted or denied. The ACT can be applied to multiple resources. For example, a site might enable all users of SAS IT Resource Management to perform functions so that users can define and work with information maps. Enabling all users to work with information maps is accomplished by granting the user or the

group permission to read and write metadata and to read and delete data from the resource that is described by the metadata.   △

☐ Define WebDAV content mapping for use by a SAS IT Resource Management folder.

The HTTP server that WebDAV requires in order to be used by SAS Web Report Studio and other SAS Business Intelligence Platform applications must be configured so that its content and its metadata are synchronized and are compatible with the file structure of SAS IT Resource Management.

For more information about these tasks, see *SAS IT Management Solutions: Administrator's Guide* that is available at this Web site: **http://support.sas.com/itrm**.

After this initial setup is completed, SAS IT Resource Management can process and evaluate IT resource data.

☐ *Usage Scenarios*

SAS IT Resource Management is a software product that works with data integration and business intelligence components of the SAS Intelligence Platform. Its architecture supports many different levels of usage and customer involvement. The following topics contain only a few of the many scenarios that describe how SAS IT Resource Management can be used to manage an enterprise's IT resources:

☐ "Creating and Accessing Reports Interactively" on page 19

☐ "Generating Customized Reports on the Web" on page 21

☐ "Accessing Microsoft Office Products" on page 22

Customers can modify the processes described in these scenarios to suit the needs of their own enterprises.

Creating and Accessing Reports Interactively

After the setup tasks have been performed, SAS IT Resource Management can be run as shown in the following diagram. This processing can be performed without any customizations. In this scenario, SAS Data Integration Studio is used to define the transformations that, when executed, will process the data. SAS Enterprise Guide is used to generate report definitions, which are run interactively. The resulting reports can be viewed interactively.

Figure 3.2   Creating and Accessing Reports Interactively
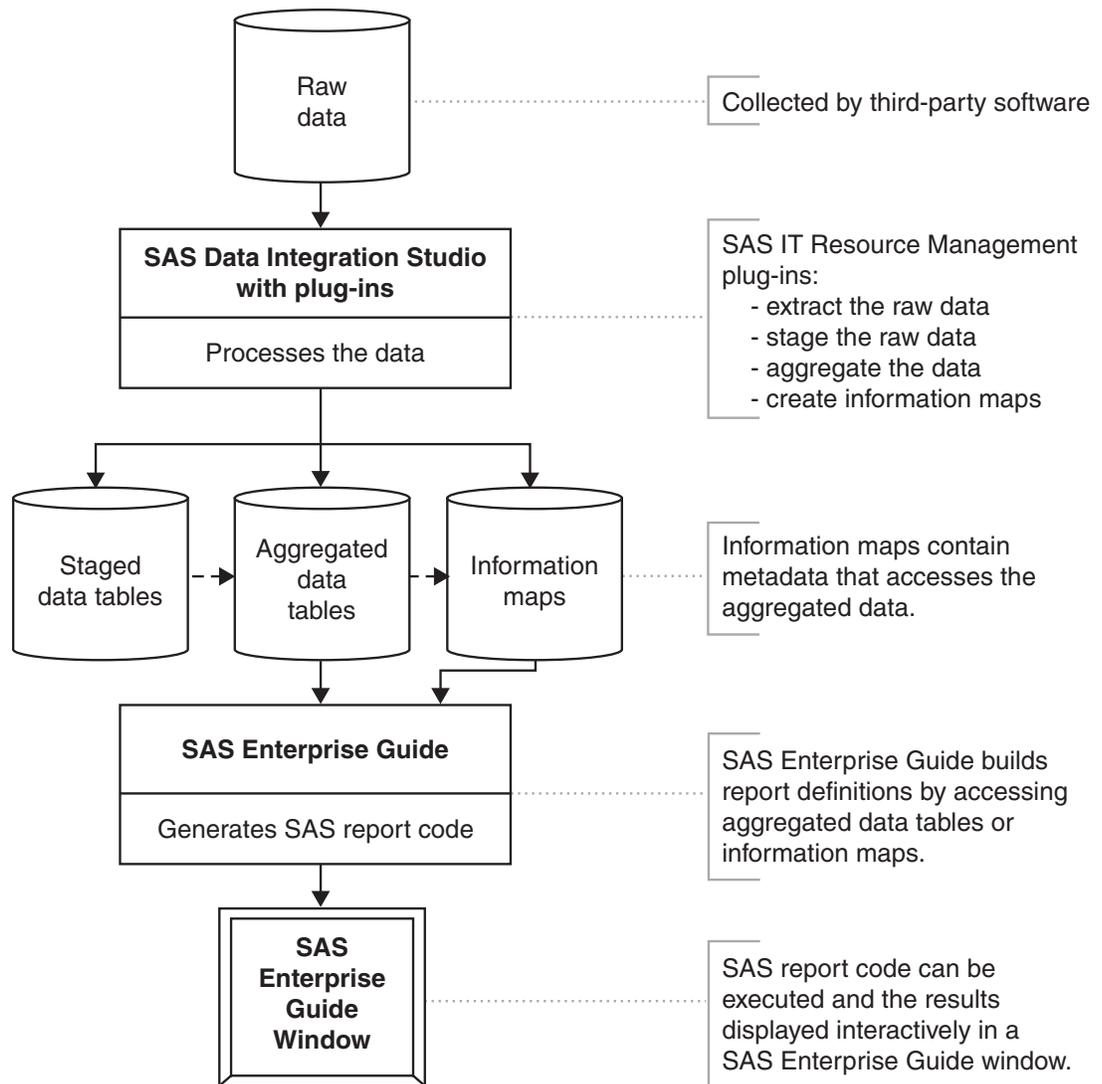
According to this basic scenario, the following processing occurs:

1 For supported adapters, SAS Data Integration Studio with SAS IT Resource Management plug-ins runs transformations that accomplish the following tasks:

   a Stage the raw data.

The raw data is performance data about IT resources that is generated by the logging mechanisms that are inherent to IT resources or that is created by the Enterprise Systems Management tools that are used to manage the IT infrastructure. The raw data is processed by a supplied adapter that is specific to the IT data that is being evaluated. The transformations that are invoked by the adapter extract the raw data, perform any calculations and conversions that are required by that adapter, and load (stage) the resulting data into tables in the IT data mart.

b Aggregate the staged data.

The staged data is aggregated according to specifications of the supplied adapter. The data is also manipulated in order to generate any additional information that is needed for the purposes of IT performance management and capacity planning. These data manipulations can include calculating weighted and non-weighted statistics, ranking columns, computing new columns, and more.

c Create basic information maps.

Information maps describe the aggregated data in terms that make sense to power analysts. SAS Enterprise Guide, SAS Web Report Studio, and other reporting software use information maps to generate reports.

2 SAS Enterprise Guide generates reports. Analysts can view the resulting reports interactively in a SAS Enterprise Guide window.

Generating Customized Reports on the Web

Power analysts can use the business intelligence components of the SAS Intelligence Platform in order to create information maps that can be used to generate ad hoc reporting as shown in the following diagram.

Figure 3.3   Generating Ad Hoc Reports
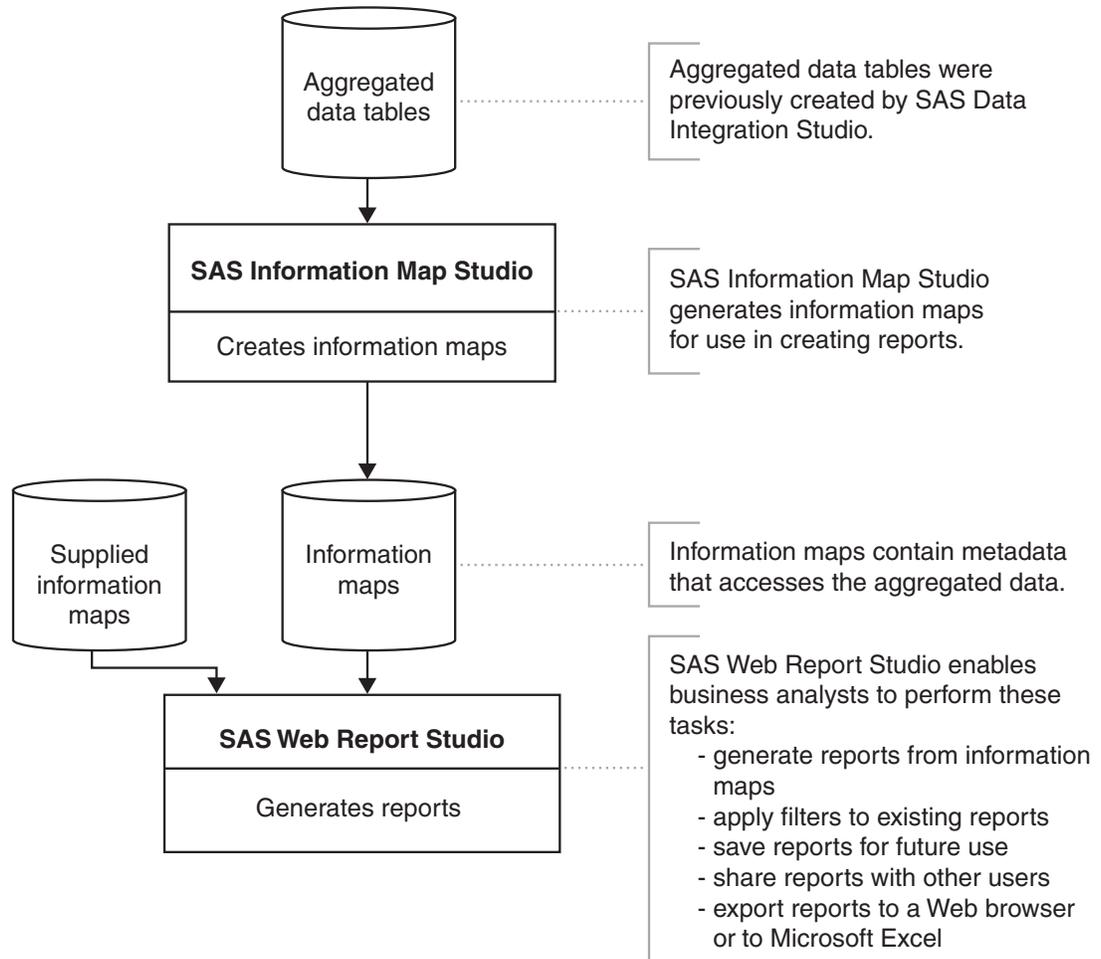
According to this scenario, the data has already been staged and aggregated so that power analysts can define and generate customized reports. The following processing occurs:

1 Power analysts use SAS Information Map Studio to access an aggregated table. By using this product, they can define information maps that contain the data that they want to analyze.

2 Power analysts use SAS Web Report Studio to access the information maps that were created in the previous step. By using this product, they can create report definitions. After they have specified the contents and the structure of the reports, power analysts can apply filters to the results in order to provide a more focused evaluation of the data.

Accessing Microsoft Office Products

SAS Add-In for Microsoft Office is a business intelligence component of the SAS Intelligence Platform that enables power analysts to access the reporting and analysis features of SAS within Microsoft Office Products such as Microsoft Word and Microsoft Excel. Using the SAS Add-In for Microsoft Office option in Microsoft Word or Microsoft Excel, power analysts can execute stored processes that were created in SAS Enterprise Guide as shown in the following diagram.

