SAS® IT Resource Management 3.8: Administrator’s Guide
Contents

About This Book ......................................................... ix

PART 1  Introduction  1

Chapter 1 • General Overview ........................................ 3
  Introduction to SAS IT Resource Management ....................... 3
  Lockdown Feature ................................................... 6
  Architecture and Basic Principles for Data Administrators .......... 9
  How to Locate Documentation ...................................... 13
  National Language Support (NLS) .................................. 15
  Terminology Changes .............................................. 16

Chapter 2 • Preparing to Work with SAS IT Resource Management ... 17
  Working with SAS Management Console ............................ 17
  Working with SAS Enterprise Guide ................................. 22
  Working with Metadata ............................................ 24
  Additional Requirements for z/OS ................................ 29

Chapter 3 • Working with the SAS IT Resource Management Client ... 31
  Overview of the SAS IT Resource Management Client ............. 31
  Features of the SAS IT Resource Management Client ............... 35
  Working with Wizards ............................................. 43
  SAS IT Resource Management Transformations ..................... 46
  Icons for SAS IT Resource Management Objects ................... 47

PART 2  Accessing and Processing IT Data  49

Chapter 4 • IT Data Mart .............................................. 51
  About the IT Data Mart ............................................ 51
  Working with IT Data Marts ........................................ 56
  Importing, Exporting, and Promoting Metadata ...................... 63

Chapter 5 • Adapters .................................................. 65
  About Adapters ...................................................... 65
  Working with Template Tables ..................................... 75
  Maintaining Template Tables and Staged Tables Based on Adapter Changes 84

Chapter 6 • Formulas and Formats ................................... 99
  About Formulas .................................................... 99
  Working with Formulas ............................................ 102
  Formats ............................................................. 106

Chapter 7 • Staging the Data ........................................ 109
  About Staging the Data ............................................ 110
  Working with Staging Transformations ................................ 111
<table>
<thead>
<tr>
<th>Chapter 8 • Aggregating the Data</th>
<th>143</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of the Aggregation Transformation</td>
<td>144</td>
</tr>
<tr>
<td>About Aggregation Tables</td>
<td>145</td>
</tr>
<tr>
<td>Preparing to Create an Aggregation Table</td>
<td>157</td>
</tr>
<tr>
<td>Creating an Aggregation Table with the Simple Aggregation Table Wizard</td>
<td>158</td>
</tr>
<tr>
<td>Creating Aggregation Tables with the Summarized Aggregation Table Wizard</td>
<td>160</td>
</tr>
<tr>
<td>Creating Aggregation Tables with the Aggregations through Template Wizard</td>
<td>182</td>
</tr>
<tr>
<td>Cloning an Aggregation Table</td>
<td>184</td>
</tr>
<tr>
<td>Adding a New Column to an Aggregation Table</td>
<td>186</td>
</tr>
<tr>
<td>Deleting an Aggregation Table</td>
<td>189</td>
</tr>
<tr>
<td>Editing or Modifying an Aggregation Table</td>
<td>191</td>
</tr>
<tr>
<td>Publishing an Aggregation Table as Template</td>
<td>194</td>
</tr>
<tr>
<td>Purging Contents of an Aggregation Table</td>
<td>194</td>
</tr>
<tr>
<td>Renaming an Aggregation Table</td>
<td>195</td>
</tr>
<tr>
<td>Indexing an Aggregation Table</td>
<td>195</td>
</tr>
<tr>
<td>Working with Aggregation Transformations</td>
<td>198</td>
</tr>
<tr>
<td>Working with Aggregation Transformation Filters</td>
<td>202</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 9 • Exception Analysis Processing</th>
<th>209</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of Exception Analysis Processing</td>
<td>209</td>
</tr>
<tr>
<td>How to Use the Exception Analysis Feature</td>
<td>210</td>
</tr>
<tr>
<td>How Are Exceptions Evaluated?</td>
<td>211</td>
</tr>
<tr>
<td>About the Exception Transformation</td>
<td>214</td>
</tr>
<tr>
<td>Working with the Exception Transformation</td>
<td>215</td>
</tr>
<tr>
<td>Defining an Exception Definition with the New Exception Definition Wizard</td>
<td>226</td>
</tr>
<tr>
<td>Exception and Exception Condition Tables</td>
<td>237</td>
</tr>
<tr>
<td>Examples of the Exception Analysis Process</td>
<td>244</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 10 • Adapter Setup Wizard</th>
<th>257</th>
</tr>
</thead>
<tbody>
<tr>
<td>About the Adapter Setup Wizard</td>
<td>257</td>
</tr>
<tr>
<td>Using the Adapter Setup Wizard</td>
<td>259</td>
</tr>
<tr>
<td>What Does the Adapter Setup Wizard Create?</td>
<td>273</td>
</tr>
<tr>
<td>Domain Categories</td>
<td>287</td>
</tr>
<tr>
<td>Deploy and Run Jobs That the Adapter Setup Wizard and Add Domain Category Wizard Create</td>
<td>288</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 11 • Add Domain Category Wizard</th>
<th>291</th>
</tr>
</thead>
<tbody>
<tr>
<td>About the Add Domain Category Wizard</td>
<td>291</td>
</tr>
<tr>
<td>Using the Add Domain Category Wizard</td>
<td>293</td>
</tr>
<tr>
<td>What Does the Add Domain Category Wizard Create?</td>
<td>302</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 12 • Information Maps</th>
<th>307</th>
</tr>
</thead>
<tbody>
<tr>
<td>About Information Maps</td>
<td>308</td>
</tr>
<tr>
<td>About Information Map Transformations</td>
<td>310</td>
</tr>
<tr>
<td>User-Specified Information Map Transformations</td>
<td>312</td>
</tr>
<tr>
<td>Information Map Objects That Are Generated by the Adapter Setup Wizard and the Add Domain Category Wizard</td>
<td>320</td>
</tr>
</tbody>
</table>
Working with Information Map Filters .................................................. 323
Using SAS Information Map Studio ..................................................... 328
Troubleshooting Information Maps Problems ....................................... 331

Chapter 13 • User-Written Staging Code .......................................... 333
User-Written Staging Transformations ................................................. 333
Guidelines for Processing Data with User-Written Staging Transformations ................................................. 334
Working with User-Written Staging Transformations .......................... 351
Using the Additional Generated Code ................................................. 359
What Are the Properties of the User-Written Staging Transformation? .... 362

Chapter 14 • Jobs ............................................................................ 365
Jobs That Process IT Data .................................................................. 365
Working with Jobs ........................................................................... 370
Running Jobs ................................................................................... 375
Running an “Overall” Job with the %RMRUNETL Macro ....................... 385
Allocating the Raw Data File Externally ............................................. 386

PART 3 Appendixes ...................................................................... 389

Appendix 1 • SAS IT Resource Management Components .................. 391

Appendix 2 • Data Sources Supported by SAS IT Resource Management Adapters .................................................. 395
Data Sources Supported by SAS IT Resource Management Adapters .................................................. 397
Supported Adapters ........................................................................... 397
MXG Adapters — Accessing Raw Data ................................................. 405
Amazon CloudWatch — Accessing Raw Data ......................................... 407
BMC Perf Mgr — Accessing Raw Data ................................................ 410
CSV Adapter - Accessing Raw Data ..................................................... 412
DT Perf Sentry — Accessing Raw Data ................................................ 414
Ganglia — Accessing Raw Data ........................................................... 416
HP Perf Agent — Accessing Raw Data ................................................ 419
RRDtool — Accessing Raw Data .......................................................... 421
SAR — Accessing Raw Data ................................................................. 422
SNMP — Accessing Raw Data ............................................................. 424
Web Log — Accessing Raw Data ........................................................ 430
Database Adapters: HP Reporter, MS SCOM, SAP ERP, SAS EV, and VMware .................................................. 431
HP Reporter - Accessing Data ............................................................. 433
MS SCOM - Accessing Data ............................................................... 436
SAP ERP - Accessing Data ................................................................. 437
SAS Environment Manager (SAS EV) — Accessing Data ........................ 440
Working with IBM SMF Custom Tables .............................................. 447
Working with MXG Code to Stage Data .............................................. 450
How MSU and MIPS Columns Are Included in Staged Tables for the SMF Adapter .................................................. 457

Appendix 3 • Staging Parameters ....................................................... 477
Staging Parameters ........................................................................... 478
Staging Parameters for Supported Adapters ........................................ 489
User-Written Staging Parameters ......................................................... 508

Appendix 4 • Jobs That the Adapter Setup and the Add Domain Category Wizards Create .............................................. 525

Appendix 5 • Duplicate-Data Checking .............................................. 537
Duplicate-Data Checking Overview .................................................... 537
<table>
<thead>
<tr>
<th>Appendix 6 • Data Model</th>
<th>547</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of the SAS IT Resource Management Data Model</td>
<td>548</td>
</tr>
<tr>
<td>Data Model Adapter and Domain Category Specifications</td>
<td>551</td>
</tr>
<tr>
<td>What Are Key Metrics?</td>
<td>562</td>
</tr>
<tr>
<td>Key Metrics for the Server Performance Domain Category</td>
<td>564</td>
</tr>
<tr>
<td>Detail Aggregation Template Tables for Amazon CloudWatch and Ganglia Adapters, and for Selected IBM SMF Staged Tables</td>
<td>570</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 7 • Naming Standards</th>
<th>573</th>
</tr>
</thead>
<tbody>
<tr>
<td>About Naming Standards for SAS IT Resource Management Objects</td>
<td>573</td>
</tr>
<tr>
<td>Naming Standards and Location of Objects</td>
<td>573</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 8 • Macros</th>
<th>581</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to the Macros in SAS IT Resource Management</td>
<td>583</td>
</tr>
<tr>
<td>%RMDELETE</td>
<td>584</td>
</tr>
<tr>
<td>%RMDELPVT</td>
<td>586</td>
</tr>
<tr>
<td>%RMDMPATH</td>
<td>589</td>
</tr>
<tr>
<td>Duplicate-Data Checking Macros</td>
<td>590</td>
</tr>
<tr>
<td>%RMMSBMCP</td>
<td>596</td>
</tr>
<tr>
<td>%RMMSDTPS</td>
<td>598</td>
</tr>
<tr>
<td>%RMMSMXG</td>
<td>600</td>
</tr>
<tr>
<td>%RMMSSCOM</td>
<td>604</td>
</tr>
<tr>
<td>%RMMSSNMP</td>
<td>608</td>
</tr>
<tr>
<td>%RMPROINT</td>
<td>610</td>
</tr>
<tr>
<td>%RMRUNETL</td>
<td>615</td>
</tr>
<tr>
<td>%RMVINST</td>
<td>619</td>
</tr>
<tr>
<td>Backup and Recovery Macros</td>
<td>620</td>
</tr>
<tr>
<td>Macros to Handle Large Data Volumes</td>
<td>625</td>
</tr>
<tr>
<td>Macros for SAS Visual Analytics Integration</td>
<td>629</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 9 • Best Practices and Troubleshooting Tips</th>
<th>639</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to Back Up SAS IT Resource Management</td>
<td>640</td>
</tr>
<tr>
<td>How to Backload Raw Data</td>
<td>643</td>
</tr>
<tr>
<td>How to Set the Logging Level for the Web Application Server</td>
<td>646</td>
</tr>
<tr>
<td>Debugging Problems in SAS IT Resource Management</td>
<td>647</td>
</tr>
<tr>
<td>Use the Apply Button to Update Metadata</td>
<td>651</td>
</tr>
<tr>
<td>Tips for Working with the IT Data Mart</td>
<td>651</td>
</tr>
<tr>
<td>Tips for Working with Aggregations</td>
<td>652</td>
</tr>
<tr>
<td>How to Maintain the Latest Raw Value in an Aggregation Table</td>
<td>653</td>
</tr>
<tr>
<td>Tips for Working with Information Maps</td>
<td>655</td>
</tr>
<tr>
<td>Tips for Configuring and Administering SAS IT Resource Management</td>
<td>656</td>
</tr>
<tr>
<td>Handling Holidays</td>
<td>657</td>
</tr>
<tr>
<td>Performance Issues</td>
<td>661</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 10 • Method for Overriding Locations at Execution Time</th>
<th>665</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overriding Locations at Execution Time</td>
<td>666</td>
</tr>
<tr>
<td>Processing Large Files of Data</td>
<td>666</td>
</tr>
<tr>
<td>Processing Multiple Files of Data</td>
<td>667</td>
</tr>
</tbody>
</table>
Overriding Locations in the Information Map Transformation .................. 678
Overriding Locations in the Exception Transformation .......................... 678
Overriding Locations in the Performance Report Transformation .......... 679

Appendix 11 • Statistics ............................................................................. 681
Appendix 12 • Open-Source System Management Tools ......................... 683
Appendix 13 • Deploying Jobs in Batch Mode ........................................... 691
Appendix 14 • Working with SAS Visual Analytics in SAS IT Resource Management .................. 697
    Working with SAS Visual Analytics in SAS IT Resource Management .... 697
    Using SAS Visual Analytics Designer with SAS IT Resource
    Management Data Sources ................................................................. 702
    Importing VMware SAS Visual Analytics Reports into SAS IT
    Resource Management ................................................................. 722
    Using SAS Management Console to Create a Library ..................... 727
    SAS Visual Analytics Macros ......................................................... 728
Appendix 15 • Working with the VMware Adapter ................................... 731
    VMware vCenter - Accessing Data ................................................. 731
    Working with the VMware Lookup TableVMware .......................... 734
    VMware Data Acquisition Jobs ....................................................... 737
    Enabling Access to the VMware vCenter Server Appliance
    (vCSA) Postgres Database ............................................................ 738
Recommended Reading ........................................................................... 749
Index .......................................................................................................... 751
About This Book

Audience

The purpose of the *SAS IT Resource Management 3.8: Administrator's Guide* is to present all topics that are related to system administration and data preparation in SAS IT Resource Management. For information about reporting topics, see *SAS IT Resource Management 3.8: Reporting Guide*. For information about report distribution, see the *IT Resource Management 3.8: Report Center Guide*.

*SAS IT Resource Management 3.8: Administrator's Guide* is designed for the following users:

- Data administrators are responsible for administering the IT data mart. They also set up the jobs that stage and aggregate IT performance data so that report-ready data is available for generating reports. Data administrators typically deploy and schedule the batch production jobs that prepare and generate the IT performance reports. They often function as IT performance managers and capacity planners.

  Data administrators typically use the documentation that is found in the *SAS IT Resource Management 3.8: Administrator's Guide*, although they usually refer to all SAS IT Resource Management documentation.

- Performance analysts are responsible for analyzing IT performance data that is managed by the data administrator, and designing and creating reports that communicate IT intelligence. These users 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. Performance analysts often function as capacity planners, system administrators, and business analysts.

  Performance analysts typically use the documentation that is found in *SAS IT Resource Management 3.8: Reporting Guide*, although they might refer to all SAS IT Resource Management documentation.

- Information consumers are responsible for analyzing report data and making decisions based on that data. These users are business people who are interested in the overall performance aspects of IT at a company. They often function as system architects, IT managers, and IT executives. Information consumers 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.