Figure 3.4   Accessing Data with SAS Add-In for Microsoft Office Products
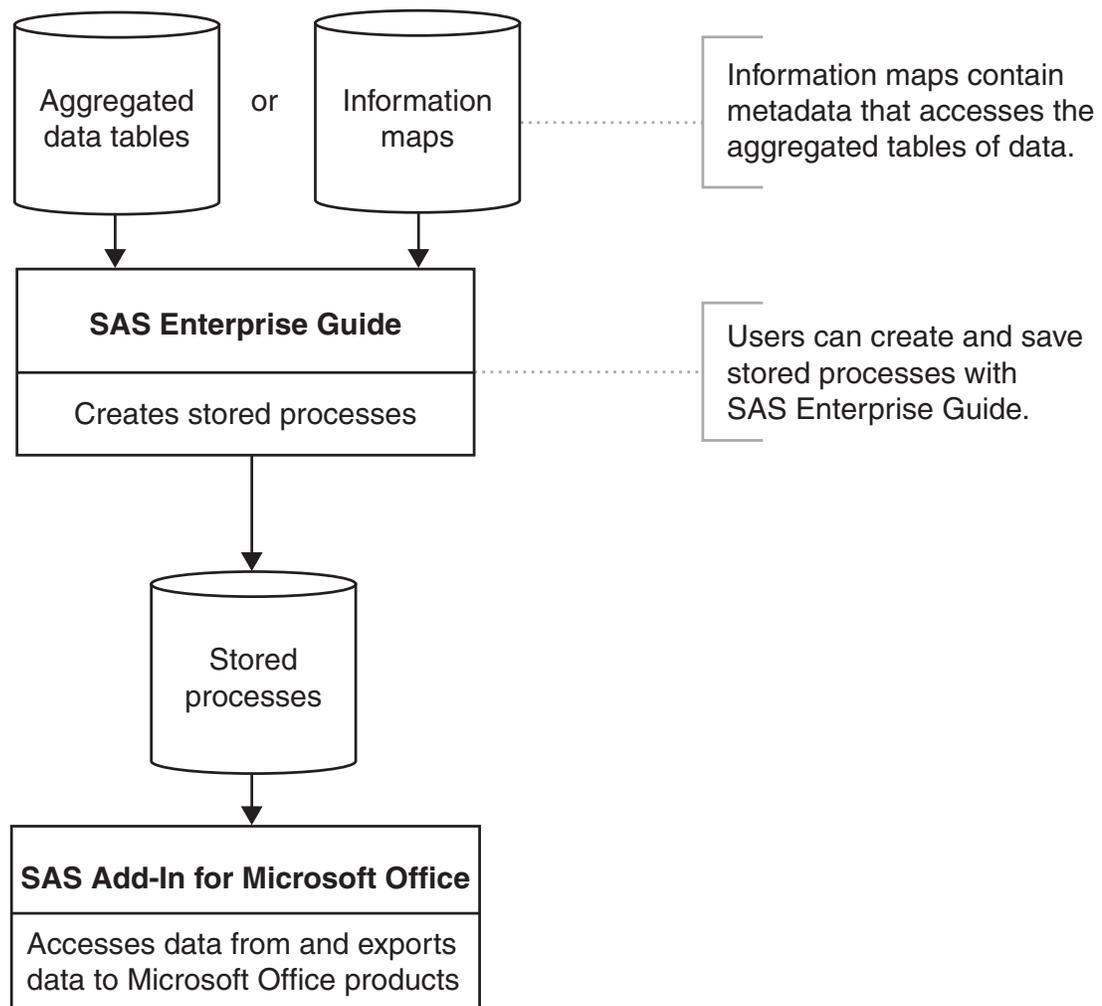
According to this scenario, the data is already staged and aggregated and information maps of the data have been generated. The following processing occurs:

1 Power analysts use SAS Enterprise Guide to create stored processes that contain SAS code. When executed, the SAS code performs analytical tasks and generates reports based on the information maps that were previously generated. The stored processes can be shared among multiple users.

2 From the Microsoft Word and Microsoft Excel interfaces, power analysts select the SAS Add-In for Microsoft Office option. They can execute the stored processes that were created and stored by SAS Enterprise Guide in the previous step.

Note: This same scenario can also be applied to SAS Information Delivery Portal: Stored processes that are defined in SAS Enterprise Guide can be executed in SAS Information Delivery Portal. △

Reference Table of SAS IT Resource Management Tasks

The following table lists the tasks that can be performed with SAS IT Resource Management and the components that accomplish those tasks.

If you want to perform this task	Use this component:
Create a metadata repository	SAS Data Integration Studio
Define logins for users and groups of users	SAS Management Console
Create an IT data mart	New Object Wizard in SAS Data Integration Studio
Delete an IT data mart	Delete IT Data Mart function on the Edit menu of SAS Data Integration Studio
Set up staging transformations for the input data sources	Adapter Setup Wizard in SAS Data Integration Studio
Define ETL processing options	Adapter Setup Wizard in SAS Data Integration Studio
Create batch ETL jobs	Adapter Setup Wizard in SAS Data Integration Studio
Create staged table	New Staged Table wizard in SAS Data Integration Studio
Aggregate data tables into summarized aggregation tables	Summarized aggregation transformation in SAS Data Integration Studio
Aggregate data tables into simple aggregation tables that are not summarized	Simple aggregation transformation in SAS Data Integration Studio
Create default information maps	Adapter Setup Wizard in SAS Data Integration Studio
Create customized information maps	Information map transformation in SAS Data Integration Studio or through SAS Information Map Studio
Create report definitions	SAS Enterprise Guide
Generate reports and view them interactively through Microsoft Windows	SAS Enterprise Guide
Generate reports and view them interactively on the Web	SAS Web Report Studio
Access SAS functionality from Microsoft Word and Microsoft Excel	SAS Add-In for Microsoft Office
Define stored processes	SAS Enterprise Guide
Execute stored processes	SAS ID Portal, SAS Web Report Studio, and SAS Add-In for Microsoft Office
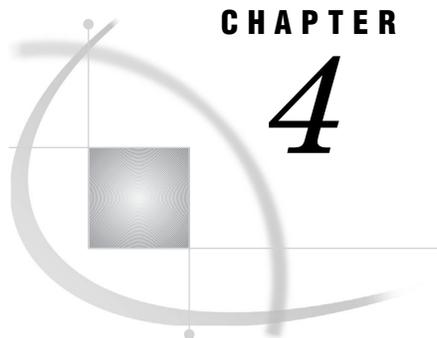
C H A P T E R

4

The IT Data Mart

What Is the IT Data Mart?

Introduction to the IT Data Mart

The scalability and effectiveness of SAS performance evaluation software depends on its ability to store and access IT data as well as the processes and jobs that work with this data. The IT data mart is a key component of SAS IT Resource Management. It is the logical collection of the jobs, data, information maps, tables, and other elements that support the extracting, transforming, and loading (ETL) of IT data. IT data marts are set up, managed, and administered by the data administrator by means of the wizards and user interfaces that are available in SAS Data Integration Studio. Multiple data marts can be created in order to help organize a site's data. For example, a site might decide to set up a separate data mart for each of its adapters or business areas.

The IT data mart is located in the ITMS Repository, which is established when the SAS IT Resource Management software is installed.

   Note: IT data marts must have unique names. △

IT data marts are located on the **Custom** tab of SAS Data Integration Studio. To navigate to an IT data mart from the **Custom** tab, select **Repositories ▶ ITMS ▶ ITRMSoftwareTree ▶ ITDataMartTree**.
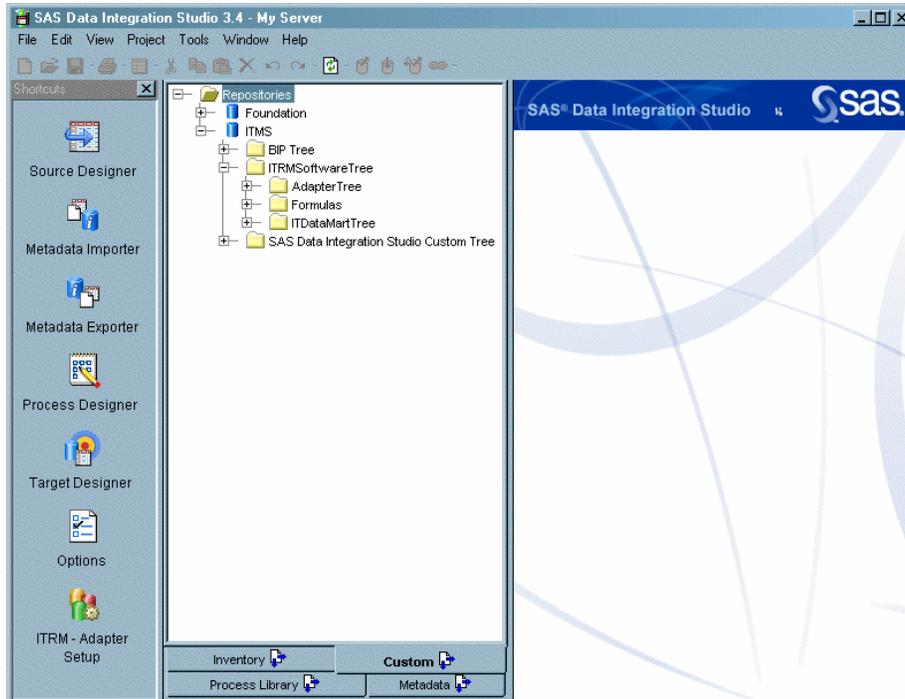
Create an IT Data Mart

You can create an IT data mart by invoking the New Object Wizard that is available in SAS Data Integration Studio. To create an IT data mart, perform the following steps:

1 From the SAS Data Integration menu bar, select **File ▶ New Object** to open the New Object Wizard.
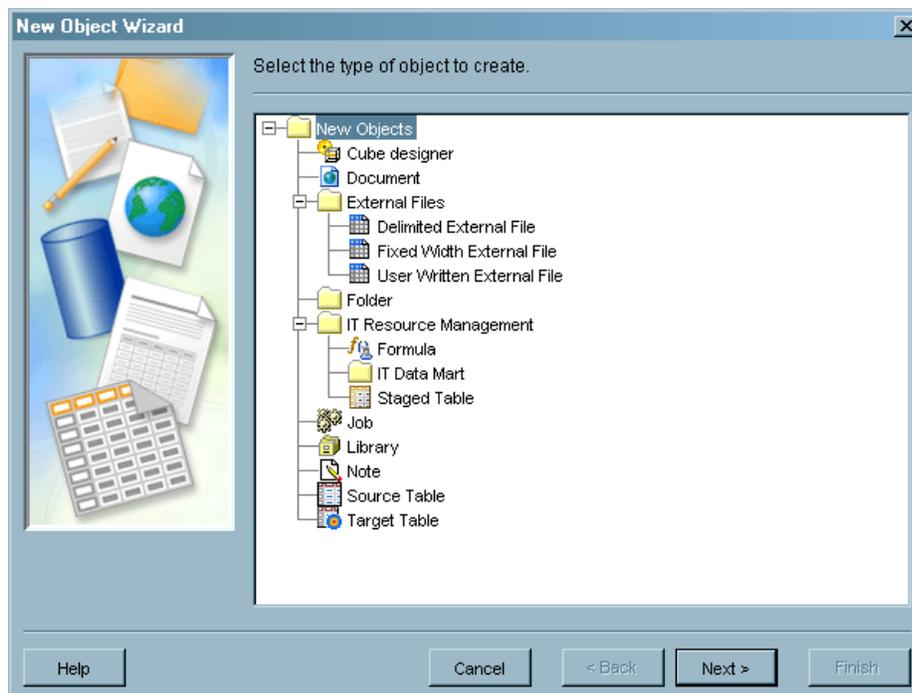
2 From the list of new objects, locate the `IT Resource Management` folder. Select `IT Data Mart` and then click `Next`. The New IT Data Mart Wizard opens.