  Information consumers typically use the documentation that is found in *SAS IT Resource Management 3.8: Overview* and in *SAS IT Resource Management 3.8: Report Center Guide*. 
Prerequisites

Here are the prerequisites for using SAS IT Resource Management 3.8:

- A user ID and password that is appropriate for the type of access that is needed to accomplish designated IT Resource Management functions.
  
  *Note:* Data administrators use SAS Management Console to define the logins for users and groups of users, based on their roles and the SAS products that they need to work with.

- An operating environment that includes a supported client, middle tier, and server.

- **Depending on your role, you might need access to the following software that is used by SAS IT Resource Management 3.8:**
  
  - SAS Data Integration Studio with plug-ins for SAS IT Resource Management
  - SAS Information Map Studio
  - SAS Enterprise Guide with add-ins for SAS IT Resource Management
  - SAS Add–In to Microsoft Office
  - ITRM Report Center
  - SAS Web Report Studio
  - SAS BI Dashboard
  - SAS Information Delivery Portal
  - SAS Management Console

To log on to a SAS product, select **Programs ⇒ SAS**. From the list of software that is displayed, select the application that you want to work with. If prompted, enter your user ID and password.

Online Help is available for all SAS software. Click **Help** within the product in order to access it. In addition, documentation for SAS software is available at this web location: [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html). Use the A-Z index to locate the documentation that you want to access.
Part 1

Introduction

Chapter 1
   General Overview ....................................................... 3

Chapter 2
   Preparing to Work with SAS IT Resource Management .......... 17

Chapter 3
   Working with the SAS IT Resource Management Client ........ 31
Chapter 1
General Overview

Introduction to SAS IT Resource Management

What Is SAS IT Resource Management?

Information Technology managers need to access, manage, integrate, manipulate, analyze, and share information about large quantities of performance data for many IT resources. These resources include hardware, operating system software, networks, web servers, databases, and applications. As such, IT performance evaluation software requires technology that can perform the following tasks:

• work with performance data from these many different sources
• summarize and analyze that data
• provide reports that permit quick and accurate analyses of a company's IT resources from current, historical, and forecasted perspectives

The SAS solution to this critical business challenge is SAS IT Resource Management (ITRM).
SAS IT Resource Management provides many IT domain intelligence features, as shown in the following list.

- a comprehensive IT performance management and capacity planning data model for supported adapters
- the Adapter Setup wizard, which facilitates the efficient specification of the extract, transform, and load (ETL) jobs, analysis, and reporting processes for many IT resources
- the Add Domain Category wizard, which facilitates the specification of extract, transform, and load (ETL) jobs, analysis, and reporting processes for additional domain categories for adapters that are already specified
- tools and transformations for the creation of user-written adapters and maintenance of adapters
- supplied report definitions that facilitate IT resource analysis
- analysis and reporting of exceptions that are detected during the processing of raw data

SAS IT Resource Management is built on SAS®9.4 and extends that platform with these features:

- IT data mart structure
- staging and aggregation code for specialized ETL processing of IT data sources
- plug-ins to SAS Data Integration Studio and SAS Enterprise Guide
- exception analysis processing
- ITRM Report Center web application for the distribution and organization of IT intelligence reports

ITRM Report Center is a web-based application that enables the many reports that are produced by the SAS IT Resource Management solution to be grouped, filtered, managed, and viewed. ITRM Report Center supports these workspaces: Home, Gallery, Resource, and Administration.

**SAS IT Resource Management Functionality**

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:

- manage adapters (access, read, stage, aggregate, and report) for many popular network and systems management tools across hardware platforms, operating system environments, networks, web servers, databases, and applications.
- establish IT data marts that contain the IT resource management data from data sources that the enterprise.
- create common references to measurements that are available in disparate data sources. This functionality ensures that the IT data mart provides an independent set of measurements that can be analyzed across the IT enterprise.
- calculate standardized measurements, units, and statistics to populate the IT data mart with analysis and report-ready data.
- define Aggregation transformations that are specific to the time-based summarizations and statistical measurements that are necessary to accommodate a site's analysis and reporting needs.
• provide the ability to create 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, prediction, peak period and seasonality analysis, time-based analysis, workload analysis, and enterprise IT performance summaries that complement existing IT utilization, availability, and performance analysis capabilities.

• define Exception transformations that can detect and report on exceptional conditions in the source data

• provide a variety of report output mediums to accommodate the needs of the data administrators, performance analysts, and high-level information consumers.

It also takes advantage of SAS®9.4 and the enterprise-class solutions that SAS®9.4 provides. These solutions include the following:

• SAS Data Integration Studio

The SAS IT Resource Management solution provides additional IT-specific features and functionality to the data management capabilities of SAS Data Integration Studio. These additional ITRM features and functions are seamlessly integrated with those of SAS Data Integration Studio. The enhanced capabilities of SAS Data Integration Studio that are delivered by SAS IT Resource Management are commonly referred to as the SAS IT Resource Management client, throughout this document. They are labeled accordingly in the SAS IT Resource Management software.

The SAS Data Integration Studio 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. You can use SAS Data Integration Studio to perform the following tasks:

• create and maintain the IT data marts that are the containers for the information maps, ETL jobs, tables, templates, data, and 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 services. SAS IT Resource Management extends SAS Enterprise Guide for the creation of report definitions that can be run interactively within SAS Enterprise Guide. Alternatively, they can be scheduled to run in batch mode to publish SAS IT Resource Management reports and report properties to the SAS Content Server for consumption by the ITRM Report Center application.

• SAS 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 provides access to the following components:
• SAS Information Map Studio: This product provides the functionality to create business-oriented data sources that are appropriate for all users, expert to novice, when designing and creating reports.

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

• 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, and more.

• 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. It enables users to access data 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 Visual Analytics Administration and Reporting: This web-based product leverages SAS high-performance analytic technologies. SAS Visual Analytics empowers business users, business analysts, and IT administrators to accomplish tasks from an integrated suite of applications that are accessed from a home page. The central entry point for SAS Visual Analytics enables users to perform a wide variety of tasks, such as preparing data sources, designing reports, as well as analyzing and interpreting data. Reports can be displayed on a mobile device or in the SAS Visual Analytics Viewer (the viewer).

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

---

**Lockdown Feature**

**Overview of the Lockdown Feature**


*Note:* The XCMD option must be set to `NOXCMD` in order to use the lockdown feature.

**TIP** The *lockdown path list* is a list that specifies which files and directories a SAS session can access when locked down. It does not specify which paths are inaccessible. This lockdown path list is often referred to as a *whitelist*.

For SAS IT Resource Management 3.8, if the application server (such as SASITRM) is locked down, jobs might fail if the required physical files and directories are not listed in the lockdown whitelist. (This is a desired result of using the lockdown feature.)

**What Paths Should be Added to the Whitelist?**

The paths to the following locations should be added to the lockdown whitelist:

- all input raw data files and directories
• all SAS library objects for all IT data marts
• any directories that are specified by the WORKDIR= parameter of supplied SAS macros
• any temporary files or directories such as temporary disk space locations that are overridden on the **Report Parameters** tab of the Performance Report or Exception transformation

Temporary disk space is used to store files and directories that are generated by a Performance Report or an Exception transformation. If the override path for a Performance Report or an Exception transformation is specified in the **Report Parameters** tab, be sure to include it in the whitelist. The following display shows a specified override path.

**TIP** For best results, specify the override location for these files.

If the override location for these files is not specified, the following paths are used. The path to these files is constructed based on your operating environment and the user ID of person running the jobs. You must add these paths to the whitelist:

• For Windows operating environments, SAS IT Resource Management uses one of the following paths to the temporary files. The path is selected from this list in the following order:
  • the value of the TEMP environment variable (for the user)
  • the value of the TEMP environment variable (for the system)
  • the value of the USERPROFILE environment variable
• For UNIX operating environments, the path is selected from this list in the following order:
  • the value of the TEMP environment variable
  • /tmp
  • the value of the HOME environment variable
  • .

• For z/OS operating environments, the path is selected from this list in the following order:
  • The value of the FILETEMPDIR option if it is specified, if it exists, and if FILESYSTEM=zFS
  • /tmp

Note: If there is code that is written by the user, then the user is responsible for evaluating whether the code requires additions to the whitelist. (Code that is written by the user might exist in the User-Written Staging transformation, in pre- or post-code sections of any transformations, or in any other place.)

How to Add Paths to the Whitelist

Adding paths to the lockdown whitelist is described further in the LOCKDOWN statement documentation, using the PATH= and FILE= arguments. Here is an example:

LOCKDOWN PATH="C:\My\Raw\Data";

This PATH example adds the directory C:\My\Raw\Data, including its files and subdirectories, to the whitelist of accessible paths.

To generate and publish reports from the Performance Report or the Exception transformation, or to send alerts from the Exception transformation, the HTTP (or URL) access method is required. (For lockdown purposes, HTTP and URL are an aliased name pair and mean the same thing.) By default, HTTP (or URL) access is denied when a server is locked down. Therefore, these two transformations will fail to execute correctly. The site can specify HTTP (or URL) as an exception to the lockdown state by using the ENABLE_AMS argument. Here is an example:

LOCKDOWN ENABLE_AMS=HTTP;

This ENABLE_AMS example adds HTTP (URL) access to the list of allowable access methods. When the Performance Report transformation and the Exception transformation generate and publish reports, HTTP is required in order to notify the middle tier. HTTP access also enables the Exception transformation to send alerts.

Note: If your site has specified NOXCMD as part of the locked down server settings, the RRDtool and SNMP staging transformations will not execute correctly. (The RRDtool and SNMP adapters require the XCMD option to be set on.) Therefore, the lockdown feature is not available for servers that are running these two adapters.
The Architecture of SAS IT Resource Management

SAS IT Resource Management uses data integration and business intelligence components that are provided by the SAS Intelligence Platform. It also uses 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 web-based interfaces for report creation and information delivery. The web-based ITRM Report Center application runs on this tier.
  
  Note: SAS IT Resource Management supports both secured (https) and unsecured (http) middle tiers.
- 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 server tier provides the metadata for the files and tables that are read into and generated by the SAS IT Resource Management software.
- SAS Visual Analytics server and middle tiers are typically deployed to dedicated hardware resources. They can run on Linux x64 and Windows x64 operating environments.

With multi-tier processing, the tiers can be separated so that the processing can be done on multiple machines.

- The SAS IT Resource Management client must run on the Windows operating environment.
- The SAS IT Resource Management middle tier can run in Windows or UNIX operating environments.
- The SAS IT Resource Management server can run in Windows, UNIX, or z/OS operating environments.

Therefore, those software components for the server tiers and the middle tiers can be installed on different machines according to the site requirements of an enterprise and the platforms that are supported by SAS for each tier of the SAS software architecture. 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 architectural components consist of the clients, middle tier, and servers that are used by SAS IT Resource Management. These components are presented in the detail and
summary diagrams of the plan files for the SAS IT Resource Management solution. Here is a sample of the diagrams that are delivered:

**Figure 1.1  SAS IT Resource Management 3.8 Architectural Components**

![SAS IT Resource Management Architectural Components Diagram](image)

**Note:** The multiple tiers shown in this diagram represent categories of software that perform similar functions. They do not necessarily represent separate machines or 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.

**The Basic Principles and Components of SAS IT Resource Management**

**Using IT Resource Management**

After the initial setup is complete, you can use IT Resource Management to process and evaluate IT resource data. SAS IT Resource Management provides the processes and the supporting technology that are required to regularly collect, aggregate, analyze, and report on the IT performance evaluation data that is vital to the health of an enterprise.

To start SAS IT Resource Management from Windows, select **Start** ➔ **Programs** ➔ **SAS** ➔ **SAS IT Resource Management**.

In general, the processes that gather and monitor IT performance evaluation data consist of the following 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. The data can also be
created by the Enterprise Systems Management tools that are used to manage the IT
infrastructure. The raw data is read into SAS IT Resource Management
transformations that are supplied with SAS IT Resource Management software.

For information about how to generate and reference the raw data for supported
adapters, see the various adapter-specific "Accessing Raw Data" topics in "Data
Sources Supported by SAS IT Resource Management Adapters" on page 397.

2. Process (stage) the raw data.

The raw data is processed (or staged) by adapters that are customized for 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 jobs. The job that actually executes the transformation can run interactively but
is normally 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 can access the associated
templates that are needed to process and load the raw data into staged tables. For
data sources that are not natively supported by the solution, the User-Written Staging
transformation is available. The staged tables can then be used as input to an
Aggregation transformation or other SAS Data Integration Studio and SAS IT
Resource Management transformations.

Information about these staging components is available in the following topics.
- For a list of the adapters that are supported by SAS IT Resource Management,
  see “Supported Adapters” on page 66.
- For more information about the staging transformations that are available for the
  supported adapters, see “About Staging the Data” on page 110.
- For more information about user-written staging code, see “User-Written Staging
  Transformations” on page 333.

3. Aggregate the data in the staged tables.

After the raw data is staged, it can be read into the aggregation step. An aggregation
is the act or process of grouping data, using an operation that produces a statistic,
such as a sum, average, minimum, or maximum. The term aggregation can also refer
to the grouped data that results from such an operation. Aggregation transformations
can generate summarized aggregated tables or simple aggregated tables.

- Simple aggregations do not undergo any summarizations; they simply append
  new data as it was read by the staging transformation to an existing aggregation
  table. (These tables are typically called detail aggregation tables.)
- Summarized aggregations read data from a staged or user-defined table and then
categorize and aggregate data according to the specifications of the Aggregation
  transformation.

Jobs that contain Aggregation transformations are created and updated in SAS Data
Integration Studio.

An Aggregation transformation can contain multiple aggregations that each generate
an aggregation table of data. SAS IT Resource Management provides the ability to
customize Aggregation transformations based on a site's requirements. An
Aggregation transformation can be customized to perform aging and filtering of the
aggregated data. It can perform calculations that create additional columns of data
and join columns from different tables. It can support summarizations of data into
any choice of time periods. The Aggregation transformation can also compute
statistics on the data, calculate percent of change of a statistic over a specified period of time, calculate the rank of a statistic or a class or ID column, and more.

An unlimited number of aggregations can be created for each staged table. For example, the same data source can be read into both a daily aggregation and a weekly aggregation within the same or separate Aggregation transformations. For more information about working with Aggregation transformations and aggregation tables, see “About Aggregation Tables” on page 145.


Incoming data can be evaluated by an exception analysis process that detects user-defined conditions. Typically, the source data to an Exception transformation is a staged table. However, it can be any table that users need to examine for exceptional conditions. (Information maps are not valid input to the Exception transformation.)

The Exception transformation can be customized to filter the data and define the occurrence level and type of exception that is to be detected. The transformation supports the creation of exception definitions. The expression that is specified in the exception definition defines the condition being evaluated. These conditions are supported: constant threshold, other column, range, statistic bounds, and free form values. (Some exception definitions are supplied with the software.)

When an exception is detected, SAS IT Resource Management can generate reports and tables. The reports are stored in the SAS Content Server.

Report jobs are usually run in batch mode.