3 Enter the information that is requested by the New Object Wizard.

Note: If you are creating an IT data mart on a z/OS server, the wizard opens an additional page on which you can enter information about space allocations. △

4 When you click `Finish` on the final page of the wizard, the new IT data mart is created. The wizard generates subfolders in the data mart, which are storage locations for the jobs, data, libraries, information maps, and tables.

The summary page of the wizard displays the information you entered.
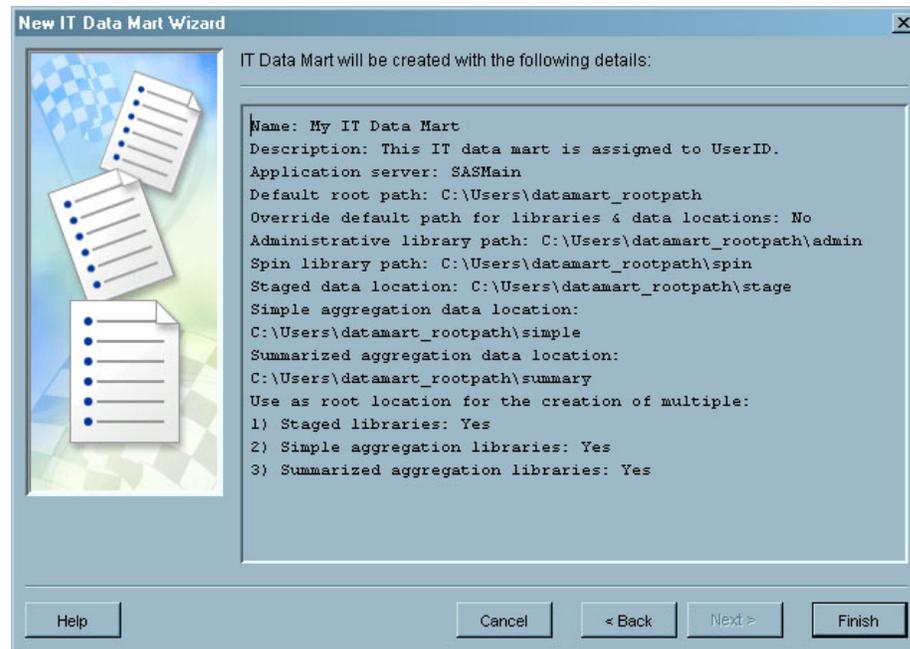
For more information, see the online Help that can be accessed on the pages of this wizard.

For more detailed information about how to work with an IT data mart, see *SAS IT Management Solutions: Administrator's Guide* that is located at this Web site: `http://support.sas.com/itrm`

Contents of the IT Data Mart

The following display shows an IT data mart called "My IT Data Mart." The folders in this data mart have been expanded in order to display their contents.
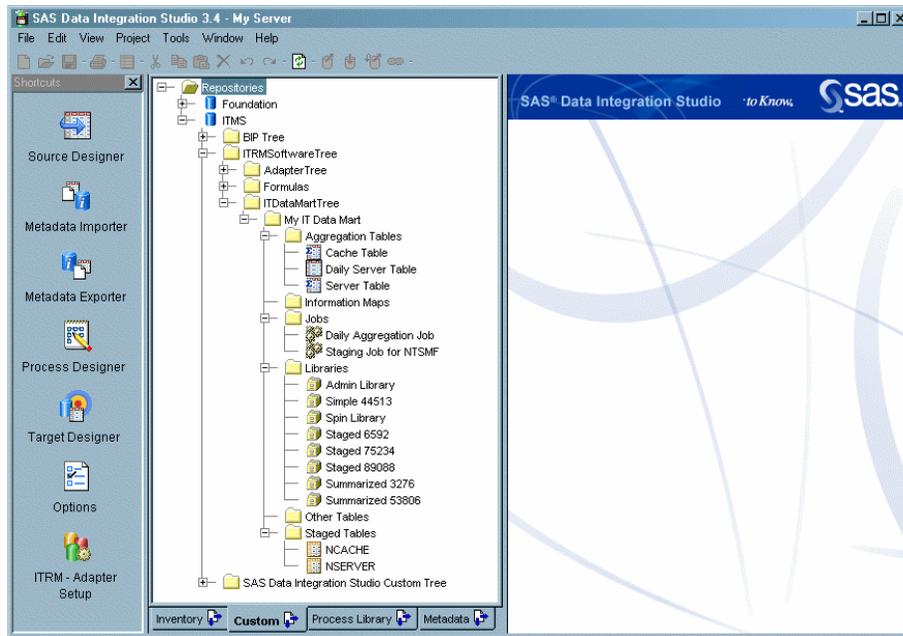
IT data marts contain the following folders, each of which is tagged with a numeric identifier that can be used to associate jobs with aggregations, information maps, libraries, and staged tables:

□ **Aggregation Tables**

This folder contains the metadata definitions for the summarized aggregation tables and the simple aggregation tables of data. These tables are generated by the jobs that execute the aggregation transformation.

□ **Information Maps**

This folder contains the information maps that are created when an ETL job for an adapter is executed. Information maps that are created by using SAS Information Map Studio can also be stored in this folder.

□ **Jobs**

This folder contains the ETL jobs that are created for this IT data mart by wizards or other processes. The jobs can include transformations that execute the adapter-specific staging code, transformations that aggregate the IT data, transformations that generate information maps, and more.

The Adapter Setup Wizard creates separate component jobs for each transformation that it generates. It also creates an overall job that contains all the component jobs.

The job is visually represented in SAS Data Integration Studio as a Process Flow Diagram (PFD) with its elements (that is, tables, transformations, information maps, and so on) displayed in a data processing flow.

□ **Libraries**

This folder contains the library definitions for the administration and spin libraries as well as the definitions for the staged tables, and the simple and summarized aggregation tables, if they have been created.

□ Admin Library

This library contains metadata about the tables and files that are created and used by the data validation processes in SAS IT Resource Management. The metadata is used to prevent the addition of duplicate data to the IT data mart tables.

Note: This table resides in the IT data mart library but it is hidden and not accessible by the user. △

□ Spin Library

The spin library contains the metadata about spin tables. Spin tables contain incomplete data about an event that is being measured. For example, an ETL job might process a record that reflects the beginning of an event. The record that reflects the end of that event might not be received until a future ETL job. In order to process the information about the entire event, the incomplete data must be stored in a separate location (the spin table) until the record that completes it is available. The incomplete record is stored until its matching record arrives in this ETL or a future ETL, or until the beginning record ages out. When the matching record arrives, the complete data about the event is moved to a summarized or simple aggregation table, as specified by the aggregation transformation.

Note: Spin tables are used for data from MXG-based adapters only. △

□ **Other Tables**

This folder contains the metadata definitions for the tables of data that the user might need. These tables can include reference tables. These lookup tables supply site-specific information such as the name of business units and their descriptions. The tables are created by the data administrator.

□ **Staged Tables**

This folder contains the metadata definitions for the staged tables of data. A *staged table* is a table that contains data that has been extracted from an input data source and then rendered in a form that is suitable for further transformation.

These tables are generated by the jobs that execute the staging transformation that is run for each supplied adapter. The IT performance records for each adapter have unique characteristics that must be specified before executing the ETL job for that adapter. The Adapter Setup Wizard specifies these staging parameters and stores the resulting staged tables in the IT data mart.

Users can also generate staged tables by using the New Staged Table wizard to define the table and then by creating and executing a job that stages the raw data.

For more information about the New Object Wizard, see the online Help or the *SAS IT Management Solutions: Administrator's Guide* that is located at this Web site: **http://support.sas.com/itrm**.
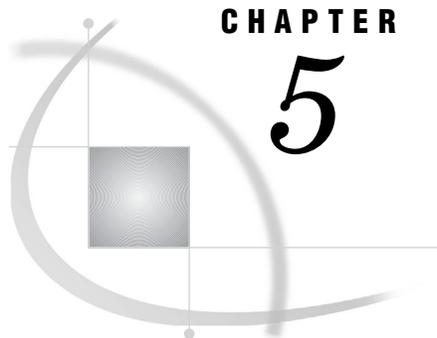
C H A P T E R

5

Adapters

What Are Adapters?

Adapters are key components of SAS IT Resource Management. Adapters consist of specialized software that enables the customer to load raw data about IT resources from many diverse data sources. Adapters also enable the customer to convert that raw data into a standard form that facilitates aggregation and reporting about their IT resources. Raw performance data is generated by the logging mechanisms that are inherent to IT resources. It can also be created by the Enterprise Systems Management tools that are used to manage the IT infrastructure. SAS IT Resource Management accepts data from many different vendors—the only requirement is that the data must include a timestamp so that it can be categorized and aggregated appropriately for subsequent analysis.

Raw data about an IT resource is represented using measures and formats that are specific to the software that collected it. In order for the data to be processed into statistics about an enterprises's IT resources, the raw data must be read, interpreted, and possibly converted into a more standard form. It can then be loaded into staged tables in preparation for subsequent aggregation and reporting.

For each type of IT performance data that it supports, SAS IT Resource Management supplies an adapter that consists of the template tables, transformations, and staging code that are necessary to stage that IT performance data.

For many adapters, SAS IT Resource Management also supplies information map transformations and aggregation transformations by means of the Adapter Setup Wizard. If not supplied, these transformations can be created manually. To do so, see the Help topics "Create an Information Map Transformation" and "Create an Aggregation Transformation."

The supplied adapters can be viewed from the **Custom** tab of SAS IT Data Integration Studio.

Display 5.1   View of Supplied Adapters in Custom Tab
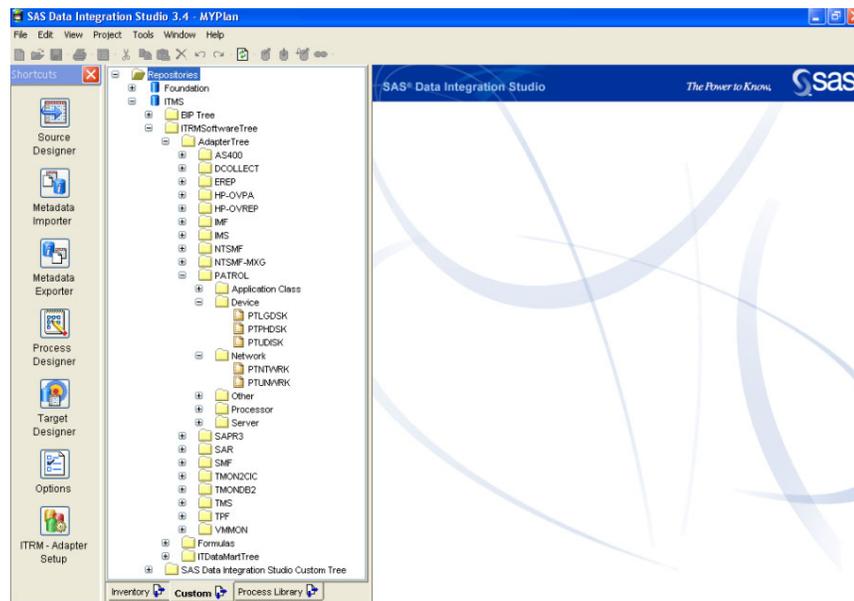
Note: In the preceding display, the **AdapterTree** folder is expanded to show the supplied adapters. In addition, the **Device** and **Network** folders in the Patrol adapter are expanded to show their template tables.   △

Adapters stage the data by means of transformations that are executed by the SAS Data Integration Studio jobs. For information about how to work with SAS Data Integration Studio, see *SAS Data Integration Studio: User's Guide* that is available on this Web site:
http://support.sas.com/documentation/onlinedoc/etls/index.html.

Types of Adapters

The name of an adapter represents the data source from which SAS IT Resource Management gathers raw data. The following table shows the adapters that are supported by SAS IT Resource Management that are available to access raw data files for specific operating environments.

Table 5.1   Table of Supported Adapters

Adapter Name	Description
User-written	
User-written Staging Code	User-written staging code is supported by the Source Designer and Target Designer of SAS Data Integration Studio and transformations that are supplied by SAS IT Resource Management.
For z/OS Data Sources (and for raw data sources that are supported through MXG)	

Adapter Name	Description
DCOLLECT	DASD Collect obtains the following Mainframe Storage System data: □ active data sets □ VSAM data set information □ volumes □ inactive data □ migrated data sets □ backed-up data sets □ capacity-planning data such as the following: 　□ DASD capacity planning: DCOLLECT provides information and statistics for volumes that are managed by DFSMShsm (ML0 and ML1). 　□ tape capacity planning: DCOLLECT provides statistics for tapes that are managed by DFSMShsm. □ SMS configuration information
EREP	Environmental Record Editing and Printing processes the error records from the MVS, VM, and VSE operating systems to produce formatted reports. These EREP reports can show the status of the entire installation, an I/O subsystem, or an individual device, depending upon which report you request. EREP reports can vary in format, depending on the following report types: □ System summary reports show error data in summary form. □ Trend reports show error data by daily totals. □ Event history reports show error data in a time sequence by occurrence.
IMF	The BMC Mainview for IMS product, formerly the Boole & Babbage Control/IMS, supplies transaction information such as CPU usage, number of I/Os, and response time. When you collect IMF data instead of IMS Monitor data, BMC recommends that you collect a duration of one hour of consistently high activity, starting at the beginning and ending at the end of an RMF interval.
NTSMF-MXG	The Demand Technology NT System Management Facility is the system management facility for Windows NT, Windows 2000, Windows XP, and Windows 2003 servers and workstations. NTSMF collects data from Windows systems and for Windows server applications such as Exchange, SQL Server, and IIS. *Note:* SAS IT Resource Management also supports a separate NTSMF adapter that is not z/OS based. △

Adapter Name	Description
SMF	The IBM System Management Facility collects and records system and job-related information that is used for the following purposes:
	□ billing users
	□ reporting reliability
	□ analyzing the configuration
	□ scheduling jobs
	□ summarizing direct access to volume activity
	□ evaluating data set activity
	□ profiling system resource use
	□ maintaining system security
	Note: RMF is a subtype of SMF records. RMF is the IBM strategic product for z/OS performance measurement and management. RMF is the base product that collects performance data for z/OS and Sysplex environments to monitor system performance. Because RMF data is a subtype of SMF data, no further adapter work is necessary. △
TMON2CIC	ASG-TMON for CICS TS for z/OS, formerly Landmark TMON, monitors the CICS Transaction Server (TS) and provides resource consumption measurements by tracing each transaction's performance by CICS event and related unit of work.
	Note: CICS data can be produced by either TMONCICS or as a subtype of SMF. △
TMONDB2	ASG-TMON for DB2 monitor, formerly Landmark TMON, works with the SQL Analyzer to manage DB2 applications and critical DB2 resources by providing a single view of DB2 data-sharing group performance. TMON for DB2 tracks DB2 buffer pools, lock contention and serialized resource usage, transaction statistics from ASG-TMON for CICS to TMON for DB2, and dynamic and static SQL calls. TMON for DB2 provides a view for all performance statistics by plan, package, and statement, including CPU time, I/O analysis, lock activity, and buffer pool utilization by SQL statement.
TMS	The Computer Associates Tape Management System product controls and protects tape data sets and volumes in z/OS environments.
TPF	The IBM Transaction Processing Facility operating system works with application programs to process transactions in a real-time environment. The TPF system is designed for businesses and organizations that have large networks and high volumes of online transactions.
VMMON	IBM VM Monitor collects performance information that is associated with VM, including measurements for user activity, processor storage, I/O, and applications.

For Distributed Systems Data Sources

Adapter Name	Description
HP-OVPA	HP Performance Manager Agent software, formerly OpenView Performance Agent, captures enterprise systems management measurement data for IT resources from Windows systems and many UNIX variants such as HP-UX, Sun OS/Solaris, IBM AIX, Tru 64 UNIX, and Linux.
HP-OVREP	HP Reporter software, formerly OpenView Reporter, captures HP OpenView measurement data that is stored in a relational database via SAS/ACCESS to Oracle or ODBC.
Patrol	BMC Performance Manager for Servers, formerly BMC Patrol, collects UNIX and Windows enterprise system management data from UNIX and Windows systems.
For Windows Systems Data Sources	
NTSMF	The Demand Technology NT System Management Facility collects Windows Systems Management Facility data for servers or Exchange. NTSMF is the system management facility built for Windows NT, Windows 2000, Windows XP, and Windows 2003 servers and workstations. NTSMF collects data from Windows systems and for Windows server applications such as Exchange, SQL Server, and IIS.
	Note: SAS IT Resource Management also supports a separate NTSMF adapter that is z/OS based. The NTSMF adapter that is z/OS based is for raw data sources that are supported through MXG. △
For UNIX Systems Data Sources	
SAR	System Activity Reporter is a logging mechanism that is native to most UNIX and Linux variants. SAR captures the contents of cumulative system activity counters.
For Applications Data Sources	
SAPR3	SAP R/3, via the SAS IT Management Adapter for SAP, collects SAP R/3 and SAP Business Warehouse (BW) workload performance measurements.
	□ For SAP R/3, measurements are read from the SAP Statistic File (stat file).
	□ For SAP BW, the measurements that communicate the amount of computer resources that were consumed to populate and query BW cubes are read. These measurements are then used to supplement BW server performance statistics.

For AS/400 and IMS systems, customers can process the data from these sources by creating the staged and aggregated tables that are necessary to generate IT performance reports and by creating the jobs that will execute the transformations that generate the data for those tables. The Source Designer functionality of SAS Data Integration Studio can create the transformations that stage raw data from any input source. SAS Data Integration Studio provides the following functionality:

□ The Source Designer is the tool that is used to specify information about the raw data input source, such as the following:

□ the type and location of the source of raw data

- □ the name and file access method of the data server
- □ the record length, starting record location, and number of records to process
- □ the character that delimits the fields of data in the record
- □ how to define and name the columns of data
- □ instructions about how to apply formats and informats to the data
- □ the name of the IT data mart to be used to store the input file

□ The staging transformation and the aggregation transformation are the tools that are used to specify information about the staged table or aggregation table, such as the following:

- □ the type of table to be created
- □ the name of the table that is to be created
- □ the type of storage and the library that is to contain the target data set
- □ the folder that is to contain the table
- □ the name of the raw data that is to be input to this transformation
- □ the columns of the raw data that are to be input to this transformation
- □ the location of the metadata for that data set

For information about user-written staging code, see *SAS IT Management Solutions: Administrator's Guide* that is located here: **http://support.sas.com/itrm**.

Staging the Data

Introduction to Staging the Data

A staging transformation generates a SAS program that loads the raw data into the staged tables. When this program is executed by a job in SAS Data Integration Studio, it dynamically accesses the metadata for the staged tables and the parameters that are specified in the staging transformation. The SAS program uses this information to populate the staged tables. A unique staging transformation is associated with each supported adapter.

Note: All SAS IT Resource Management adapters are supported for all SAS IT Resource Management operating environments unless there is a technical limitation that is associated with the raw data (log file) data sources. For example, if the raw data resides on a device that is not compatible with the architecture of the SAS IT Resource Management server, then that raw data file might not be usable as input unless further processing is performed.   △

Every time a staging transformation is executed, the existing data in the staged table is removed in order for the new data to be loaded. The staged table is generally used as input to an aggregation transformation. However, a user can change this process flow by using the standard methods that are available in SAS Data Integration Studio. In addition, a staging transformation can be modified to include additional staged tables that are supported by the given adapter transformation. This feature enables the system to process data from various sources through the same staging transformations and aggregations. (For information about aggregations, see Chapter 6, "Aggregations," on page 39.)

Before loading the performance data into staging tables, adapters perform any additional processing that is necessary to convert the data into standardized, normalized values. The measures and formats that are used to collect the various types of performance data determine any special processing that the adapter must perform.

Depending on the adapter, the staging transformation might also perform other functions, such as:

☐ detecting and handling duplicate data

☐ generating computed columns from the input data

☐ enabling or disabling processing features at run time

☐ supporting the input of single files

☐ on Windows and UNIX, supporting the transfer of data from z/OS by means of the File Transfer Protocol (FTP)

☐ for MXG-based adapters, providing support for spin files

SAS IT Resource Management provides two methods of staging IT performance data:

☐ by using the Adapter Setup Wizard

☐ by using the New Object Wizard

Using the Adapter Setup Wizard

The Adapter Setup Wizard guides you through the steps that set up the jobs that, when run, execute the staging transformations, the information map transformations, and the aggregation transformations for a supported input data source. These steps include entering the name of the IT data mart where the staged tables will reside, the name of the adapter, the location of the raw data, and possibly some parameters that specify how the data is delimited or how duplicate data checking is to be performed. The Adapter Setup Wizard creates the required staged tables by using the template tables that are supplied for each adapter.

To invoke the wizard, on the `Shortcuts Bar` of the SAS Data Integration Studio desktop, click `Adapter Setup`.

Note: The `Shortcuts Bar` is an optional pane of task icons on the left side of the SAS Data Integration Studio desktop. To display it, select **View** ▸ **Shortcuts Bar** from the menu bar. For more information about this topic, see the online Help for SAS Data Integration Studio. △

Using the New Object Wizard

You can also set up a staging transformation by using the New Object Wizard. Like the Adapter Setup Wizard, the New Object Wizard for Staged Tables guides you through the steps that are necessary to define the staged tables. These steps include entering the name of the IT data mart where the staged tables will reside, the name of the adapter, the location of the raw data, and possibly some parameters that specify how the data is delimited or how duplicate data checking is to be performed. However, unlike the Adapter Setup Wizard, the New Object Wizard enables you to select the template tables that you want to use. You do not have to use all the tables that are supplied for this adapter.

To invoke the wizard, perform the following steps:

1 Navigate to `ITDataMartTree`. To do so, click to expand the following objects: **Repositories** ▸ **ITMS** ▸ **ITRMSoftwareTree** ▸ **ITDataMartTree**.