5. Generate information maps.

After the performance data has been aggregated, it is ready for the reporting processes. For a supported adapter, SAS IT Resource Management 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 Intelligence Platform applications, such as SAS Web Report Studio in order to generate reports. These reports can provide domain intelligence about the adapters, such as CPU utilization, threshold analysis, and peak period analysis.

For more information about working with Information Map transformations to create and customize information maps, see “About Information Maps” on page 308.

6. Define and generate the reports.

SAS IT Resource Management generates tabular and graphical reports from report definitions that are supplied with the software, or created in SAS Enterprise Guide. Report definitions can be accessed by the Performance Report transformation. When the job that contains that Performance Report transformation is run, the reports are generated and stored in the SAS Content Server. Report jobs are usually run in batch mode.

Report definitions can be run directly from SAS Enterprise Guide, and the resulting reports can be viewed interactively from the SAS Enterprise Guide Project window or from a web browser. The reports can also be published to your web server.

7. View the reports.

Using ITRM Report Center, reports that are generated by running the Performance Report or the Exception transformation can be accessed and managed. This web application enables information consumers to organize their reports into gallery folders, galleries, and albums. Galleries can be filtered so that they display only a subset of the available reports.
ITRM Report Center requires that users of this web application be assigned to users, groups, and roles in the metadata. SAS IT Resource Management delivers groups and roles that are necessary to use ITRM Report Center. For more information, see *SAS IT Resource Management 3.8: Report Center Guide*.

For more information about the reporting capabilities that are available using SAS IT Resource Management data, see *SAS IT Resource Management 3.8: Reporting Guide*.

Information consumers and performance analysts can also use these additional processes:

- **Generate and view ad hoc reports.**

  SAS Web Report Studio is a web-based interface that can use information maps to select and report on data. Information maps are generated by Information Map transformations.

- **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.

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

- **Use SAS Visual Analytics to actively interact with data produced by SAS IT Resource Management.**

---

### How to Locate Documentation

#### Accessing SAS IT Resource Management Documentation

Documentation about SAS IT Resource Management is available in the form of web-based documentation, and online Help.

To locate the SAS IT Resource Management documentation, use the Products Index at [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html). The following documentation can be accessed from the SAS IT Resource Management documentation page:

- **What's New in SAS IT Resource Management 3.8?**

  This document provides a brief description of the new features that are included in this release of the SAS IT Resource Management software and documentation.

- **SAS IT Resource Management 3.8: Overview**

  This document provides information about the extensive domain intelligence that is available with SAS IT Resource Management. It also provides a glossary for terms that are used by SAS IT Resource Management.

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

- **SAS IT Resource Management 3.8: 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 set up and maintain IT data marts, work with simple and summarized aggregations, information maps, and exception processes. It also provides information about the wizards, especially the Adapter Setup and Add Domain Category wizards. These wizards facilitate the specification of the ETL processes required for administering a site's IT resource data.

This document provides information about the other functional components of the software, such as the SAS Metadata Repository (SMR) and the like.

The audience for this document is SAS IT Resource Management data administrators or capacity planners.

- **SAS IT Resource Management 3.8: Reporting Guide**
  This document contains detailed information about the tasks that are required to generate, view, and manage reports. It describes how to work with the Performance Report task in SAS Enterprise Guide, the Performance Report transformation, and the ITRM Report Center application. It also provides information about the other SAS products that support the reporting processes, such as SAS Web Report Studio, SAS Information Delivery Portal, and SAS Add-in for Microsoft Office.

  A “Report Conversion” appendix provides a description of the steps that are performed in order to re-create reports that were generated using SAS IT Resource Management 2.7 report macros. These steps use SAS Enterprise Guide 7.12, which is included in SAS IT Resource Management.

- **SAS IT Resource Management 3.8: Report Center Guide**
  This document describes the **Home**, **Gallery**, **Resource**, and **Administration** workspaces. It contains detailed information about the tasks that are required to create, view, and manage the galleries, albums, and folders that contain performance and exception reports.

- **SAS IT Resource Management 3.8: Migration Guide**
  This document provides a description of the steps that are performed in order to move a site's processing from the earlier versions of the software to the current version.

- **Guide to Operating SAS IT Resource Management 3.8 without a Middle Tier**
  This document provides a description of how to use SAS IT Resource Management without SAS Web Application Server.

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 document. To access this documentation, navigate to the website at this location: [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html).

**Accessing SAS IT Resource Management Online Help**

Online Help is available for anyone who performs tasks with the user interface.

**Note:** The Help that is provided with this release of the SAS IT Resource Management software briefly describes the fields on the windows that are specific to IT Resource Management.
To display the field-based Help window for an active window or tab, click **Help** or press the F1 key.

To search for topics about concepts or features that are identified by specific words, such as “information maps,” click the **Search** tab in the Help window. Enter the text to be found and press the Enter key.

Online Help is available for all SAS technology products on which SAS IT Resource Management is built.

---

**National Language Support (NLS)**

National Language Support (NLS) is a set of features that enable a software product to function properly in every global market in which the product is sold. Typically, software that is written in the English language works well for users who use English and use data that is formatted using the conventions that are observed in the United States. However, without NLS, these products might not work well for users in other regions of the world. NLS in SAS enables users in regions, such as Asia and Europe to process data successfully in their native languages and environments.

SAS IT Resource Management uses NLS formats for dates and numbers in template table columns, staged table columns, and aggregation table columns. If a column uses NLS formatting, the value in the **Format** column of the table begins with “NL”, such as `NLNUM16.0`. These NLS values in the **Format** column of the tables use the following naming convention:

- **NLNUM** indicates that the data value is numeric.
- **NLDAT** indicates that the data value is a date (without the time component).
- **NLDATM** indicates that the data value is a date (with the time component).
- The number before the period indicates the maximum number of characters (including numerals, commas, and dots) that the data value can have.
- The number following the period indicates the number of decimal places that the data value can have.

For example, a table column might have the value `NLNUM16.2` in the **Format** column of the table. In that case, you know that the data value is numeric, it has a maximum of 16 characters (including numerals, commas, and dots), and it has two decimal places. In this case, NLS enables the same data value to be presented in different ways. For example, a data value, such as 1,000,000,123.75 in the United States might be rendered as 1,000,000,123.75 in some European regions based on the system locale.

Dates and times have many representations also, depending on the conventions that are accepted in a culture. The month might be represented as a number or as a name. The name might be fully spelled or abbreviated. The order of the month, day, and year might differ according to locale. Likewise, time can be represented in one English-speaking country or region by using the 12-hour notation. However, other English speakers might expect time values to be formatted using the 24-hour notation.

In order to have NLS present data in the format that represents the traditional form that your users might expect, you can specify the locale setting when invoking SAS. A locale reflects the language, local conventions, such as data formatting, and culture for a geographical region. Local conventions might include specific formatting rules for dates, times, and numbers, and a currency symbol for the country or region. You can use the **LOCALE=** system option to specify the locale of the SAS session at SAS invocation.
Terminology Changes

The versions of SAS IT Resource Management 3.1 and later use new terminology to describe similar tasks, objects, or features that you might have used when working with earlier versions of the software. The following table provides some of the old terms that were used before this version of SAS IT Resource Management and the new terms that describe the same or similar tasks or objects.

Table 1.1  Terminology Changes for SAS IT Resource Management 3.2 and Later

<table>
<thead>
<tr>
<th>2.x Term or Phrase</th>
<th>3.x Term or Phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDB</td>
<td>IT data mart</td>
</tr>
<tr>
<td>collectors</td>
<td>adapters</td>
</tr>
<tr>
<td>QuickStart wizard</td>
<td>Adapter Setup wizard</td>
</tr>
<tr>
<td>detail level data</td>
<td>simple aggregation data</td>
</tr>
<tr>
<td>summary level data</td>
<td>summarized aggregation data</td>
</tr>
<tr>
<td>process macro</td>
<td>staging transformation</td>
</tr>
<tr>
<td>reduction macro</td>
<td>Aggregation transformation</td>
</tr>
</tbody>
</table>

Note: The terms and phrases in the table show the change in terminology for similar objects and concepts. These terms do not represent an exact one-to-one correlation. For example, the Adapter Setup wizard provides more functionality and features than the QuickStart wizard. However, the general concepts and objectives of the two wizards are similar.
**Working with SAS Management Console**

**Introduction to SAS Management Console**

SAS Management Console provides a single point of control for managing resources on all platforms that are supported by SAS. By invoking SAS Management Console, the data administrator has access to the many management functions that it provides. For information about these functions, see the *SAS Management Console: User's Guide* at [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html). Use the A-Z index to SAS Product Documentation to locate the documentation for SAS Management Console.

SAS Management Console enables SAS IT Resource Management data administrators to perform the following tasks:

- Manage metadata for users, roles, and groups in the SAS Metadata Repository. These objects govern how users access ITRM Report Center.
• After users define their jobs, they can submit those jobs for immediate execution or deploy them for scheduling in SAS Management Console. After a job is deployed, users can schedule the jobs to run in batch mode at a specified date and time. Use the Schedule Manager component of SAS Management Console to specify a job deployment directory.

In addition, to successfully deploy jobs in batch mode on Windows operating environments, the user must have log on as batch privilege.

Note: The Schedule Manager component of SAS Management Console controls the function of specifying a job deployment directory.

To access SAS Management Console, from your Microsoft Windows, select Start ⇒ Programs ⇒ SAS ⇒ SAS Management Console.

Adding Users and Groups of Users

About SAS IT Resource Management User Groups

The installation process of SAS IT Resource Management establishes two user groups: IT Resource Management Report Center Administrators and IT Resource Management Report Center Users. In addition, for all SAS applications, a group called SASUSERS is established.

• IT Resource Management Report Center Administrators
  IT Resource Management Report Center Administrators can access all the workspaces of ITRM Report Center. These workspaces are: Home, Gallery, Resource, and Administration.

• IT Resource Management Users
  IT Resource Management Report Center Users can access these workspaces: Home, Gallery, and Resource.

• A SASUSER who does not belong to either group has limited access to the Home and Gallery workspaces.

Note: For more information, see “Overview of ITRM Report Center “ in Chapter 1, “About ITRM Report Center,” in the SAS IT Resource Management 3.8: Report Center Guide.

To add new or existing users to a SAS IT Resource Management Report Center administrator or user group, perform the following steps:

1. Invoke SAS Management Console from Microsoft Windows by selecting Start ⇒ Programs ⇒ SAS ⇒ SAS Management Console.
   Connect to SAS Management Console by using an unrestricted user ID.

2. In the Repository field at the top of the Plug-ins tab, select the foundation repository that you want to work with from the drop-down list.

Note: The selected repository must be the repository that is the required metadata store for a SAS Metadata Server. Each metadata server has one foundation repository. As a default, the name of the foundation repository is Foundation. (If you performed a custom installation, then you might have assigned a different name.)

3. You can perform the following tasks:
Add a New User to a SAS IT Resource Management Report Center User Group

SAS IT Resource Management provides these two groups: IT Resource Management Report Center Administrators and IT Resource Management Report Center Users. To add a new user to one of these groups, perform the following steps:

1. Select User Manager component of SAS Management Console. Right-click the selection, or any where on the panel workspace that is open, and select New ⇒ User.

   The General tab of the New User Properties dialog box appears. Enter the name and other identifying information for the user on this dialog box.

2. Click the Groups and Roles tab. From the Available Groups and Roles column, select the group (that is, IT Resource Management Report Center Administrators or IT Resource Management Report Center Users) into which you want to place the new user. Click the arrow to add the selected group to Member of column.

3. Define sign-in credentials for this new user.

   Click the Accounts tab. Click New to display the New Login Properties dialog box where you can add sign-in information for the new user. Ensure that the User ID and Password fields are entered. (DefaultAuth is the supplied entry that contains the login for the SASITRM server.)

4. Click OK to save your changes.

Add an Existing User to a SAS IT Resource Management Report Center Group

To add an existing user to one of the two groups that are provided by SAS IT Resource Management, perform the following steps:

1. From the list of registered users in the User, Group, or Role column, right-click the IT Resource Management Report Center Administrators or IT Resource Management Report Center Users. Then select Properties.
The dialog box contains five tabs: General, Members, Groups and Roles, Accounts, and Authorization. The Properties dialog box enables you to view and modify information about the selected user or user group.

2. Click the Members tab to display a list of the Available Identities and the Current Members. To add a user to the Current Members of selected group, highlight that user in the Available Identities column. Use the arrow to move the selected user to the Current Members column.

3. For each selected member, make sure that user has a login. To set the login for a user, click Properties. On the Accounts tab, ensure that the User ID and Password fields are entered. (DefaultAuth is the supplied entry that contains the login for the SASITRM server.)

4. [Optional] Set permissions for the user using the Authorization tab.

5. Click OK to save your changes.

Note: For more information, see the SAS 9.4 Intelligence Platform: Security Administration Guide.

**Enabling the Log On as a Batch Job Privilege for Windows Users**

All Windows users of SAS IT Resource Management need the Log On as a Batch Job privilege.

To meet this requirement, log on to Windows as an Administrator and modify the local security policy. To do so, select Start ⇒ Administrative Tools ⇒ Local Security Policy ⇒ Local Policies ⇒ User Rights Assignment ⇒ Log on as a batch job.
Note: The “Log on as a batch job” privilege is relevant only to Windows. There is no direct analog on UNIX or z/OS.

**TIP**  If you have an operating system group (such as SAS Server Users) that has this right, you can just add users and service account identities to that group.

**Adding Locations for the Deployment of Jobs**

In order to run a job in batch mode, a job must be deployed into a directory on the application server. The location of this directory can be defined in SAS Management Console. New deployment directories can also be defined in the SAS IT Resource Management client, while you are deploying a job. To specify the location, perform the following steps:

1. If SAS Management Console is not running, start it by selecting **Start** ⇒ **Programs** ⇒ **SAS** ⇒ **SAS Management Console**.

   **Note:** You must have the authority to use the **Scheduler Manager** plug-in in SAS Management Console. Your system administrator can grant this authority, if necessary.

2. Click the **Plug-ins** tab, if necessary, to display plug-ins in the left panel of SAS Management Console. In the **Repository** field at the top of this panel, select the foundation repository from the drop-down list.

   **Note:** The selected repository must be the repository that is the required metadata store for a SAS Metadata Server. Each metadata server has one foundation repository. As a default, the name of the foundation repository is **Foundation**. (If you performed a custom installation, then you might have assigned a different name.)

3. Select the **Schedule Manager** component of SAS Management Console.

   **Note:** If the **Schedule Manager** component is not displayed in the list of plug-ins, your user ID is not defined to have access to it. Users can be granted access to Schedule Manager by administrative users.

4. From the menu bar, select **Actions**. From the drop-down list, select **Deployment Directories**. The Deployment Directories dialog box appears.

**Figure 2.2 Deployment Directories Dialog Box**

5. In the **Application Server** field, you can specify the application server that you want to use for deploying jobs. Use the drop-down list to show the application servers that are available, and click to select a server. (SASITRM is the application server that is configured by default when SAS IT Resource Management is installed.)
SAS IT Resource Management establishes a SAS Application Server named SASITRM that sets properties such as memory size options and formats for the exclusive use of the solution. Establishing SASITRM as the SAS Application Server ensures that SAS IT Resource Management can be installed and operated with other SAS products and solutions. Some of these might also establish SAS Application Servers.