2 Select the IT data mart where you want to store your staged tables.

3 Right-click `Staged Tables`. From the drop-down menu, select `New Object`.

4 Enter the information that is requested by the New Object Wizard.

5 When you click **Finish** on the final page of the wizard, the metadata for the new staged table is created. The table does not have data in it until a transformation that loads the data is executed.

The summary page of the wizard displays the information you entered.
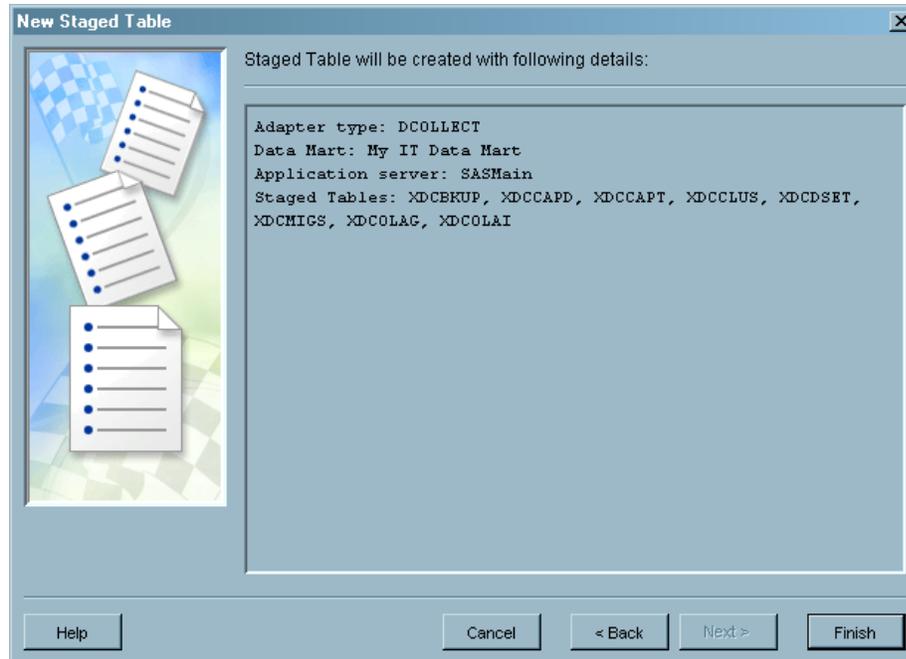
Note: You can also invoke the wizard in the following way: From the menu bar, select **File ▶ New Object**. Then, in the **IT Resource Management** folder, select **Staged Table**. △

For more information about this wizard, see the online Help that can be accessed on the pages of this wizard. You can also find information about this topic in *SAS IT Management Solutions: Administrator's Guide* that is located here: **http://support.sas.com/itrm**.
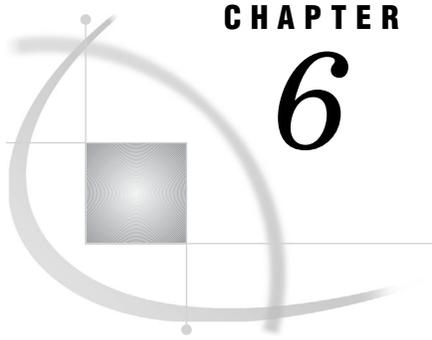
CHAPTER

6

Aggregations

What Are Aggregations?

An aggregation is a type of transformation that specifies how data is to be transformed and stored so that it can provide the needed report-ready IT performance data. In particular, an aggregation provides specifications for the following functions:

- identifying the location of the input data
- filtering data
- populating computed columns
- calculating statistics
- performing rolling accumulations based on any time period (for example, daily, weekly, monthly, quarterly, and yearly time periods)
- ranking of individual class variables over all the data, as well as ranking of statistics across requested subgroups of the class list
- grouping (classifying) the data according to user specifications

Generating Aggregation Tables

Aggregation tables are generated in two ways:

- Using the Adapter Setup Wizard: This wizard starts with identifying the raw data that is input and then guides the customer through a series of questions in order to create the following entities that are associated with that adapter:
  - libraries
  - staging transformation
  - staged tables that are associated with that staging transformation
  - aggregation transformations that aggregate the staged tables
  - summarized and simple aggregation tables
  - information map transformations that are associated with the aggregation tables

  Note: The Adapter Setup Wizard does not support all supplied SAS IT Resource Management Staging Transformations. △

□ Defining a simple or summarized aggregation: A simple or summarized aggregation can be defined, edited, or deleted from the Properties window of an aggregation transformation within a job.

The job can contain multiple aggregations each of which produces a single aggregated table. (In many instances, adapters require multiple aggregations in order to provide the data that is needed for the reporting processes.) The job that runs the aggregation transformation can be executed either by SAS Data Integration Studio interactively or in batch mode.

By selecting the **Aggregations** tab of the aggregation transformation, the customer can invoke the Summarized Aggregation Wizard or the Simple Aggregation Wizard. The aggregation wizard requires the specification of the physical table that is input to the aggregation. (The input to the aggregation is usually a staged table.) The wizard then guides the customer through a series of questions in order to generate the aggregations that process the input tables and the aggregation tables that are generated by each aggregation within the job.

When you click **Finish** on the final page of the wizard, the new aggregation is created and the corresponding summary page is displayed, as follows:

□ If you created a summarized aggregation, the summary page of the Summarized Aggregation Wizard displays the information that you entered.

Display 6.1   Summary Page of the Summarized Aggregation Wizard
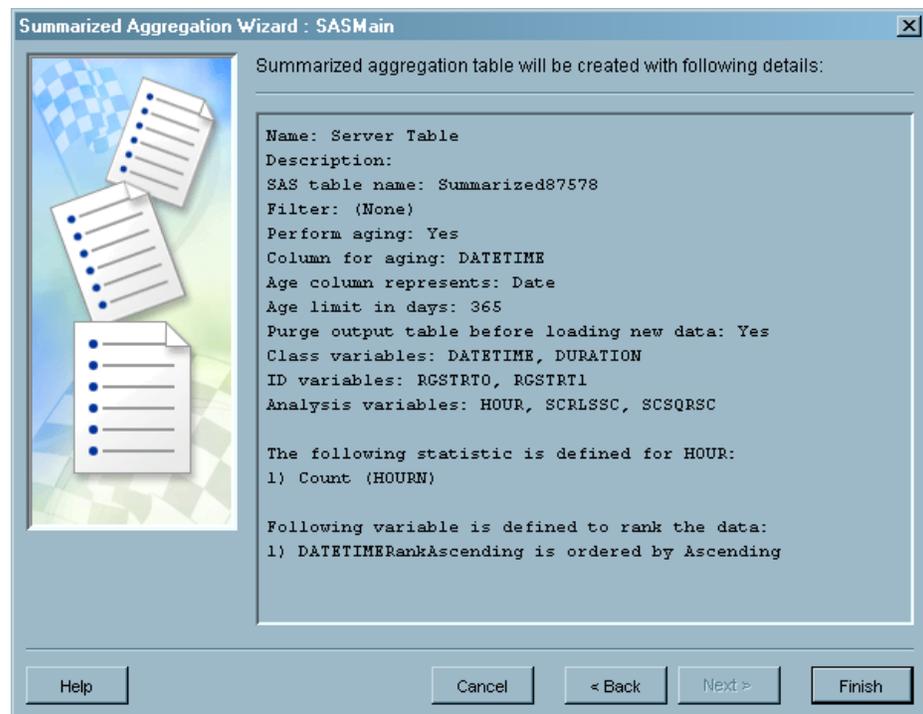
□ If you created a simple aggregation, the summary page of the Simple Aggregation Wizard displays the information that you entered.

Display 6.2 Summary Page of the Simple Aggregation Wizard
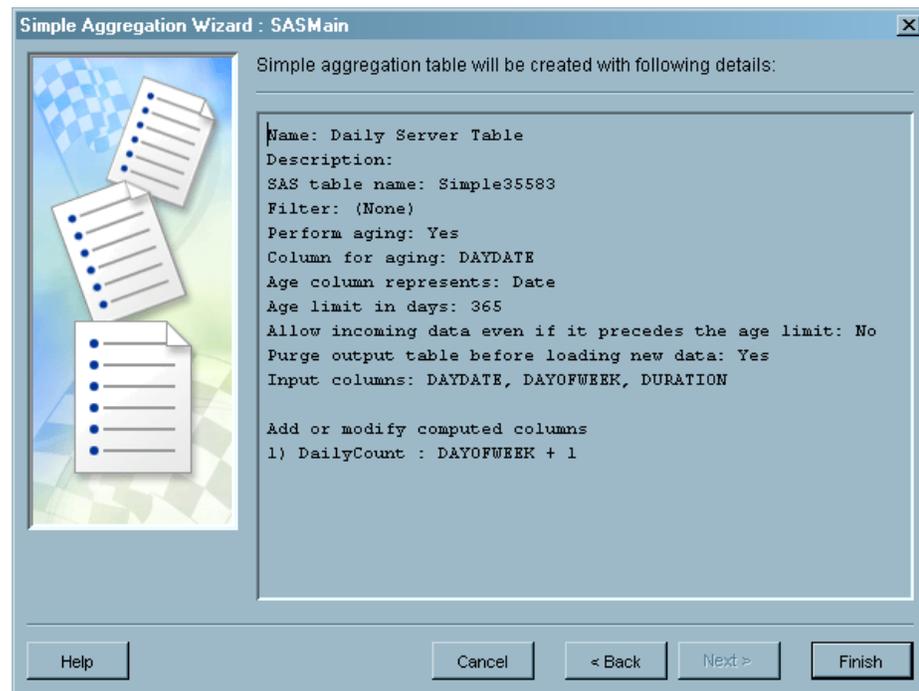
Note: For information about how to invoke the Summarized or Simple Aggregation Wizards, see the Help topic called "Create an Aggregation Transformation." △

Aggregation Example

In this example, the raw data that is processed by the NTSMF staging transformation is loaded into staged tables, called NSERVER and NCACHE tables.

Display 6.3   Example of an Aggregation Transformation
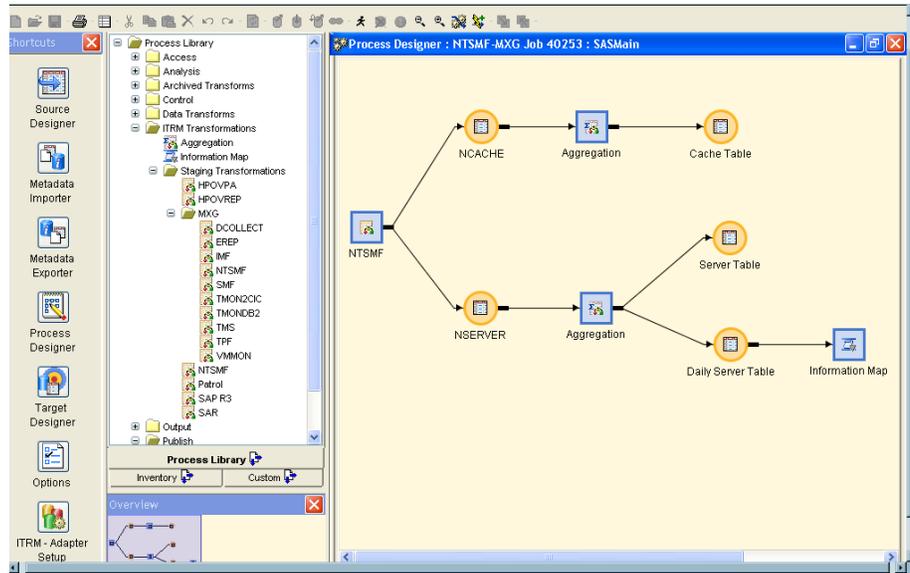
These staged tables are, in turn, input to aggregations that perform the following tasks:

□ The upper aggregation processes the NCACHE staged table and generates one summarized aggregation table called Cache Table.