**Note:** For more information, see “Defining Multiple Application Servers” in the *SAS 9.4 Intelligence Platform: Application Server Administration Guide*.

6. In the **Directories** section of the Deployment Directories dialog box, you can specify one or more directories where the generated code for deployed jobs is to be stored. The server that is selected in the **Application Server** field must be able to resolve the paths to these directories.

SAS IT Resource Management supplies a **Batch Jobs** directory. The path to this supplied directory on the SASITRM server is: `SASEnvironment\SASCode\Jobs`.

In the Deployment Directories dialog box, you can perform the following tasks:

- Define a new directory. To do so, click **New**.
- Update a directory. To do so, select the directory and click **Edit**.
- Remove the metadata for a directory. To do so, select the directory and click **Delete**.

If you are defining locations in z/OS traditional file system locations, you can specify the name of the directory as the full name of a partitioned data set.

For more detailed information about these tasks, click **Help**.

7. Click **OK** to save your changes.

---

## Working with SAS Enterprise Guide

### About Working with SAS Enterprise Guide

SAS Enterprise Guide is the primary reporting vehicle for SAS IT Resource Management. The data administrator uses the functions of SAS Enterprise Guide in order to perform the following tasks:

- Set up SAS Enterprise Guide so that it can work with SAS IT Resource Management data.
- Migrate SAS Enterprise Guide projects so that they can work with your SAS IT Resource Management 3.8 IT data marts, in which you created the report data.

### Setting Up SAS Enterprise Guide for SAS IT Resource Management Data

In order to work with the data from SAS IT Resource Management, SAS Enterprise Guide needs to access the SAS Metadata Repository. To access a SAS Metadata Repository for use by SAS Enterprise Guide, perform the following steps:
1. Invoke SAS Enterprise Guide. To do so, select Start ⇒ Programs ⇒ SAS ⇒ Enterprise Guide.

2. From the menu bar, select Tools ⇒ Options. The Options dialog box appears.

3. From the list in the left pane of the Options dialog box, select Administration.

   Figure 2.3 Administration Window of the Options Dialog Box

4. If you want to create a profile or change your profile, click Modify, which opens the Connections window. Select the profile that you want to change and click Modify.

5. The Modify Profile window appears and enables you to create or revise the profile. Enter or revise the following information.

   a. The name of the profile is required. The description is optional.
   
   b. Specify whether the machine is remote or local by clicking the appropriate button.
   
   c. Enter the machine and port number of the server that you want to connect to. (If you selected Local, the machine name is automatically set to localhost.)
   
   d. Enter the user ID and password for the person who can access this server.
   
   e. Click Save to save all specified values and close the window, or Cancel to discard all values and close the window.

6. To connect to the server, select the appropriate profile and click Set active. The active server is the source for all resource definitions (such as servers and libraries).

   If the Credentials Required dialog box appears, enter your user ID and password and click OK.

   The selected repository is identified by the active repository icon: 🛠️.
7. Click **Close** to return to the Administration window.

8. Click **OK** to return to the main SAS Enterprise Guide workspace.

For information, see *Administering SAS Enterprise Guide*. To locate this documentation, navigate to [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html). From the list of products (in **Product Index A-Z**), select the **SAS Enterprise Guide**.

### Retaining SAS IT Resource Management Options

SAS IT Resource Management options for SAS Enterprise Guide are stored in a file called **EGOptions.xml**. When SAS Enterprise Guide is installed as part of an SAS IT Resource Management installation plan, the SAS IT Resource Management version of **EGOptions.xml** is placed in the SAS Enterprise Guide root folder.

If you are invoking SAS Enterprise Guide for the first time, the options in this file are automatically merged with the default options that are supplied with SAS Enterprise Guide. At any time, you can reset your options by clicking on the **Reset All** button in your SAS Enterprise Guide Options window. This action causes the SAS IT Resource Management options in this **EGOptions.xml** file to be merged with the default options of SAS Enterprise Guide.

### Migrating SAS Enterprise Guide Projects to Work with SAS IT Resource Management 3.2 and Later

**About the Migration Wizard**

The **Migration Wizard for SAS Enterprise Guide** enables you to upgrade report projects that are created with earlier versions of SAS IT Resource Management and SAS Enterprise Guide. The upgraded version can then be used with your current version of SAS IT Resource Management and SAS Enterprise Guide.

SAS Enterprise Guide projects supplied by SAS IT Resource Management, and typically those created for use with SAS IT Resource Management, use information maps in the report projects. Therefore, you must change the map paths of the supplied information maps to point to the information maps that you created with the Adapter Setup wizard. The easiest way to change the map paths is to use the Migration Wizard for SAS Enterprise Guide.


### Working with Metadata

**About Metadata**

Metadata is structured data that describes the location and structure of enterprise data. During the installation of SAS IT Resource Management, metadata is created and stored in the SAS Metadata Repository. The metadata for SAS IT Resource Management consists of the following information:

- where SAS servers are deployed and how they are configured
- the location of the physical 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
• the specifications for processes and jobs, such as ETL processes
• security details, such as credentials, user identities, groups, and roles

The metadata for SAS IT Resource Management is created, maintained, and used by the following applications:

• SAS Management Console: creates and maintains metadata that describes the attributes of SAS servers that are used by SAS IT Resource Management. For example, it describes where the servers are deployed and how they are configured. The metadata also maintains lists of authorized users, their permissions, their account information, and more.

• SAS IT Resource Management client: creates and maintains metadata that describes the attributes of the data that is used by SAS IT Resource Management. For example, it describes the tables of staged or aggregated data, the definitions of the columns within those tables, the jobs, the libraries, and the transformations that make up the data management component of SAS IT Resource Management.

• SAS Enterprise Guide: uses metadata that describes the servers, users, libraries, information maps, and information map filters for reporting with SAS Enterprise Guide.

• SAS Add-In for Microsoft Office: uses metadata that describes the servers, users, and the IT data mart to reference and use IT Resource Management data in Microsoft Office tools.

• SAS Web Report Studio: creates and maintains metadata for web-based reports, and uses other metadata created and maintained by other SAS clients.

• SAS Visual Analytics Administration and Reporting: Uses metadata that describes the servers, users, and the IT data mart to reference and use IT Resource Management data in SAS Visual Analytics.

**Supplied Metadata**

In addition to the metadata that is described in the previous topic, SAS IT Resource Management also supplies other metadata. This supplied metadata consists of IT template tables for the supported adapters, IT formulas, and IT report definitions. The installation process for SAS IT Resource Management stores the metadata in the Folders tree.

• The **SAS IT Resource Management** folder under the **Products** folder and the **Shared Data** folder contain the metadata for the IT template tables of the supported adapters and the IT formulas. The original versions of these objects are stored in the **Products** folder and they cannot be changed. Objects in the **Shared Data** folder can be changed.

  To change a formula or a template, access it from the **Shared Data** folder, revise it as needed. Then, store the revised object in the **Shared Data** folder.

• The **SAS IT Resource Management** folder of the **Shared Data** folder contains the metadata for the 3.8 IT report and exception definitions, IT data marts, and the IT formulas. This metadata can be changed, although changing the IT report definitions is not recommended. (If you need to change an IT report definition, copy it first and change the copy, not the supplied definition.)

  **CAUTION:**
Do not make changes to the original IT report definitions in the Shared Data folder. For information about how to modify IT report definitions, see Chapter 6, “Working with SAS Enterprise Guide Projects,” in the SAS IT Resource Management 3.8: Reporting Guide.

- The SAS IT Resource Management folder of the Transformations tree contains the aggregation, exception, information map, performance report staging, and user-written staging transformations. These transformations can be dragged and dropped onto the process flow diagram of a job and further specified as needed.

Note: SAS IT Resource Management also uses folders, jobs, libraries, staged tables, aggregation tables, and information maps. These objects are created by transformations that the user specifies (either directly or by means of the Adapter Setup or Add Domain Category wizards), the jobs that the user creates and runs, or by wizards (such as the New Folder, New IT Data Mart, or New Job wizards) that are invoked from the menu bar.

Connection Profiles for the SAS Metadata Repository

To enable SAS IT Resource Management users to access the SAS Metadata Server that contains the SAS IT Resource Management metadata, perform the following steps:

1. Invoke SAS IT Resource Management.
2. Select the new Create a new connection profile button or, if you are already connected to the system then, from the menu bar, select File ➤ Connection Profile. A message box displays a message that your application is about to be discontinued from its metadata server. It asks whether you want to continue. Click Yes.
3. The Connection Profile dialog box appears. In this dialog box, you can create a new connection profile or you can open an existing connection profile and modify it. After you specify the metadata profile that you want to use, click OK.
4. In the Login dialog box that opens, enter your user ID and password, and click OK to access the server that contains the metadata repository.

Note: If you previously chose to save the user ID and password for the particular connection profile, you are connected without being prompted to enter them.

Backing Up and Restoring the SAS Metadata Repository

For information about backing up and refreshing the SAS Metadata Repository, see the “How to Back Up SAS IT Resource Management” on page 640. Additional recommendations about backing up and refreshing the SAS Metadata Repository are in the SAS 9.4 Intelligence Platform: System Administration Guide.

When you back up the metadata server, it is important to also back up the data that is associated with the metadata objects that are contained in the repositories. The metadata cannot be used without the associated data. If you need to recover from a failure, the metadata that you restore must be synchronized correctly with the associated data.

Migrating from an Earlier Version of SAS IT Resource Management

If you worked with SAS IT Resource Management 3.2, 3.21, 3.22, 3.3, 3.4, 3.5, or 3.6, then you can migrate your metadata to the new (SAS IT Resource Management 3.8) environment. After you install and configure the current version of the software, you can migrate the metadata for all your IT data marts or for a single IT data mart. For
information about these migration options, see *SAS IT Resource Management 3.8: Migration Guide*. For more information about migrating the SAS system, see the *SAS 9.4 Intelligence Platform: Migration Guide*.

If you created your own projects with earlier releases of SAS Enterprise Guide, you can convert those projects at the same time to your current version of SAS Enterprise Guide. To do so, use the Migration Wizard for SAS Enterprise Guide and the SAS Add-in for Microsoft Office. If the paths were used in the SAS Enterprise Guide 4.1, 4.2, 4.3, 5.1, or 6.1 projects, the wizard can update the paths to the information maps. For information about the Migration Wizard, see “Migrating SAS Enterprise Guide Projects to Work with SAS IT Resource Management 3.2 and Later” on page 24.

**Tools for Exploring SAS IT Resource Management Metadata**

**How to Access the SAS IT Resource Management Metadata**

You can access the SAS IT Resource Management metadata in the SAS Metadata Repository by using the following methods:

- Explore the metadata repository from the SAS IT Resource Management client. This method is the preferred way to access the SAS IT Resource Management metadata.
- Explore the metadata repository from the Folders tab of SAS Management Console.
- Browse the metadata repository from a Base SAS session. This method should be used only under the direction of SAS Technical Support.

**Explore the Metadata Repository from the SAS IT Resource Management Client**

The SAS IT Resource Management client uses the data accessing and manipulation functions of SAS Data Integration Studio in order to populate its tables with data and to prepare that data for reporting.

**Figure 2.4 Main Window of the SAS IT Resource Management Client**

The objects that SAS IT Resource Management uses are contained in folders in the Folders, IT Data Marts, and Transformations trees. For more detailed information
about the many options and functions that are available within the SAS IT Resource Management client, see “Features of the SAS IT Resource Management Client” on page 35.

**Browse the Repository from a Base SAS Session**
Under the direction of SAS Technical Support, you can browse the repository from a Base SAS session. To do so, perform the following steps:

1. Enter `metabrowse` on the command line. The Metadata Server Configuration dialog box appears.
   
   ![Metadata Server Configuration]

   *Figure 2.5 Log On to the Metadata Server*

2. Specify the appropriate logon information for the server that you want to access. Enter **Server Name**, **Port Number**, **Protocol**, **User Name**, and **Password**. Under Windows, the **User Name** can be domain qualified. For example, you might need to use `domainname\username`, where *domainname* is your domain name and *username* is your user ID.

   Click **OK** to open the Metadata Browser.

3. To navigate through the metadata on this site, follow the directions of SAS Technical Support.

**Metadata Server Memory Management**

**Memory Management with the SAS IT Resource Management Metadata Server**
As the process size increases, the data administrator should delete from the SAS Metadata Repository objects that are not needed or that are marked for deletion by other processes. For best results, follow the recommendations for managing and maintaining your metadata server that are described in the *SAS 9.4 Intelligence Platform: System Administration Guide*. This documentation is available at [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html) in the Administration Documentation section of that website.
Additional Requirements for z/OS

If you are using SAS IT Resource Management software on z/OS, the user account running the batch jobs needs the following settings:

- Batch jobs require a REGION specification of at least 1024M.
- TSO user IDs that are using SAS IT Resource Management software should have an ASSIZEMAX specification of at least 1024M.
Chapter 3
Working with the SAS IT Resource Management Client

Overview of the SAS IT Resource Management Client

Introduction to the SAS IT Resource Management Client

SAS IT Resource Management leverages and enhances SAS Data Integration Studio to administer and manage IT resource data. (The SAS IT Resource Management solution provides features and functionality in addition to that which is provided by SAS Data Integration Studio.) SAS Data Integration Studio is a visual design tool that provides a single point of control for managing data repositories and performing extraction, transformation, and loading (ETL) processes. It offers a variety of built-in transformations that enable you to perform the following tasks:

- build and manage data repositories
- construct and maintain data integration projects
- import data from and export data to a variety of sources
- create, modify, and deploy ETL jobs

getting started

Working with the Connection Profile Dialog Box

Using the Connection Profile Wizard

Features of the SAS IT Resource Management Client

About the Desktop

The Tree Views

The Job Editor

Properties of Jobs and Tables

Working with Wizards

Wizards Supplied by SAS IT Resource Management

Wizards Supplied by SAS Data Integration Studio

SAS IT Resource Management Transformations

Icons for SAS IT Resource Management Objects
The SAS IT Resource Management client uses SAS Data Integration Studio in order to create and manage metadata objects that define sources, targets, and the transformations that connect them. It also enables you to create the jobs that contain those transformations. SAS IT Resource Management uses metadata to create or retrieve SAS code that reads input from any data source that can be read by using SAS software. The metadata objects are stored in the SAS Metadata Repository that can be shared by multiple users.

SAS IT Resource Management enhancements to SAS Data Integration Studio provide additional object types, transformations, the Adapter Setup wizard, and other wizards that facilitate the process of generating and displaying analysis and report-ready data about your IT resources.

This chapter introduces the features and functions that are available with the SAS IT Resource Management client and provides basic information about the features and functions of SAS Data Integration Studio.

**Note:** To locate specific topics in the Help for SAS Data Integration Studio, you can use the Index or the Search feature.

- From the menu bar of SAS IT Resource Management, select Help ➔ Contents and Index.
- Click the Index tab or the Search tab. Then type the name of the topic in the Find field and press the Enter key.