□ The lower aggregation processes the NSERVER staged table and generates two aggregation tables called the Server Table and the Daily Server Table. Icons next to these tables in the `Custom` tab are visual reminders of whether the aggregations are summarized or simple. The Server Table is a summarized aggregation table and the Daily Server Table is a simple aggregation table.

In this example, an information map transformation is generated from the Daily Server Table.

The following example shows what the `Custom` tab displays for this job and its tables.

Display 6.4   Custom View of an NTSMF Job and Its Tables
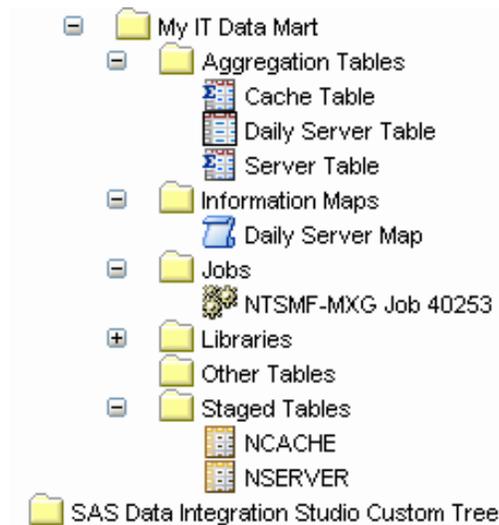
For more information about working with aggregations, see *SAS IT Management Solutions: Administrator's Guide* that is located at this Web site: `http://support.sas.com/itrm`. For information about SAS Data Integration Studio, see *SAS Data Integration Studio: User's Guide* that is located at this Web site: `http://support.sas.com/documentation/onlinedoc/etls/index.html`.
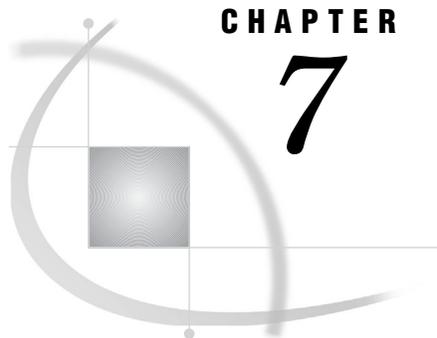
CHAPTER

7

SAS IT Resource Management Reporting

Introduction: The Reporting Process

The purpose of SAS IT Resource Management is to manipulate raw IT performance data so that the user has access to report-ready information about the enterprise's IT resources. SAS IT Resource Management provides a unique adapter for each data source that it supports. The support for each adapter includes staging and, in most cases, aggregation transformations that are appropriate for the type of data that the adapter handles. When these transformations are run, they generate tables of data, statistics, and rankings that are accumulated according to the specifications that were defined by the transformation that was either generated by the Adapter Setup Wizard or created by the user. In addition, the information map transformation generates information maps that describe each table and its contents in terms that are meaningful to business people.

Summarized and simple aggregation tables and the information maps that refer to them are the primary inputs to the reporting process. These tables and maps are registered in the SAS Metadata Server. After you have connected to the appropriate metadata server, you can access these tables and maps by using tools that are available with the SAS Intelligence Platform. Among these business intelligence components are the following products that provide methods for generating and viewing reports:

☐ SAS Enterprise Guide

☐ SAS Web Report Studio

☐ SAS Add-In for Microsoft Office

☐ SAS Information Delivery Portal

SAS Enterprise Guide

Overview of SAS Enterprise Guide

SAS Enterprise Guide is the primary report-generating product that SAS provides. It communicates with the SAS System to access data, perform analysis, and generate results. Regardless of their SAS knowledge, users can produce results easily and quickly. SAS Enterprise Guide provides the following features:

- □ an intuitive, visual interface
- □ transparent access to data
- □ ready-to-use tasks for analysis and reporting
- □ a code editing facility

SAS Enterprise Guide can connect to various SAS Metadata Repository operating environments, including UNIX, z/OS, and Windows.

SAS Enterprise Guide uses *projects* to manage a collection of related data, tasks, code, and results. With projects, you can run multiple tasks on the same group of data files and create interactive reports. These tasks enable you to analyze and report on the aggregation data and information maps that are generated in SAS IT Resource Management. Aggregation tables and information maps can be input to a number of different analytic tasks in SAS Enterprise Guide in order to create report definitions. Using functions that are available in SAS Enterprise Guide, you can generate a wide variety of analytic reports for resource management purposes (for example, utilization of resources, performance of IT devices, and forecasting for capacity planning). The resulting report output can then be viewed interactively in SAS Enterprise Guide or published to the Web.

SAS Enterprise Guide can generate report output about your IT resources by directly accessing the summarized and simple aggregation tables of data that are generated by IT Resource Management or by using information maps that refer to that data in order to import the appropriate tables of data into the project. (SAS IT Resource Management supplies information maps for many adapters that it supports.)

Create a Report in SAS Enterprise Guide

To create a report in SAS Enterprise Guide, perform the following steps:

1 Start SAS Enterprise Guide from the Windows Start menu by selecting **Programs** ▶ **SAS** ▶ **SAS Enterprise Guide**.

Display 7.1 SAS Enterprise Guide Welcome Window
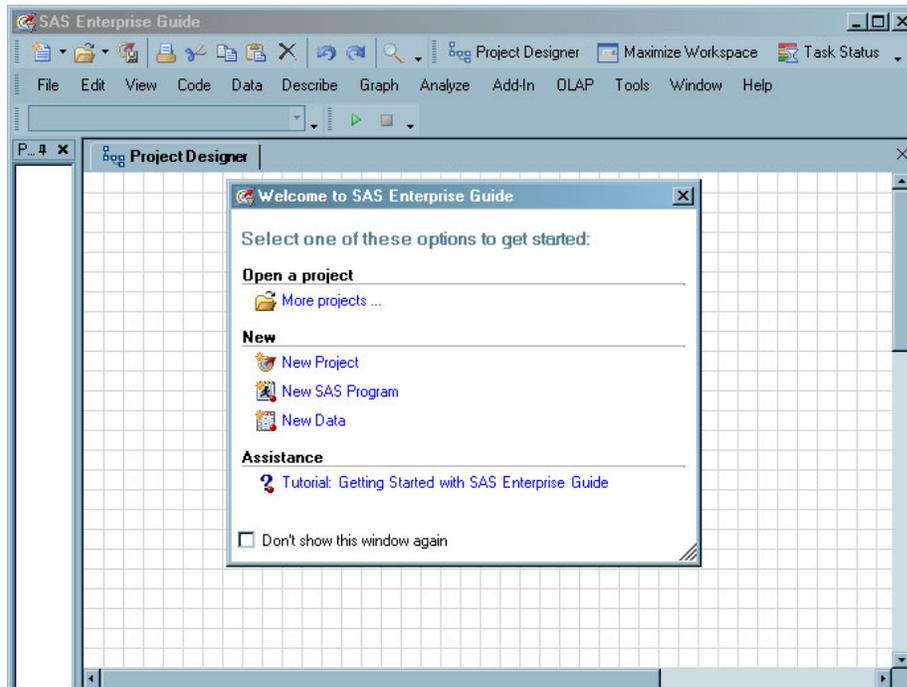
2 From the Welcome window of SAS Enterprise Guide, you can select an existing Project Designer window that you have already opened or you can create a new project. (If you want to work with a new project that has not been opened before, click **x** to close the Welcome window and select the **File** menu. From the list of tasks that displays, you can open an existing project or you can create a new project.)

   Note: If **Don't show this window again** is checked, the Welcome window is not opened. In that case, use the **File** menu to open a new or existing project. △

3 The preferred method of reporting is to use information maps. (Information maps enable you to select only the data items and filters that you want to work with.) To report using information maps, perform the following steps:

   a Select **File ▶ Open ▶ Information Map**.
   b Select the information map that you want to use.
      (You can also add an information map to a project by using the SAS Folders window. To open this window, select **View SAS Folders**. Double-click on the information map that you want to add to the project.)
   c Select the data items and optional filters that you want to include in your table. In addition, you can select an output location for the table that will be generated.
   d Click **OK** to run the information map that creates the table.

4 If you want to work directly with your tables of data, perform the following steps:

   a Select **File ▶ Open ▶ Data**.
   b Select the SAS server that contains the table that you want to use.
   c Select the library that contains the data that you want to report on. (Refer to the **Jobs** folder of your IT data mart in SAS Data Integration Studio to determine the name of the library that is associated with the table you are working with.)

      d Then, select the appropriate summarized or simple aggregation table from the list that is displayed and open it.

5 Add a report task to the project.

6 The SAS data set that is created can be used as input for further tasks and queries. To create a stored process, right-click on the report task and select **Create Stored Process** to invoke the Create New SAS Stored Process Wizard. (A stored process is a SAS program that can be stored on a central server and accessed by multiple remote clients. Along with the advantages of shared, secure code, stored processes enable users to take advantage of the SAS Enterprise Guide drag-and-drop interface to build and share complex SAS programs.)

    Note: You can execute the SAS code that you generated interactively in SAS Enterprise Guide. Alternatively, you can run a SAS Enterprise Guide project in batch mode outside the SAS Enterprise Guide application by saving the project and using a script program to run the project and direct the output to your Web browser. For more information about running jobs, see the *SAS IT Management Solutions: Administrator's Guide*. △

For more information about SAS Enterprise Guide, see the SAS Enterprise Guide Help and the SAS Enterprise Guide Tutorial, which are available from within the product. You can also refer to the documentation at this Web site: **http://support.sas.com/documentation/onlinedoc/guide**.

SAS Web Report Studio

Overview of SAS Web Report Studio

SAS Web Report Studio is a Web-based query and reporting application that is provided by the business intelligence components of the SAS Intelligence Platform. It is designed for users who want to generate reports, view them, and share them with others on the Web.

SAS Web Report Studio uses *data sources* to create report definitions. Data sources are information maps that translate technical data structures into user-friendly business terminology. The maps provide access to data items in the summarized and simple aggregation tables of data that are generated by the aggregations in SAS IT Resource Management. Information maps are created when the information map transformations that are supplied with SAS IT Resource Management are run. (Information maps can also be created manually. See the Help topic called "Create an Information Map Transformation.")

    Note: SAS Information Map Studio can be used to modify the maps that are generated by Information Map transformations in SAS Resource Management. However, the information maps that are automatically generated at ETL time by the Information Map transformations are recreated whenever the ETL job is run. Therefore, any modifications that were made to an information map before running the ETL job will be lost. To avoid this situation, modify a copied version of the automatically generated information map and save that modified version under a different name so that it will not be overwritten by the ETL processes. △

Create a Report in SAS Web Report Studio

To create a report by using SAS Web Report Studio with an information map as the data source, perform the following steps:

1 From the SAS Intelligence Platform, access SAS Web Report Studio. From the Welcome to Web Report Studio window, click **Report** to create a new report definition.