### Getting Started

To access the SAS IT Resource Management client, log on and connect to a metadata server:

1. To start SAS IT Resource Management from Microsoft Windows, select Start ➔ Programs ➔ SAS ➔ SAS IT Resource Management Client 3.8. The following dialog box appears.

   **Figure 3.1** Open a Connection Profile Dialog Box

   ![Connection Profile Dialog Box](image)

2. Select (or create) a connection profile to connect to the server that contains the metadata for the SAS IT Resource Management objects that you want to work with. These objects can be jobs, templates, data, IT data marts, tables, information maps, report definitions, and transformations. The connection profile contains the information that identifies the server that contains that repository and the user who is accessing the information from that repository.

   **Note:** At run time, SAS IT Resource Management authenticates to the metadata server using the one-time password technique documented for SAS 9.2 and later. This means that the user submitting the code (whether interactively or in batch) must have a User object that is defined in metadata. The user should also have a
Login object that is defined for each authentication domain, with the correct user ID and password for each. In SAS Management Console, the User Manager can be used to create and modify Users. For each User object, the Logins can be created or modified on the Accounts tab of the User dialog box. For more information, see the “Security Overview” chapter in the SAS 9.4 Intelligence Platform: Overview.

**Working with the Connection Profile Dialog Box**

To manage your connection profiles, select **File → Connection Profile**. From the dialog box that appears, you can perform the following tasks:

- Create a new connection profile.

  If you select this task and click **OK**, the Connection Profile wizard appears. Enter the information that is requested by the wizard.

  In the following display, values for the **Machine**, **Port**, **User ID**, and **Password** fields have been entered.

  ![New Configuration Profile Wizard](image)

  Click **Finish** to create the new connection profile.

- Open an existing connection profile.

  If you select this task, from the drop-down list of existing connection profiles, select the profile that you want to open and click **OK**.

- Edit an existing connection profile.

  If you click **Edit**, the Connection Profile wizard appears. Enter the changes to the information that is requested by the wizard. Click **Finish** to open the updated connection profile.

- Delete an existing connection profile.
If you click **Delete**, from the drop-down list of existing connection profiles, select the profile that you want to delete and click **Delete**. In the confirm deletion message box, click **Yes** to delete the connection profile.

**Using the Connection Profile Wizard**

The Connection Profile wizard guides you through the steps that are needed to build (or edit) a connection profile that enables you to connect to a metadata server. The wizard prompts you to enter (or revise) the following information:

- the name of the connection profile. If you want to set this profile as the default connection profile, check the corresponding box.
- the fully qualified name of the machine on which the repository server operates.

**CAUTION:**

Do not enter "localhost" in the **Machine field**. SAS IT Resource Management jobs fail to run if the metadata host in the configuration profile is set to localhost.

- the TCP port on which the metadata server is listening for connections. To enter a port number, type directly in the field.
- the user ID (and domain if applicable) that is used to log on to the metadata server. In order to specify the domain for this profile, you must also specify a value in the **Authentication Domain** field.

**Note:** You must authenticate to the operating environment where the metadata server is running.

- the password that is required for the specified user to log on to the metadata server. If you want to save the user ID and password in this connection profile, check the corresponding box.
- the authentication domain for the metadata server. If you specify a value for this field, the credentials that are specified for the metadata server are used to access servers or databases that are in the same authentication domain.

**Note:** You must authenticate to the operating environment where the metadata server is running.

- If you want to save the user ID and password in this profile, check the corresponding box.
- If you want to use the Integrated Windows authentication (single sign-on), check the corresponding box. When you check this box, the **Advanced** option is enabled.

Click the **Advanced** option to open the Advanced Settings dialog box.

**Figure 3.3** Advanced Settings for the Configuration Profile
This dialog box enables you to specify the method for authenticating your credentials to the server and to SAS application servers. For information about how to specify the security package, the service principal name (SPN), and the security package list, click Help.

- [Optional] Click Next to display the Project Selection page. On this page, you can select a project to work with, if any projects have been defined. If you select a project, an additional tab appears in the left panel. This Checkouts tab shows any new objects that you created.

If you create an object using SAS Data Integration Studio wizards or other dialog boxes, the new object might be checked out by default. In order to bring these objects into IT Data Marts tab, you must check-in that object. This action requires an understanding of the change management feature of SAS Data Integration Studio. For information about this, see the check-in and check-out topics about Change Management in the Help for SAS Data Integration Studio. You can also find information in the “Working with Change Management” topic in Chapter 2, “Getting Started,” in SAS® Data Integration Studio 4.901: User's Guide.

- After the required information is entered, the wizard displays a summary page that lists the options that you specified for this connection profile. If necessary, you can go back to previous pages of the wizard and modify your specifications.

- When you click Finish, the connection profile is created (or updated).

---

**Features of the SAS IT Resource Management Client**

**About the Desktop**

After you open a connection profile, the SAS IT Resource Management desktop appears. (The SAS IT Resource Management client is powered by SAS Data Integration Studio.) The following display shows the desktop that opens by default.
The main components that are shown in the previous display are described in the following table.

**Table 3.1 Desktop Components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title bar</td>
<td>Top of the desktop</td>
<td>Shows the current version of SAS IT Resource Management and the name of the current connection profile.</td>
</tr>
<tr>
<td>Menu bar</td>
<td>Under the title bar</td>
<td>Provides access to the drop-down menus. The list of active options varies according to the current work area and the type of object that you select. Inactive options are disabled or hidden.</td>
</tr>
<tr>
<td>Toolbar</td>
<td>Under the menu bar</td>
<td>Provides access to shortcuts for items on the menu bar. The list of active options varies according to the current work area and the type of object that you select. Inactive options are disabled or hidden.</td>
</tr>
<tr>
<td>Tree view</td>
<td>Left pane on the desktop</td>
<td>Provides access to the Folders, Inventory, Transformations, and IT Data Marts trees. It also provides access to the Basic Properties pane.</td>
</tr>
</tbody>
</table>
### Component | Location | Description
--- | --- | ---
Basic Properties pane | Bottom of the left pane on the desktop | Displays basic properties of an object that is selected in the tree view. To display this pane, select **View ⇄ Basic Properties** from the desktop.

Status bar | Bottom of the desktop | Displays this information:
- the name of the currently selected object
- the name of the default SAS Application Server if one has been selected
- the login ID and metadata identity of the current user
- the name of the current SAS Metadata Server
To select a different SAS Application Server, double-click the name of that server to display a dialog box.
If the name of the SAS Metadata Server turns red, the connection is broken. In that case, you can double-click the name of the metadata server to display a dialog box that enables you to reconnect.

Runtime Manager | Under the Details pane | Displays this information:
- the run-time status of the current job
- the last time the job was executed in the current session
- the SAS Application Server that was used to execute the job
To display this pane, select **View ⇄ Runtime Manager** from the desktop.

Actions History | Under the Details pane | Displays low-priority errors and warnings. To display this pane, select **View ⇄ Actions History** from the desktop.

---

**The Tree Views**

**About Trees**
Trees facilitate how you work with SAS IT Resource Management. They provide you with easy access to the folders, transformations, and metadata objects that are registered with the SAS Metadata Server. In addition to the **Folders, Inventory**, and **Transformations** trees that are provided by SAS Data Integration Studio, the SAS IT Resource Management client provides the **IT Data Marts** tree.

You can change how the trees appear in the left panel of the desktop. To do so, select one of the options from the drop-down list. These options enable you to move the tree up, down, to the right, or to the left in the left panel.
IT Data Marts Tree

The IT Data Marts tree displays the IT data marts that can be accessed by the current connection profile. IT data marts contain the metadata for the jobs, libraries, tables, information maps, and other elements that support the ETL processes and reporting of IT resource data. As such, the IT Data Marts tree is the primary starting point for most of the SAS IT Resource Management processes. For best results, perform your IT resource management tasks from within this tree.

For more information about IT data marts, see “About the IT Data Mart” on page 51.

Folders Tree

The Folders tree organizes metadata into folders that are shared across a number of SAS applications. My Folder and Shared Data are the folders that you use most of the time. The following folders are supplied by default:

- **My Folder** is the private folder of the user who is currently logged on. It can be used to store metadata that is not available to other users. Metadata in this folder can be viewed only by the user who is currently logged on and by users who have unrestricted access.

- **Products** is the folder that contains the software that is installed with SAS Data Integration Studio and SAS IT Resource Management. Along with other objects, this folder contains template tables for the installed adapters and the supplied formulas that can be used to compute new columns from existing columns of data. The contents of this folder cannot be modified. However, they can be viewed and copied to another folder.

- **Shared Data** is the folder that contains data that can be accessed by any user who is logged on. It contains the supplied SAS Enterprise Guide report definitions and the formulas that are installed with SAS IT Resource Management. This folder can also contain IT data marts that are intended to be accessed by multiple users.

- **System** is the folder that contains applications, channels, subscribers, services, and the dialog boxes of the types of objects that are installed and used by SAS Data Integration Studio and SAS IT Resource Management.

- **Users** is the folder that contains the private folders of users who are connected to the active metadata server.

*Note:* SAS IT Resource Management does not support the creation or use of Favorites folders.

Inventory Tree

The Inventory tree displays metadata for objects that are registered on the current metadata server, such as tables and libraries. Metadata in this tree can be stored in folders that group metadata by type, such as Table, Library, Job, Information Map, and so on.

Transformations Tree

The Transformations tree displays transformations that can be dragged and dropped onto the process flow diagrams of SAS Data Integration Studio jobs. SAS IT Resource Management provides the SAS IT Resource Management folder that contains the Aggregation, Exception, Information Map, and Performance Report transformations. In addition, this folder contains the staging transformations for each of the adapters supported by SAS IT Resource Management, as well as a staging transformation for user-written adapters.
The transformation's Properties dialog box enables you to view or update the metadata for a transformation in a SAS Data Integration Studio job. One way to display this dialog box is to open a job on the Diagram tab of the Job Editor window. Then, right-click a transformation on the Diagram tab, and click Properties in the pop-up menu. The Property dialog box for most transformations has one or more tabs that are unique to that transformation. The following table describes the purpose of the common tabs for a transformation. For more information about each tab, see the Help for that tab.

**Table 3.2 Common Tabs in a Transformation Properties Dialog Box**

<table>
<thead>
<tr>
<th>Tab</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Enables you to enter general information that identifies and describes the transformation.</td>
</tr>
<tr>
<td>Mappings</td>
<td>Enables you to review and modify the mappings for the transformation.</td>
</tr>
<tr>
<td>Note: This tab is not used by SAS IT Resource Management transformations.</td>
<td></td>
</tr>
<tr>
<td>Options</td>
<td>Enables you to review and modify options for the transformation.</td>
</tr>
<tr>
<td>Table Options</td>
<td>Enables you to review and modify table options for the transformation.</td>
</tr>
<tr>
<td>Code</td>
<td>Enables you to review and modify the code that is generated for the transformation.</td>
</tr>
<tr>
<td>Precode and Postcode</td>
<td>Enables you to review and modify user-written code that is inserted at the beginning or end of the transformation.</td>
</tr>
<tr>
<td>Parameters</td>
<td>Enables you to review and modify parameters for the transformation.</td>
</tr>
<tr>
<td>Notes</td>
<td>Enables you to review and modify notes for the transformation.</td>
</tr>
<tr>
<td>Extended Attributes</td>
<td>Enables you to review and modify extended attributes for the transformation.</td>
</tr>
</tbody>
</table>

**Basic Properties Pane**

The Basic Properties pane displays the basic properties of an object that is selected in a tree view. The Basic Properties pane is an optional pane that can appear on the left side of the desktop. To display or hide this pane, select or deselect View Basic Properties from the menu bar.

**Checkouts Tree**

The Checkouts tree displays metadata that has been checked out for update, as well as any new metadata that has not been checked in. The metadata appears automatically when you are working under the change management function of SAS Data Integration Studio.

*Note:* This tree is not used by SAS IT Resource Management.
The Job Editor

Job Editor Window
The Job Editor window enables you to create, maintain, and troubleshoot SAS IT Resource Management jobs. To display this window, right-click a job in the tree view and select Open. The following display shows a sample Job Editor window. This window contains the process flow diagram (PFD). (The process flow diagram consists of the tables and transformations that are the components of the job.)

Figure 3.5  Sample Job Editor Window

![Sample Job Editor Window](image)

To open an existing job in the Job Editor window, navigate to the folder where it is located and double-click it. To create a new job, from the menu bar select New Job. In order to maintain unique job names within the repository, the name of the new job is a concatenation of "New Job" and a five-digit number. (An example of this convention is "New Job 28424").

Note: You can rename a job to a more meaningful name. For information about how to rename a job, see “Rename a Job” on page 375.

The job opens in the Job Editor window. In the Job Editor window, you can add, delete, and modify the transformations and tables of a job.

Job Editor Tabs
The following table describes the main tabs in the Job Editor window.
Table 3.3  Job Editor Tabs

<table>
<thead>
<tr>
<th>Tab</th>
<th>How to Display the Tab</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagram</td>
<td>Always displayed.</td>
<td>Used to build and update the process flow for a job.</td>
</tr>
<tr>
<td>Code</td>
<td>Select Tools ⇒ Options from the desktop. On the General tab, select Show Code Tab.</td>
<td>Used to review or update code for a job.</td>
</tr>
<tr>
<td>Log</td>
<td>Select Tools ⇒ Options from the desktop. On the General tab, select Show Log Tab.</td>
<td>Used to review the log for a submitted job.</td>
</tr>
<tr>
<td>Output</td>
<td>Select Tools ⇒ Options from the desktop. On the General tab, select Show Output Tab.</td>
<td>Used to review the output of a submitted job.</td>
</tr>
</tbody>
</table>

Use the Details pane to monitor and debug a job in the Job Editor window. To open this pane, select View ⇒ Details from the desktop.

Use the Runtime Manager pane to display the run-time status of the current job, the last time the job was executed in the current session, and the SAS Application Server that was used to execute the job. This information is available as long as the job is active. To open this pane, select View ⇒ Runtime Manager from the desktop.

Properties of Jobs and Tables

Job Properties
The job’s Properties dialog box enables you to view or update the metadata for a SAS Data Integration Studio job. One way to display this dialog box is to right-click a job in the IT Data Marts tree, Folders tree, or Inventory tree. Then, click Properties in the menu that appears. The following table describes the purpose of each tab in a job’s Properties dialog box. For more information about each tab, see the Help for that tab.

Table 3.4  Tabs in a Job Properties Dialog Box

<table>
<thead>
<tr>
<th>Tab</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Enables you to enter general information that identifies, describes, and locates the job.</td>
</tr>
<tr>
<td>Code</td>
<td>Enables you to review and modify the code that is generated for the job.</td>
</tr>
<tr>
<td>Precode and Postcode</td>
<td>Enables you to review and modify user-written code that is inserted at the beginning or end of the job.</td>
</tr>
</tbody>
</table>
### Status Handling
Enables you to review and modify status handling conditions and actions for the job.
(Some transformations have this tab as well.)