Display 7.2   Welcome Window of SAS Web Report Studio
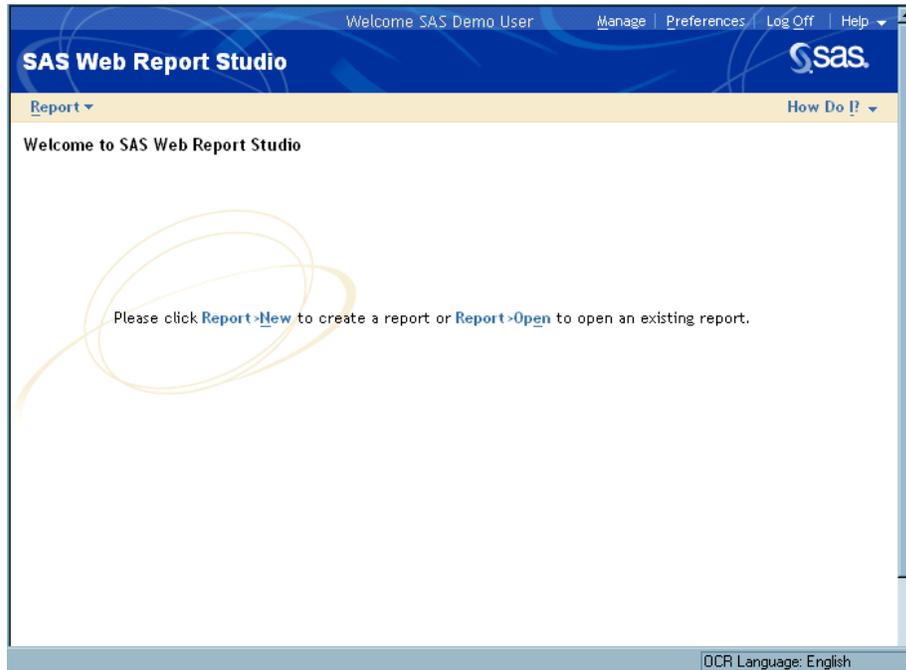
2 Using the appropriate information map as the data source, specify (or modify) a report definition. SAS Web Report Studio provides several tools for this purpose, such as the Edit Report view and the Report Wizard. Templates are also available from which to design a report.

3 Generate the report by executing the report definition in Web Report Studio. The information map will access the corresponding data items that are in the tables of summarized and simple aggregation data that you included in your report definition.

4 View the generated report in your Web browser.

The following example shows the **Edit Report** tab for an Hourly CPU Utilization report:

Display 7.3   Sample Report for Hourly CPU Utilization

For more information about using SAS Web Report Studio, see the SAS Web Report Studio Help, which is available from within the product. For information about administrative tasks associated with SAS Web Report Studio, see the "SAS Intelligence Platform: Web Application Administration Guide." To locate this information, perform the following steps:

1   From the Web site at `http://support.sas.com/documentation/onlinedoc/sas9doc.html`, select `Documentation for the SAS 9.1.3 in PDF`.

2   From the drop-down list of products at the top of the page, select `SAS Intelligence Platform` and click `Go`.

3   Scroll down the list of documentation, and select "SAS Intelligence Platform: Web Application Administration Guide."

SAS Add-In for Microsoft Office

SAS Add-In for Microsoft Office is a SAS Intelligence Platform tool that provides access to SAS from the menus and toolbars of Microsoft Office products. From Microsoft Word and Microsoft Excel, information consumers and power analysts can use SAS to access data, perform data analysis, and prepare reports. In the following example, the Analyze Data window displays the graphs and charts that can be used to analyze data:

Display 7.4 Accessing the Analyze Data Window from SAS Add-In for Microsoft Office
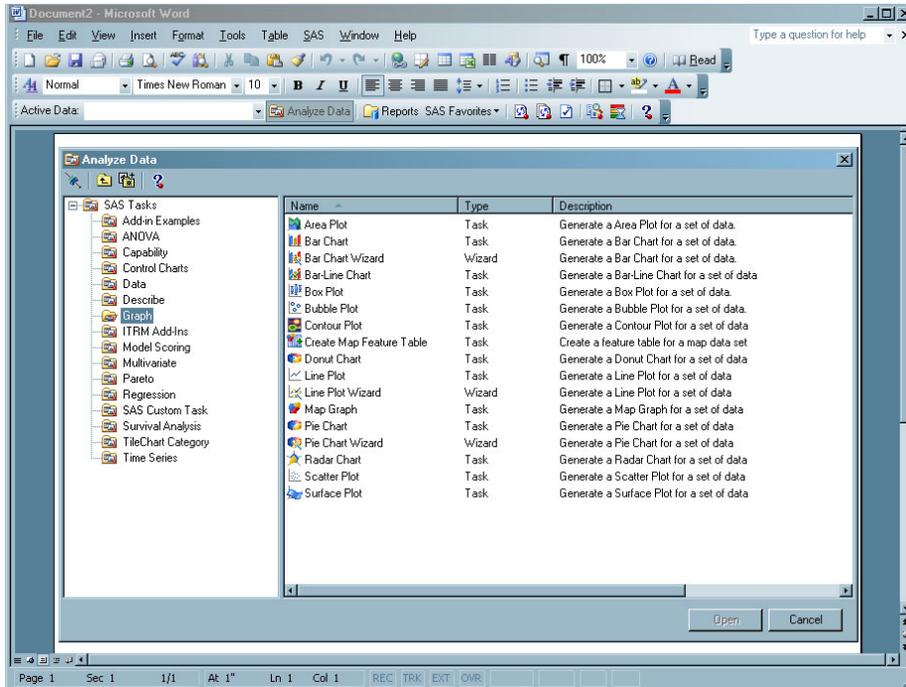
In addition, SAS Add-In for Microsoft Office enables information consumers and power analysts to run stored processes and to customize the appearance of results that are returned by Microsoft Word or Microsoft Excel. The following example shows a stored process for creating a CPU Utilization report:

Display 7.5 Stored Process for CPU Utilization
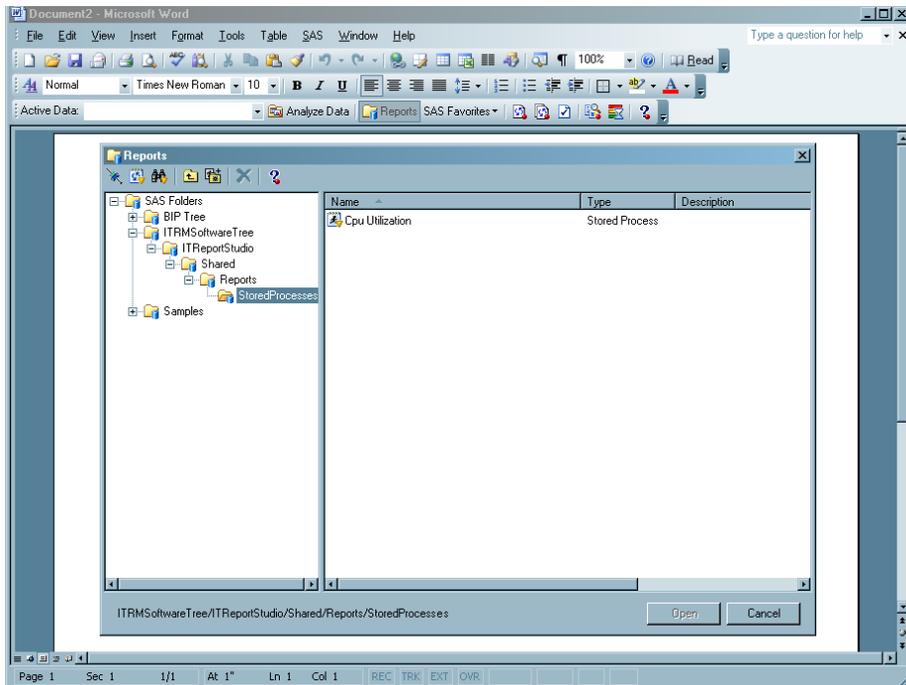
SAS Information Delivery Portal

SAS Information Delivery Portal is a business intelligence component of the SAS Intelligence Platform. It provides a Web-based interface that can be used to view and organize SAS IT Resource Management content, including SAS Information Maps, SAS Stored Processes, SAS publication channels and packages, SAS reports, documents, syndication channels, and links to Web addresses. Users can run stored processes, which were created in SAS Enterprise Guide. These stored processes generate reports using the tables of IT Resource Management data. SAS Information Delivery Portal also provides single sign-on so that users can launch applications such as SAS Web Report Studio from the portal without reentering a user name and password. The reports that are generated by SAS Web Report Studio can be displayed and distributed to other users from this portal. The SAS Information Delivery Portal can provide security so that reports can be viewed only by a particular group of users.

In the SAS Information Delivery Portal, pages are the primary means of organizing information. The following example shows a page called Home:

Display 7.6   SAS Information Delivery Portal
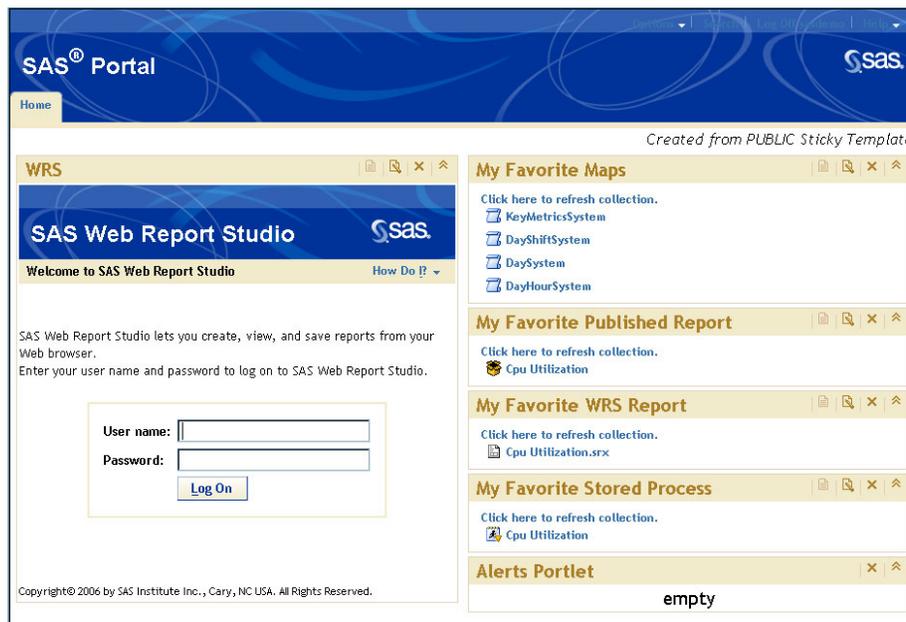
The Home page in the preceding example was set up to enable you to log on to SAS Web Report Studio and to link to favorite reports and stored processes.