### Parameters
Enables you to review and modify parameters for the job.

### Options
Enables you to review and modify options for the job.

### Notes
Enables you to review and modify notes for the job.

### Extended Attributes
Enables you to review and modify extended attributes for the job.

### Authorization
Enables you to review and modify metadata access settings for the job.

---

**Table Properties**
The table's Properties dialog box enables you to view or update the metadata for the table. One way to display this window is to right-click a table in the Folders tree or the Job Editor window and click Properties. The next table describes the purpose of each tab in a table's Properties dialog box. For more information about each tab, see the Help for that tab.

<table>
<thead>
<tr>
<th>Tab</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Enables you to enter general information that identifies and describes the table.</td>
</tr>
<tr>
<td>Columns</td>
<td>Enables you to maintain column metadata.</td>
</tr>
<tr>
<td>Indexes</td>
<td>Enables you to review, add, and modify indexes on table columns.</td>
</tr>
<tr>
<td>Keys</td>
<td>Enables you to review, add, and modify key columns.</td>
</tr>
<tr>
<td>Parameters</td>
<td>Enables you to review and modify parameters for the table.</td>
</tr>
<tr>
<td>Physical Storage</td>
<td>Enables you to specify the format and location of a table.</td>
</tr>
<tr>
<td>Options</td>
<td>Enables you to review and modify options for the table.</td>
</tr>
<tr>
<td>Notes</td>
<td>Enables you to review and modify notes for the table.</td>
</tr>
</tbody>
</table>
**Working with Wizards**

**Wizards Supplied by SAS IT Resource Management**

In addition to the wizards that are supplied by SAS Data Integration Studio, SAS IT Resource Management provides the following wizards:

The following wizards are invoked from the **New** menu:

- **New IT Data Mart wizard**

  The New IT Data Mart wizard enables you to create a new IT data mart. An IT data mart contains the metadata for the jobs, libraries, tables, information maps, and other elements that support the ETL processes of and reporting on IT performance data.

  To invoke the New IT Data Mart wizard, navigate to the **IT Data Marts** tree. Then select **New ‣ IT Resource Management ‣ IT Data Mart**.

  **Note:** You can also invoke the New IT Data Mart wizard from the first page of the Adapter Setup wizard by selecting the **New IT data mart** option.

  For more information about IT data marts, see “About the IT Data Mart” on page 51.

- **New Formula wizard**

  SAS IT Resource Management provides standard formulas that can be used to generate a computed column. To locate these formulas, navigate to the **Shared Data** folder in the **Folders** tree and select **SAS IT Resource Management ‣ IT Formulas**. You can copy these formulas, modify them, or create new customized formulas by using the New Formula wizard.

  To invoke the New Formula wizard, navigate to the **IT Data Marts** tree. Then select **New ‣ IT Resource Management ‣ Formula**.

  For more information about formulas, see “About Formulas” on page 99.

- **defining ETL jobs**

  The Adapter Setup wizard helps you define the ETL jobs that read, stage, aggregate, map, and generate information maps and reports for the IT resource data that an adapter loads. This wizard also helps you define the report jobs that generate gallery reports.

  The Adapter Setup wizard produces data acquisition, staging, aggregation, information map, and report jobs. Configuration options of minimal, typical, and full are available to define the quantity of jobs generated by the Adapter Setup wizard and are good choices for most user’s needs. You can also specify that only the staging job is generated. However, your site might have other requirements that limit or
expand the number and type of jobs that should be generated. Therefore, you should examine the results of the Adapter Setup wizard. You might need to add or delete elements of the jobs, transformations, or tables in order to accommodate the needs of your site or organization.

To invoke the Adapter Setup wizard from the toolbar of SAS Data Integration Studio, select New ⇒ IT Resource Management ⇒ Adapter Setup.

For more information about the Adapter Setup wizard, see “About the Adapter Setup Wizard” on page 257.

The following wizards are supplied by SAS IT Resource Management, but are not invoked directly from the New menu:

• The Add Domain Category wizard enables you to add domain categories to an existing staging transformation that was generated by the Adapter Setup wizard. For each new domain category, the wizard creates aggregation jobs, information map jobs, and reporting jobs that process the raw data for an IT resource.

To invoke the Add Domain Category wizard, right-click the staging transformation that was created by the Adapter Setup wizard. Then select Add Domain Category from the drop-down list.

For more information, see “About the Add Domain Category Wizard” on page 291.

• Aggregation wizards

Aggregation tables contain IT resource data that has been classified, summarized, or aged according to the specifications of an Aggregation transformation.

To invoke the aggregation table wizards, open (or create) a job that contains an Aggregation transformation. Right-click the Aggregation transformation and select the Add Aggregation Table option. You can then choose one of the following options:

• Summarized Aggregation Table, which enables you to directly specify the variables (and their associated properties) that are to be aggregated.

• Simple Aggregation Table, which is not summarized. The new data is simply appended to the aggregation table.

• Aggregations through Template, which creates aggregation tables by using the provided aggregation templates or user-defined templates.

For more information about aggregating data, see “Working with Aggregation Transformations” on page 198.

• The New Exception Definition wizard enables you to specify the exceptional conditions that you want to detect in your source data. This wizard can be accessed from the Exception transformation. For more information, see “Overview of Exception Analysis Processing” on page 209.

• Maintain Staged Tables wizard

The Maintain Staged Tables wizard enables adapter updates that are delivered by SAS to be applied to your IT data marts. It enables you to update the staged tables of an IT data mart, based on the revisions that have been made in the IT resource collection software and files.

To invoke the Maintain Staged Tables wizard, navigate to the IT Data Marts tree. Then right-click the IT data mart whose tables are to be updated, and select the Maintain staged table option.

For more information about IT data marts and maintaining their associated tables, see “About the IT Data Mart” on page 51.
• Staged Table wizard

A staged table is a SAS IT Resource Management table that contains data that has been extracted from an input data store and rendered into a form that is suitable for further transformation. It can be created either by the Adapter Setup wizard or by the Staged Table wizard.

To invoke the Staged Table wizard, open (or create) a job that contains a staging transformation. Right-click the staging transformation and select the Add Staged Tables option. Then select either of the following templates:

• From Supplied Template
• From User-Defined Template

For more information about staged tables, see “Working with Staging Transformations” on page 111.

Wizards Supplied by SAS Data Integration Studio

After you are connected to the server that you want to use, you can access the wizards that SAS Data Integration Studio provides. Click New to display the menu of the SAS Data Integration Studio client.

Figure 3.6 SAS Data Integration Studio Menu

These wizards can create the new objects that can help you work with your IT performance data. From the menu on the toolbar of the SAS IT Resource Management client, select New to open the wizards, dialog boxes, and windows that create the following objects:

• Folder
• Job
• Table
SAS IT Resource Management Transformations

SAS IT Resource Management supplies many transformations that enable you to work with your IT data. To specify a transformation, you must first open (or create) a job. This action creates a process flow diagram on the Diagram tab of the Job Editor window. Transformations can be dragged and dropped onto the process flow diagram of the job, and their properties, data sources, and resulting tables can then be specified according to your requirements. The Adapter Setup wizard specifies the necessary transformations programmatically, or you can do so by working directly with the transformations.

In addition to the standard SAS Data Integration Studio transformations that are accessible from the Transformations tree, SAS IT Resource Management provides the following transformations:

<table>
<thead>
<tr>
<th>Type of Transformation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregation</td>
<td>Specifies how a staged (or other) table is to be aggregated into a simple or summarized aggregation table. This transformation also supports the creation of aggregation tables from templates.</td>
</tr>
<tr>
<td>Data Acquisition</td>
<td>Specifies how to extract a subset of VMware data from a database.</td>
</tr>
<tr>
<td>Exception</td>
<td>Specifies how to detect exceptional conditions that might exist in the source data.</td>
</tr>
<tr>
<td>Information Map</td>
<td>Creates information maps from aggregation tables.</td>
</tr>
<tr>
<td>Performance Report</td>
<td>Specifies the reports that are to be generated from information maps or aggregation tables and how these reports are to be stored in the SAS Content Server.</td>
</tr>
<tr>
<td>Type of Transformation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Staging (one for each supported adapter)</td>
<td>Specifies how raw data is to be processed and loaded into staged tables for the supported adapters.</td>
</tr>
<tr>
<td>User-Written Staging</td>
<td>Specifies how raw data is to be processed and loaded into staged tables for data that is not supported by IT Resource Management adapters.</td>
</tr>
</tbody>
</table>

To locate these transformations, select the Transformations tree and navigate to the SAS IT Resource Management folder. For information about the properties of transformations, see “Transformations Tree” on page 38.

---

### Icons for SAS IT Resource Management Objects

The following table lists icons that are used by objects in SAS IT Resource Management.

**Table 3.6 SAS IT Resource Management Icons**

<table>
<thead>
<tr>
<th>Object Name</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter transformation</td>
<td>![Adapter Transformation Icon]</td>
</tr>
<tr>
<td>Aggregation transformation</td>
<td>![Aggregation Transformation Icon]</td>
</tr>
<tr>
<td>Column (Character contents)</td>
<td>![Column (Character contents) Icon]</td>
</tr>
<tr>
<td>Column (Numeric contents)</td>
<td>![Column (Numeric contents) Icon]</td>
</tr>
<tr>
<td>IT Data Mart</td>
<td>![IT Data Mart Icon]</td>
</tr>
<tr>
<td>Deployed Job</td>
<td>![Deployed Job Icon]</td>
</tr>
<tr>
<td>Exception transformation</td>
<td>![Exception transformation Icon]</td>
</tr>
<tr>
<td>External file</td>
<td>![External file Icon]</td>
</tr>
<tr>
<td>Folder</td>
<td>![Folder Icon]</td>
</tr>
<tr>
<td>IT Formula</td>
<td>![IT Formula Icon]</td>
</tr>
<tr>
<td>Information Map</td>
<td>![Information Map Icon]</td>
</tr>
<tr>
<td>Object Name</td>
<td>Icon</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Job</td>
<td><img src="image1" alt="icon" /></td>
</tr>
<tr>
<td>Library</td>
<td><img src="image2" alt="icon" /></td>
</tr>
<tr>
<td>Performance Report transformation</td>
<td><img src="image3" alt="icon" /></td>
</tr>
<tr>
<td>IT Report Definition</td>
<td><img src="image4" alt="icon" /></td>
</tr>
<tr>
<td>IT Resource Management Desktop</td>
<td><img src="image5" alt="icon" /></td>
</tr>
<tr>
<td>Staging transformations</td>
<td><img src="image6" alt="icon" /></td>
</tr>
<tr>
<td>Table</td>
<td><img src="image7" alt="icon" /></td>
</tr>
<tr>
<td>IT Template</td>
<td><img src="image8" alt="icon" /></td>
</tr>
</tbody>
</table>
Part 2

Accessing and Processing IT Data

Chapter 4
IT Data Mart .......................................................... 51

Chapter 5
Adapters ............................................................. 65

Chapter 6
Formulas and Formats ........................................... 99

Chapter 7
Staging the Data .................................................... 109

Chapter 8
Aggregating the Data ............................................. 143

Chapter 9
Exception Analysis Processing .............................. 209

Chapter 10
Adapter Setup Wizard .......................................... 257

Chapter 11
Add Domain Category Wizard ................................ 291

Chapter 12
Information Maps .................................................. 307

Chapter 13
User-Written Staging Code .................................... 333

Chapter 14
Jobs ................................................................. 365
Chapter 4
IT Data Mart

About the IT Data Mart

What Is an IT Data Mart?

An 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 processing and analysis of IT data. IT data marts are set up, managed, and administered by the data administrator using the wizards and user interfaces that are available in SAS IT Resource Management. Multiple IT data marts can be created in order to help organize a site's data. For example, a site's data administrator might set up a separate data mart for each of the operating system types or business areas that exist within the corporate enterprise.
How Is an IT Data Mart Created?

An IT data mart is created by the New IT Data Mart wizard. This wizard can be invoked in two ways:

- from the SAS IT Resource Management menu bar.
  Select New ⇒ IT Resource Management ⇒ IT Data Mart to open the New IT Data Mart wizard.
- from the Adapter Setup wizard.
  Select New ⇒ IT Resource Management ⇒ Adapter Setup to open the Adapter Setup wizard. On the first page of that wizard, you can click New IT data mart to open the New IT Data Mart wizard. (You can also select an existing IT data mart from this page.)

About the IT Data Mart Wizard

The New IT Data Mart wizard guides you through the steps to create an IT data mart. You are prompted to specify the name and description of the IT data mart, the default application server, and the default root path. You can also change the default location where the IT data mart is to be stored.

On completion, the New IT Data Mart wizard generates the following objects:

- the main root folder for the IT data mart
- the IT data mart itself
- an Administrative subfolder
- the administrative library, Admin
  
  Note: The name of the Admin library is programmatically generated by the concatenation of Admin and a random number, nnnn.
- a Contents subfolder

Where Can the IT Data Mart Be Stored?

When you create an IT data mart, you can specify a location where it is to be stored. The Location field on the first page of the New Object wizard enables you to specify where your IT data mart is to be stored. By default, your IT data mart is stored in the SAS IT Resource Management/IT Data Marts subfolder of the Shared Data subfolder. However, you can change this location to any location to which you have Write privileges.

How Can the IT Data Mart Be Accessed?

You can access an IT data mart from the subfolders that are listed on the IT Data Marts tree, the Folders tree, or the Inventory tree of SAS IT Resource Management. To work most effectively with your IT data mart, access it from the IT Data Marts tree.
How Is the IT Data Mart Populated?

IT data marts can be populated in two ways.

• The standard way to populate the IT data mart is through the Adapter Setup wizard. For information about the Adapter Setup wizard, see Chapter 10, “Adapter Setup Wizard,” on page 257.

• You can also populate an IT data mart with jobs, tables, libraries, and other objects by explicitly adding individual objects, by using the menu actions and menu bar actions.

What Are the Contents of an IT Data Mart?

IT data marts can contain the following objects:

• Admin library

The Admin library is stored in the Administrative folder of the IT data mart. You can store any content, including SAS formats, in this library. The Admin library also stores adapter resource lookup tables for the staging transformations of several adapters, such as the SNMP or IBM SMF adapters.

Note: You might create the IT data mart outside of the Adapter Setup wizard by invoking the IT Data Mart wizard directly from the New menu of SAS IT Resource Management. If so, the Administrative folder with its Admin library, is the only subfolder that is created.

CAUTION:

Do not delete the Admin library. Deleting the library can cause processing errors.

• The Contents folder is a general-purpose folder that can be used for manually entered content. For example, you can use this folder to store jobs, tables, and so on.

T I P Use this folder when you want to generate your own jobs and specify transformations in those jobs manually (that is, without invoking the Adapter Setup wizard).

• IT data mart object ()

The IT data mart object enables you to perform certain tasks, which are available when you right-click the object.
In the IT Data Marts tree, the IT data mart object and its root folder object are the same; in the Folders tree, the IT data mart object, and its root folder object appear as two separate objects.

**CAUTION:**

For best results, use the IT Data Marts tree for most IT Resource Management tasks that involve IT data marts. Working in the IT Data Marts tree ensures that the metadata is updated properly.