For more information about using the SAS Information Delivery Portal, see the Help that is available from within the product. For information about administrative tasks that are associated with SAS Information Delivery Portal, see the *SAS Web Infrastructure Kit: Developer's Guide*. This documentation is located at this Web site: **http://support.sas.com/rnd/itech/library/library9.html**.
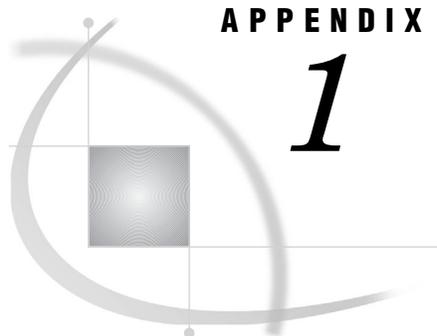
APPENDIX

1

Other Resources

Other Resources

SAS IT Resource Management provides many other resources to assist you in using this product and in managing your IT resources. The resources that SAS IT Resource Management provides include the following:

- □ online documentation
- □ Web-based documentation
- □ technical support
- □ training and consulting services
- □ SAS IT Resource Management e-mail forum

Each of these resources is described in the following sections of this appendix.

Online Help

The user interface for SAS IT Resource Management is available through the following SAS product interfaces:

- □ SAS Data Integration Studio

  Online Help consists of the standard help for SAS Data Integration Studio and the help for the additional software that provides support for SAS IT Resource Management. To access this help from within SAS Data Integration Studio, click **Help** on the associated window or press the F1 key.

- □ SAS Management Console

  Online Help consists of the standard help for SAS Management Console. To access this help from within SAS Management Console, click **Help** on the associated window or press the F1 key.

□ SAS Enterprise Guide

Online Help consists of the standard help for SAS Enterprise Guide. To access this help from within SAS Enterprise Guide, click **Help** on the associated window or press the F1 key.

□ SAS Web Report Studio

Online Help consists of the standard help for SAS Web Report Studio. To access this help from within SAS Web Report Studio, click **Help** on the associated window or press the F1 key.

□ SAS Information Map Studio

Online Help consists of the standard help for SAS Information Map Studio. To access this help from within SAS Information Map Studio, click **Help** on the associated window or press the F1 key.

□ SAS Add-In for Microsoft Office

Online Help consists of the standard help for SAS Add-In for Microsoft Office. To access this help, on the toolbar for Microsoft Word or for Microsoft Excel, select **SAS**. Then, select SAS Add-In for Microsoft Office.

□ SAS/CONNECT

Online Help consists of the standard help for SAS/CONNECT. To access this help from within SAS, click **Help** to open SAS Help and Documentation. From the SAS Products section, scroll down to the help for SAS/CONNECT.

□ SAS/SHARE

Online Help consists of the standard help for SAS/SHARE. To access this help from within SAS, click **Help** to open SAS Help and Documentation. From the SAS Products section, scroll down to the help for SAS/SHARE.

Web-Based Product Documentation

About Web-Based Product Documentation

SAS IT Resource Management is built on the SAS®9 architecture and leverages other SAS products and solutions. Web-based access to SAS product documentation is available for the following:

□ SAS IT Resource Management documentation

□ SAS System documentation

To access these Web pages, use a frame-capable version of a Web browser such as Microsoft Internet Explorer or Netscape Navigator.

SAS IT Resource Management Documentation

Information about SAS IT Resource Management 3.1.1 is available from the Web page at: **http://support.sas.com/itrm**. Along with notes about topics of general interest, this site contains links to the following sets of documents:

□ *Introduction to SAS IT Resource Management*: Provides an overview of SAS IT Resource Management 3.1.1.

□ *SAS IT Management Solutions: Administrator's Guide*: Provides a detailed description of the SAS IT Resource Management 3.1.1 for data administrators.

□ Installation documentation is available from the Install Center, which can be found at this location: `http://support.sas.com/documentation/installcenter/index.html`. It describes how to install and configure the latest software.

□ *SAS IT Resource Management: Migration Documentation*: Describes how to convert your IT Resource Management 2.7 environment to SAS IT Resource Management 3.1.1.

Note: Information about the previous versions of the software, SAS IT Resource Management 2.7, is available from the Web page at: `http://support.sas.com/itrm`. △

Technical Papers, presentations, white papers, and SAS Global Forum papers provide information about many topics, including those papers that pertain to managing your IT resources. This information is located at this Web site: `http://support.sas.com/documentation/whitepaper/technical/`.

SAS System Documentation

The SAS System includes many software products and solutions that are leveraged by SAS IT Resource Management. You can access SAS documentation from this Web page: `http://support.sas.com/documentation/onlinedoc`. You can view documentation for SAS®9, SAS 8, and also documentation for the other products and solutions that are used by SAS IT Resource Management. To view this documentation, select a product from the drop-down list and click **Go**.

Note: You can also order SAS books from SAS Book Sales (1-800-727-3228). △

Technical Support

If you have questions or problems about your licensed software, you might want to explore the SAS Institute Technical Support Web site at `http://support.sas.com/techsup/intro.html`.

The Technical Support Web site offers SAS Notes, Technical Support documents, FAQs, SAS sample programs, phone numbers, and e-mail support. This Web site also provides an online mechanism for reporting and tracking problems and questions for Technical Support. These electronic services are available 24 hours a day.

If you want your question or problem handled by phone, ask your site's SAS Installation Representative or on-site SAS support personnel to call the SAS Technical Support Division. Sites in North America can call 919-677-8008 or send a Fax to 919-531-9449. Sites that are outside of North America should check the Technical Support Web site or contact their SAS Installation Representative or on-site SAS support personnel for the nearest SAS Institute office.

Training and Consulting Services

The SAS IT Resource Management solution is tightly integrated with other SAS solutions, such as SAS Data Integration Studio, SAS Enterprise Guide, and the business intelligence components of SAS Intelligence Platform. Therefore, customers might require training for these solutions as well for SAS IT Resource Management.

SAS offers training that is suited to your needs. For example, you can select live Web classes, instructor-led classes, or self-paced SAS e-Learning courses. Because SAS is a global company with customers in many different countries, SAS also provides training in the national language of many of these countries. For more information, see the *Training* Web page at the following address: **http://support.sas.com/training/ index.html**. At this Web site, you can select training that is appropriate for your location and language.

You can also contact the SAS Education department by calling 1-800-333-7660.

SAS IT Resource Management E-mail Forum

You can exchange information with other users of SAS IT Resource Management by subscribing to the ITMS-L listserv. This e-mail forum is available for users to exchange tips, techniques, and information about SAS IT Resource Management.

□ To subscribe, send an e-mail message to *listserv@vm.sas.com* with the following information:

1 Leave the subject line blank.

2 In the body of the message, type

```
subscribe ITMS-L <your first name> <your last name>
```

For example, type the following: *subscribe ITMS-L John Smith*

□ To remove your name from the e-mail forum, send an e-mail message to *listserv@vm.sas.com* with the following information:

1 Leave the subject line blank.

2 In the body of the message, type

```
signoff ITMS-L
```

□ To send mail to the listserv, send e-mail to *itms-l@vm.sas.com*.

APPENDIX

2
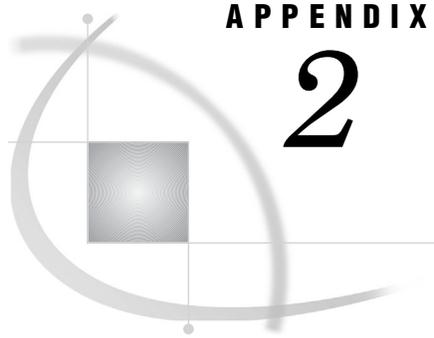
Statistics

SAS IT Resource Management can calculate the following statistics:

- count
- geometric mean
- harmonic mean
- harmonic mean weighted by (user-specified numeric column from the input table)
- maximum
- mean
- minimum
- number missing
- population coefficient of variance
- population coefficient of variance weighted by (user-specified numeric column from one of the input tables)
- population standard deviation
- population standard deviation weighted by (user-specified numeric column from the input table)
- population variance
- population variance weighted by (user-specified numeric column from the input table)
- range
- sample coefficient of variance
- sample coefficient of variance weighted by (user-specified numeric column from the input table)
- sample standard deviation
- sample standard deviation weighted by (user-specified numeric column from the input table)
- sample variance
- sample variance weighted by (user-specified numeric column from the input table)
- sum
- uncorrected sum of squares
- weighted geometric mean weighted by (user-specified numeric column from the input table)
- weighted mean weighted by (user-specified numeric column from the input table)
- weighted uncorrected sum of squares weighted by (user-specified numeric column from the input table)

APPENDIX

3
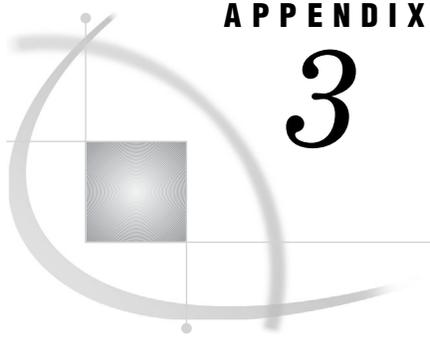
Required Components

The following list contains the components that are included in order to successfully install and run SAS IT Resource Management 3.1.1:

□ Third-party software:
  □ MXG on SAS IT Resource Management 3.1.1 servers licensed and installed in z/OS operating environments
  □ NTSMF on SAS IT Resource Management 3.1.1 servers licensed and installed on Windows

□ SAS IT Resource Management specific server and client software:
  □ SAS IT Resource Management 3.1.1 software
  □ SAS IT Resource Management adapters

□ Supporting SAS Server, Middle Tier, Application Server, and Client software and packages:
  □ Base SAS
  □ SAS/SHARE
  □ SAS/STAT
  □ SAS/ETS
  □ SAS/ACCESS (to Oracle, to DB2)
  □ SAS/ACCESS to ODBC on SAS IT Resource Management servers licensed and installed in Windows and UNIX operating environments
  □ SAS Enterprise Guide
  □ SAS Data Integration Studio
  □ SAS Enterprise Business Intelligence Server

APPENDIX

4
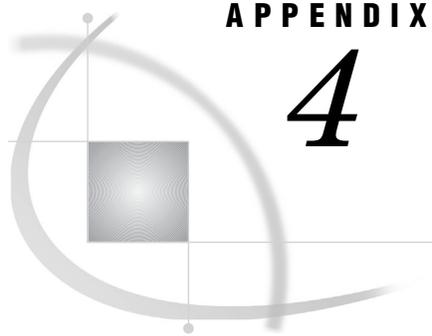
Recommended Reading

The following titles are available at
http://support.sas.com/documentation/onlinedoc/index.html:

☐ *Administering SAS Enterprise Guide*

☐ *SAS Data Integration Studio: User's Guide*

☐ *SAS Enterprise Guide Administrator: User's Guide*

☐ *SAS IT Resource Management: Administrator's Guide*

☐ *SAS IT Resource Management: Migration Documentation*

Other titles of interest include the following documentation:

☐ *SAS 9.1.3 Intelligence Platform: Administration Documentation* that is available
at **http://support.sas.com/documentation/configuration/913admin.html**.

This documentation includes *SAS Management Console 9.1.3: User's Guide*

☐ *SAS Web Infrastructure Kit: Developer's Guide* that is available at
http://support.sas.com/rnd/itech/library/library9.html.

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Your Turn

We want your feedback.

- [ ] If you have comments about this book, please send them to **yourturn@sas.com**. Include the full title and page numbers (if applicable).
- [ ] If you have comments about the software, please send them to **suggest@sas.com**.