- **adapter-based subfolders**
  A separate subfolder is generated each time you successfully execute the Adapter Setup wizard. The name of the subfolder is based on the adapter that you selected during the Adapter Setup wizard. Each adapter-based subfolder contains a **Domain Categories** subfolder and a **Staging** subfolder.

  **Note:** After the Adapter Setup wizard has run, you can create additional domain categories by using the Add Domain Category wizard. For more information, see “About the Add Domain Category Wizard” on page 291.

- **Separate subfolders in the Domain Categories subfolders** contain the objects such as jobs and tables for each domain category that you specified. The name that is assigned to this subfolder is the name of the domain category that you selected. The objects that are added for a domain category can include the output
aggregation tables, libraries, information maps, and the associated aggregation, information map, and reporting jobs.

*Note:* The physical tables are generated when their corresponding jobs are run. These tables do not have to be stored in a fixed location with respect to the root location of the IT data mart. You can store these tables in any location to which you have Write privileges. The metadata for information maps is not generated until the information map job is run. The metadata for the information maps does not have to be stored in a fixed location with respect to the root location of the IT data mart. You can store this metadata in any location to which you have Write privileges.

- A **Staging** subfolder is generated for each instance of the adapter that you selected. This subfolder contains the staging job, library, and staged tables for that adapter. (For some adapters, a spin library is also generated.)

  The name that is assigned to the adapter-based subfolder is generated based on the name of the selected adapter.

- An **Exception** subfolder is generated if exception definitions were created for the domain category of the adapter. The **Exception** subfolder contains the exception job, library, and exception tables for that adapter.

*Note:* In order for a new subfolder to be associated with an IT data mart, create it from the **IT Data Marts** tree in the SAS IT Resource Management client.

The following figure displays IT Data Mart 52633 in the **IT Data Marts** tree.

*Figure 4.2 Example of an IT Data Mart*
Working with IT Data Marts

Introduction to Working with IT Data Marts

You can create, delete, erase, modify, purge, and rename an IT data mart. For best results, perform these functions and others from the IT Data Marts tree.

Copy and Paste an IT Data Mart

Starting in SAS IT Resource Management 3.6, you can copy an IT data mart only from the IT Data Marts tree. (Use the following procedure to copy a single IT data mart. Copying multiple IT data marts at the same time is not supported.)

To copy and paste an IT data mart, perform the following steps:

1. Copy the IT data mart.

To do so, from the IT Data Marts tree, right-click the IT data mart that you want to copy and select Copy.
2. Paste the copied IT data mart.
Right-click in the white space of the IT Data Marts tree. The list of possible actions appears.

*Figure 4.4 Paste IT Data Mart*

Select **Paste IT Data Mart** to paste the copied IT data mart into the IT Data Marts tree. The progress indicator shows you when the IT data mart is pasted.

**Create an IT Data Mart**

To create an IT data mart, perform the following steps:

1. From the SAS IT Resource Management menu bar, select **New ⇒ IT Resource Management**. From the list that is displayed, select **IT Data Mart**. The New IT Data Mart wizard appears.

2. On the **General information** page of the wizard, specify the name, description, and location of the IT data mart.
   - The name of the new data mart is required. The **Name** field can contain a maximum of 60 characters. The wizard does not permit you to enter invalid characters. The name must be unique within its parent folder. For best results, the name should be unique within the metadata server.
   - A value is optional in the **Description** field. The **Description** field can contain a maximum of 200 characters.
   - The **Location** field contains the default location for the IT data mart. A value is required in this field. This location is typically in the **Shared Data\SAS IT Resource Management** folder of the repository where you are logged on. You can modify this field to specify any location to which you have Write privileges. The wizard does not permit you to enter invalid characters.

   *Note:* Make sure that the folder where the IT data mart is stored is not in a directory that currently has other files that are unrelated to the IT data mart.
For example, C: \ and C:\Windows are not acceptable locations on Windows for the IT data mart root path.

3. On the **Application server information** page, specify the default application server.

   Application servers store and execute SAS code. The default application server that is specified with this wizard accesses metadata, DBMS tables, and external files on remote hosts. The application server does this so that it can build and support an IT data mart. A value is required in this field.

   Select the default application server from the drop-down list of currently defined SAS Application servers. Then click **Test Connection** to make sure that you are connected to the server that you specified. If you are not connected at this time, you are prompted to enter your user ID and password in order to access the server.

   **Note:** Application servers are defined when the SAS IT Resource Management software is installed and configured. Use SAS Management Console to modify this list of available servers.

4. On the **Root path information** page, specify the path that is used to form the default locations for any subsequent SAS libraries that are automatically created for this IT data mart. The path that you specify should be a fully qualified path; relative paths are not supported. A value is required in this field.

   For directory-based systems, the wizard does not permit you to specify a path that already has content in it. This restriction does not apply to traditional z/OS systems. For more information, see “Notes about the Default Root Path” on page 60.

   **Note:** On UNIX and on z/OS using zFS locations, you can specify paths that contain symbolic links. Using symbolic links is useful if you want to retain flexibility for changing the real physical location of libraries. For example, you could move all of the libraries in an IT data mart to another physical disk by simply redefining one symbolic link. See the UNIX ‘ln’ command for more information.

   You can enter the path in the field. Alternatively, you can click **Browse** and select a root path from the Select a Directory dialog box that displays the directory structure on your file system. IT data marts with invalid root path are not created and an error message that explains the problem is displayed. This physical path is not validated. Make sure that each IT data mart uses a different path. The value for this field cannot contain the single quotation character (‘).

   **Browse** is disabled when the selected application server is running on a machine that uses the z/OS operating system. When entering a z/OS path manually, you can use either a prefix for a traditional z/OS file system path (**MY.DATAMART**) or a root directory in the zFS hierarchical file system (**/u/mynname/datamart**).

   **Note:** The documentation for SAS on z/OS has traditionally used the terms UNIX System Services (USS) and hierarchical file system (HFS) to refer to the UNIX file system on z/OS. The SAS 9.4 documentation uses the terms UNIX file system and zFS to refer to this file system. In addition to the original HFS implementation, the z/OS operating system also provides another UNIX file system known as the z/OS file system (zFS). zFS, which provides certain performance and manageability benefits, is functionally equivalent to HFS from the perspective of a SAS user.

5. On the **Summary** page, the wizard displays the specifications that are used to create the new IT data mart. If they are satisfactory, click **Finish** to create the new IT data mart.
Notes about the Default Root Path

On traditional z/OS systems, the path to the default root cannot contain more than 26 characters. On Windows, UNIX, and zFS hierarchical file system, the path to the default root cannot contain more than 126 characters.

If the path that you enter is flagged as an error, you can use Browse to locate the correct path. However, before you click Browse, erase the erroneous path.

Note: The following information applies to any directory-based file system, including Windows, UNIX, and zFS on z/OS. It does not apply to the use and specification of z/OS traditional file system paths.

For directory-based systems, you cannot specify a default root path for an IT data mart that refers to a physical location that already exists and contains files or subdirectories that are unrelated to this IT data mart. This restriction does not apply to traditional z/OS systems.

For example, suppose that a user creates an IT data mart named “Cluster XYZ”. On directory-based systems, the user might specify a default root path such as C:\datamarts\ClusterXYZ. A directory for miscellaneous content is automatically created as C:\datamarts\ClusterXYZ\admin as part of the IT data mart creation. If the user subsequently uses the Adapter Setup Wizard for this IT data mart, additional SAS libraries might be created as C:\datamarts\ClusterXYZ\staging, and so on.

When the user performs an operation such as erasing an IT data mart, a confirmation dialog box is displayed that lists the default root path of that IT data mart. If you click Yes in the dialog box, the physical directories and the metadata for the selected IT data mart are removed. Everything under the default root path is physically deleted. If there are files under that root path that do not pertain to the IT data mart, they are also deleted. In the previous example, if there already was a C:\datamarts\ClusterXYZ \documents directory that contained non-related content, that non-related content would also be deleted.

Delete an IT Data Mart

Deleting an IT data mart removes all the metadata that is associated with the IT data mart. It does not remove the physical tables. To delete an IT data mart and all its contents, perform the following steps:

1. On the IT Data Marts tree of SAS IT Resource Management, right-click the IT data mart that you want to delete. (Make sure that the jobs that are located in that IT data mart are not open in a Diagram tab of the Job Editor window.)

   Note: You can also access the Delete function from the Folders tree of SAS IT Resource Management. However, performing tasks on the IT data mart from any tree other than the IT Data Marts tree is not recommended. (The metadata that is associated with the IT data mart might not be properly updated.)

2. Click Delete. A message box appears that asks you to confirm that you want to delete the objects from the selected IT data marts and all their contents.

3. To continue with the deletion, click Yes. To cancel the deletion, click No.
**Erase an IT Data Mart**

Erasing an IT data mart deletes both metadata and physical files for the IT data mart. It deletes all of the metadata contents of the metadata folder that are associated with the IT data mart. It also deletes all subfolders and items below that folder in the metadata folder hierarchy, such as SAS libraries, jobs, information maps, and other metadata content.

Erase also deletes the physical directory or file that is associated with each SAS library in the IT data mart. If the IT data mart uses a directory-based file system (such as Windows, UNIX, or zFS), the erase function deletes the physical root path that is specified for the IT data mart. In addition, it deletes all subdirectories and files below that root in the file system hierarchy.

*Note:* For directory-based systems (not traditional z/OS systems), if the root path of your IT data mart contains any content that is not related to your IT data mart, it is also deleted.

To erase an IT data mart and all its contents, perform the following steps:

1. On the **IT Data Marts** tree of SAS IT Resource Management, right-click the IT data mart that you want to erase. (Make sure that the jobs that are located in that IT data mart are not open in a **Diagram** tab of the Job Editor window.)

   *Note:* You can also access the Delete function from the **Folders** tree of SAS IT Resource Management. However, performing tasks on the IT data mart from any tree other than the **IT Data Marts** tree is not recommended. (The metadata that is associated with the IT data mart might not be properly updated.)

2. Click **Erase**. A message box appears that asks you to confirm that you want to erase the objects from the selected IT data marts and all their contents. The message box shows the root path of the IT data mart.

3. To continue the process of erasing the IT data mart, click **Yes**. To cancel the erase action, click **No**.

**Modify an IT Data Mart**

You can modify some of the properties of an IT data mart.

To do so, perform the following steps:

1. On the **IT Data Marts** tree of SAS IT Resource Management, right-click the IT data mart that you want to modify. Select **Properties**. (Make sure that the jobs that are located in that IT data mart are not open in a **Diagram** tab of the Job Editor window.)

   *Note:* If you rename an IT data mart to the same name as an existing IT data mart within the same application server, the following message is displayed: “IT Data Mart folder with this name already exists in the selected folder location. Change the name or select a different folder location.”

2. • Select the **General** tab to view and modify the **Name**, **Description**, and **Location** fields.

   *Note:* In general, you should not change or delete any supplied fields on this tab. If you need to work with a user-supplied field, do so by using the **New** and **Delete** buttons to add and delete fields, respectively.
**Note:** For paths on directory-based systems (not a traditional z/OS file system path), if you change the default root path to a path that already exists and has existing content, a warning message is displayed. If the existing content is associated with the IT data mart that you are working with, the warning can be ignored. However, if the existing content is not associated with the IT data mart that you are working with, you should specify a different path. This best practice protects your existing content from accidental deletions.

- Select the **Advanced** tab to view metadata for the IT data mart. In general, modifying these fields can cause processing errors. However, you can modify the **Name** and **Description** fields.

3. Click **OK** to save your changes.

**Note:** If you change the name or the location of an IT data mart, you should redeploy all the jobs that are contained in the IT data mart. If you add or delete tables or columns, change the locations of tables, or change a parameter on a transformation, you should redeploy the jobs that are associated with those tables.

### Purge the Tables of an IT Data Mart

Purging an IT data mart removes the contents of the tables in that IT data mart. It does not remove the metadata or the physical tables. To purge the tables of an IT data mart, perform the following steps:

1. On the **IT Data Marts** tree of SAS IT Resource Management, right-click the IT data mart whose table you want to purge.

2. From the drop-down menu that is displayed, click **Purge**.

3. Review the list of tables that are displayed in the confirmation dialog box. Click **Yes** to delete the tables. Otherwise, click **No**.

### Rename an IT Data Mart

**Note:** If the renaming of the IT data mart includes moving it to another folder, perform the **Move to Folder** task in the **Folders** tree. Then, perform the renaming task in the **IT Data Marts** tree.

To rename an IT data mart, perform the following steps:

1. On the **IT Data Marts** tree of SAS IT Resource Management, right-click the IT data mart that you want to rename. (Make sure that the jobs that are located in that IT data mart are not open in the **Diagram** tab of the Job Editor window.)

2. From the drop-down menu, click **Rename**. The name of the IT data mart is highlighted.

3. Enter the new name of IT data mart in the highlighted area.

**Note:** If you rename an IT data mart to the same name as an existing IT data mart within the same application server, the following message is displayed: **IT Data Mart folder with this name already exists in the selected folder location. Change the name or select a different folder location.**

Alternatively, you can rename the IT data mart by right-clicking the IT data mart and selecting **Properties**. Select the **General** tab. Enter the new name of the IT data mart in
the Name field. If you rename an IT data mart to the same name as an existing IT data mart, a message is displayed. It warns you that the new name is already in use for another IT data mart.

*Note:* In any job, if you explicitly specified the path to an IT data mart, and you subsequently rename that IT data mart, then you should change the name of the IT data mart in that explicitly specified path. In addition, if you change any other folder name that is used in an explicit path reference, you should ensure that the explicitly specified path uses the changed folder name.

**CAUTION:**

Redeploy the jobs that are contained in the IT data mart. Redeploying jobs is necessary because renaming an IT data mart changes the metadata path of anything that is associated with that IT data mart.

---

### Importing, Exporting, and Promoting Metadata

#### About Importing, Exporting, and Promoting Metadata

SAS IT Resource Management metadata objects are managed as all other SAS metadata objects are managed. The SAS Intelligence Platform provides several tools to assist you in copying, promoting, importing, and exporting your metadata. For information about how metadata can be managed, see the “Using the Promotion Tools” chapter in the SAS 9.4 Intelligence Platform: Data Administration Guide.

#### About Promoting an IT Data Mart

The IT data mart object is unique to SAS IT Resource Management and enables you to perform actions on the whole IT data mart. One of these actions is the ability to promote the IT data mart by means of the export and import tools. These tools can be used to promote IT data marts that were created in SAS IT Resource Management 3.2 and later to a new IT Resource Management environment. They enable you to move the definition of an IT data mart from one metadata server to another. For example, you might want to move (or promote) an IT data mart for one of the following reasons:

- to move an IT data mart from a test system to a production system
- to move an IT data mart to a new server when the original host is being replaced by new or different hardware
- to share an IT data mart within or across an organization
- to share user-written or customized adapters across IT data marts or IT Resource Management systems

#### Notes

If you migrated from an earlier release of SAS IT Resource Management, you might have worked with an ITMS repository. IT data marts in that repository do not have to be moved to the Foundation repository. By default, new IT data marts are created in the Foundation repository.

Earlier releases of SAS IT Resource Management used a specific location for the Admin library. Therefore, each library could be named “Admin”. In later releases of SAS IT.
Resource Management, the name of any library must be unique (within a specific application server).

- If you used the SAS Migration Utility, the libraries are automatically renamed so that they are unique.

- If you used the Import from SAS Package wizard, the libraries are not automatically renamed and warnings are written to the SAS log. To correct this problem, rename the libraries manually so that their names are unique.

**Methods of Exporting and Importing IT Data Marts**

You can perform the exporting and importing of an IT data mart in two ways:

- interactively, using the Export to SAS Package and Import from SAS Package wizards

- in batch mode from an operating system command line or from a batch script. The tools that run in batch mode provide the same capabilities as the Export to SAS Package and Import from SAS Package wizards, with the following exceptions:

  - The wizards provide the option of either including or excluding associated physical content such as table data and source code files. When you use the batch tools, the promotion automatically includes all associated content except physical files for tables and external files. (The batch tools do not provide the option of promoting physical files for tables and external files.)

  - In the Export to SAS Package wizard, you can display a list of the objects on which an object depends and then individually specify which of these objects to export. In the batch export tool, you can select a global option to include all dependent objects.

You might have objects that are shared across multiple IT data marts, such as generated transformations or formulas. If so, export and then import the shared objects first, one time only. Then do one of the following:

- Exclude the shared object from the IT data mart before you execute the Export to SAS Package and Import from SAS Package wizards.

- Deselect the shared objects from the list of dependent objects in the Import from SAS Package wizard.

**Note:** Before you run the Import from SAS Package wizard, verify that shared objects are not checked in the list of dependent objects.

**Note:** For information about exporting and importing an IT data mart, see Chapter 3, “Migrating a Single IT Data Mart from SAS IT Resource Management 3.2, 3.21, 3.3, 3.4, 3.5, 3.6, 3.7, or 3.8 to 3.8,” in *SAS IT Resource Management 3.8: Migration Guide*. For information about using the batch export and import tools, see the topic called “About the Batch Export and Import Tools” in *SAS 9.4 Intelligence Platform: System Administration Guide*, which is located here: http://support.sas.com/documentation/cdl/en/bisag/68240/HTML/default/viewer.htm?p=16u72wcci3y0n1wq3iarcqr116.htm.
About Adapters

What are Adapters?
Adapters consist of specialized software that enables you to process data about IT resources from many diverse data sources. Adapters convert raw data from a given source into a set of organized IT resource information. This organization includes staged tables, aggregated tables, analysis- and report-ready data, and reports that facilitate aggregation and reporting on your 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. To process the raw data into meaningful statistics about an enterprise's IT resources, it must be read, interpreted, and possibly
converted into a more standard form. The data can then be loaded into staged tables in preparation for subsequent aggregation and reporting. For each type of IT performance data that is supported, SAS IT Resource Management supplies an adapter. The adapter consists of the transformations, template tables, and code that are necessary to stage, aggregate, and report on that IT performance data.

For most adapters, by means of the Adapter Setup wizard, SAS IT Resource Management also supplies Aggregation, Information Map, and Performance Report transformations. When executed, these transformations create the aggregation tables, information maps, and reports that enable you to convert raw data from various sources into meaningful intelligence about your IT resources. If these transformations are not created by the Adapter Setup wizard, then they can be created manually. To do so, see “Preparing to Create an Aggregation Table” on page 157 and “Overview of Specifying an Information Map Transformation” on page 312. For more information about using Performance Report transformations and reporting jobs, see the SAS IT Resource Management 3.8: Reporting Guide.

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 the documentation that is available for this product at http://support.sas.com/documentation/onlinedoc/etls/index.html.

**Supported Adapters**

The name of an adapter represents the data source from which SAS IT Resource Management gathers raw data.

All SAS IT Resource Management adapters are supported on all SAS IT Resource Management operating environments unless there is a technical limitation that is associated with the raw data (log file) sources. For example, the raw data might reside on a device that is not compatible with the architecture of the host system on which the SAS IT Resource Management server is installed. In that case, that raw data file might not be usable as input unless further processing is performed.

**Tip** The log records from the TMON2CIC and TMONDB2 adapters are typically compressed. If you want to process data from those input sources on platforms other than z/OS, de-compress the data before staging it.

**Table 5.1 Table of Supported Adapters**

<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon CloudWatch</td>
<td>Amazon CloudWatch is a monitoring service for AWS cloud resources and for the applications that run on AWS. Amazon CloudWatch can collect and track metrics, collect and monitor log files, and set alarms. Amazon CloudWatch can monitor AWS resources such as Amazon EC2 instances, Amazon S3 and EBS volumes, and Amazon RDS DB instances. It can also monitor custom metrics generated by applications and services as well as any log files that are generated.</td>
<td>SAS IT Resource Management 3.8 supports data collection for these AWS services only: EC2, EBS, RDS, and S3.</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
<td>Latest Verified Version of the Data Source</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>ASG TMON2CIC</td>
<td>ASG TMON for CICS TS for z/OS (formerly from Landmark) 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 ASG TMONCICS or as a subtype of SMF.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>ASG TMONDB2 and ASG TMONDB2 V5</td>
<td>ASG TMON for DB2 (formerly from Landmark) works with the SQL Analyzer to manage DB2 applications and critical DB2 resources by providing a single view of DB2 data-sharing group performance. This adapter tracks DB2 buffer pools, lock contention and serialized resource usage, transaction statistics from ASG TMON for CICS to ASG TMON for DB2, and dynamic and static SQL calls. This adapter 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. Note: For V4 and earlier versions, use ASG TMONDB2. For higher versions, use ASG TMONDB2 V5.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>BMC Mainview IMS</td>
<td>BMC Mainview for IMS (formerly IMF) supplies transaction information such as CPU usage, number of I/Os, and response time. When you collect BMC Mainview for IMS data instead of IBM IMS data, BMC recommends that you collect a duration of one hour of consistently high activity. The hour should start at the beginning and end at the end of an RMF interval.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>BMC Perf Mgr</td>
<td>BMC Performance Manager for Servers (formerly BMC PATROL) collects UNIX and Windows enterprise system management data.</td>
<td>v3</td>
</tr>
<tr>
<td>CA TMS</td>
<td>The Computer Associates CA 1 Tape Management product (formerly TMS) controls and protects tape data sets and volumes in z/OS environments.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
<td>Latest Verified Version of the Data Source</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Comma Separated Values (CSV)</td>
<td>The Comma Separated Values adapter is a SAS product that reads any character delimited file.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>DT Perf Sentry</td>
<td>Demand Technology Performance Sentry (formerly NTSMF) collects data from Windows systems and for Windows server applications such as Exchange, SQL Server, and IIS. SAS IT Resource Management also supports a separate Demand Technology Performance Sentry adapter that is z/OS based. The Demand Technology Performance Sentry with MXG adapter that is z/OS based is for raw data sources that are supported through MXG.</td>
<td>v4.0</td>
</tr>
<tr>
<td>DT Perf Sentry with MXG</td>
<td>Demand Technology Performance Sentry (formerly NTSMF) with MXG collects data from Windows systems and for Windows server applications such as Exchange, SQL Server, and IIS. (SAS IT Resource Management also supports a separate Demand Tech Perf Sentry adapter that is not MXG based.)</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>Ganglia</td>
<td>Ganglia is a scalable distributed monitoring system for high-performance computing systems such as clusters and grids.</td>
<td>3.7.1</td>
</tr>
<tr>
<td>HP Perf Agent</td>
<td>HP Performance Agent (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.</td>
<td>v11</td>
</tr>
<tr>
<td>HP Reporter</td>
<td>HP Reporter software (formerly OpenView Reporter) captures HP Performance Agent measurement data that is stored in a relational database via SAS/ACCESS to Oracle or ODBC.</td>
<td>v4.0</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
<td>Latest Verified Version of the Data Source</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>------------------------------------------</td>
</tr>
</tbody>
</table>
| IBM AS400    | IBM OS/400 Collection Services  
*Note:* The staging code that is required for the IBM AS400 data source is not automated by a SAS IT Resource Management adapter. Instead, SAS IT Resource Management supplies a User-written Staging transformation and templates that contain table and column metadata for this adapter for use with user-written staging code. | MXG 34.08* |
| IBM DCOLLECT | IBM DFSMS Data Collection Facility 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: IBM DCOLLECT provides information and statistics for volumes that are managed by DFSMShsm (ML0 and ML1).  
  - tape capacity planning: IBM DCOLLECT provides statistics for tapes that are managed by DFSMShsm.  
• SMS configuration information | MXG 34.08* |
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
</table>
| IBM EREP     | IBM Environmental Record Editing and Printing Program processes the error records from the MVS, VM, and VSE operating systems to produce formatted reports. Depending on the requested report, these IBM EREP reports can show the status of the entire installation, an I/O subsystem, or an individual device. IBM 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. | MXG 34.08* |
| IBM IMS      | IBM Information Management System (IMS) is the transaction and hierarchical database management system from IBM.  
  *Note:* The staging code that is required for the IBM IMS data source is not automated by a SAS IT Resource Management adapter. Instead, SAS IT Resource Management supplies a User-written Staging transformation and templates that contain table and column metadata for this adapter for use with user-written staging code. | MXG 34.08* |
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
</table>
| IBM SMF      | 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. IBM RMF is the IBM strategic product for z/OS performance measurement and management. IBM RMF is the base product that collects performance data for z/OS and Sysplex environments to monitor system performance. Because IBM RMF data is a subtype of IBM SMF data, the IBM SMF adapter can be used with IBM RMF data without requiring additional customizations. | MXG 34.08* |
| IBM TPF      | The IBM Transaction Processing Facility operating system works with application programs to process transactions in a real-time environment. The IBM TPF system is designed for businesses and organizations that have large networks and high volumes of online transactions. | MXG 34.08* |
| IBM VMMON    | IBM VM Monitor Collection product collects performance information that is associated with VM, including measurements for user activity, processor storage, I/O, and applications. | MXG 34.08* |
| MS SCOM      | Microsoft System Center Operations Manager monitors Windows systems, Microsoft software, and applications to provide a view of the health of an organization’s Windows environment.  
AWS Management Pack for Microsoft System Center Operations Manager (SCOM) v2012 |
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRDtool</td>
<td>RRDtool is the OpenSource industry standard, high-performance system for the data logging and graphing of time series data. It compiles on Microsoft Windows and many Linux and UNIX platforms.</td>
</tr>
</tbody>
</table>
| SAP ERP               | Enterprise Resource Planning (ERP) Software from SAP (formerly SAP R/3), via the SAS IT Management Adapter for SAP, collects SAP ERP and SAP Business Warehouse (BW) workload performance measurements.  
- For SAP ERP, 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. | SAP ERP(ECC): v6.0  
SAP BW(BI): v7.0 |
| 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. | Dependent on the operating system.  
For information about specific operation system release versions, see “Accessing Raw Data for SAR” in Appendix 2, “Data Sources Supported by SAS IT Resource Management Adapters,” in the SAS IT Resource Management 3.8: Administrator’s Guide. |
<p>| SAS Environment Manager | SAS Environment Manager (SAS EV) is a web-based application that collects information about SAS resources as well as the events and alerts that are logged in the SAS environment. The SAS Environment Manager adapter supports the Agent Collected Metrics (ACM) and Audit and Performance Management (APM) data marts. | v2.5 |</p>
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNMP</td>
<td>Simple Network Management Protocol is a component of the Internet Protocol Suite. The SNMP adapter also supports gathering SNMP data from round-robin databases (RRDs) that are used in many network management tools.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>VMware vCenter</td>
<td>VMware vCenter Server is an operational console for VMware and includes the VMware vCenter database that serves as the raw data source for this SAS IT Resource Management adapter. The vCenter database contains VMware performance and utilization measurements for both the virtual machines and the physical servers on which they run, including detailed CPU, memory, storage, and I/O metrics. The vCenter relational database supports Oracle, Microsoft SQL Server or, for VMware vCenter releases prior to 5.5, an IBM DB2 database. For the VMware vCenter Server Appliance on Linux, the relational databases supported are Oracle for the external database or PostgreSQL for the embedded database. It is accessed by SAS/ACCESS to Oracle or ODBC. <strong>Note:</strong> Hosting the vCenter database in IBM DB2 is no longer an option for VMware vCenter Server 5.5. For more information, see <a href="https://www.vmware.com/support/vsphere5/doc/vsphere-esx-vcenter-server-55-release-notes.html">https://www.vmware.com/support/vsphere5/doc/vsphere-esx-vcenter-server-55-release-notes.html</a>.</td>
<td>v6.5</td>
</tr>
</tbody>
</table>
VMware Data Acquisition

VMware Data Acquisition is a transformation that can extract topology and configuration information from the VMware vCenter database more frequently than once a day. The vCenter relational database supports Oracle, Microsoft SQL Server or, for VMware vCenter releases prior to 5.5, an IBM DB2 database. For the VMware vCenter Server Appliance on Linux, the relational databases supported are Oracle for the external database or PostgreSQL for the embedded database. It is accessed by SAS/ACCESS to Oracle or ODBC.

*Note:* This is not an adapter. However, a staging transformation is available for this source.

Web Log

The Web Server Log adapter reads and analyzes web logs that conform to the Common and W3C Extended Log Formats (CLF and ELF.)

*Note:* SAS IT Resource Management uses MXG for this adapter.

For data sources (and for raw data sources) that are user-written, staging code is supported by the wizards of SAS Data Integration Studio, and the transformations that are supplied by SAS IT Resource Management. The New Table wizard of SAS Data Integration Studio can create the transformations that can stage raw data from any input source.

**Adapter Components That Stage Data**

SAS IT Resource Management supports adapters that are essential for extracting, standardizing, and staging data. These adapters include the following three components to stage data:

- **template tables**
  These adapter-specific models are used when transforming and loading raw data into SAS data sets called staged tables. The values in template tables are supplied by SAS IT Resource Management for specific IT data sources and thus cannot be changed. However, you can view a template table’s properties such as associated columns and
related metadata. For additional information about template tables, see “Working with Template Tables” on page 75.

staging transformations
These transformations generate the SAS code that extracts raw data, transforms it to a standardized format, and then loads it into SAS data sets (staged tables). Staging transformations include specific staging parameters such as the format of raw data, the location of the data, and how the data is to be handled during the staging process. For example, a staging transformation might specify the network path to the raw data. It might also specify how that data is delimited in its source format, and how duplicate data might be handled when it is staged.

SAS IT Resource Management provides several ways that you can customize and configure how your data is staged by a staging transformation. For example, you can use the Adapter Setup wizard to create and configure staging transformations for a supplied adapter. You can create staging transformations manually by using the User-written Staging transformation. You can also modify the staging parameters that are specified in a staging transformation after it is created. For more information about staging transformations, see “Working with Staging Transformations” on page 111.

staged tables
These SAS data sets contain the data that was extracted from an input data store. They have been rendered into a format that is suitable for further analysis. The structure and metadata for staged tables are based on corresponding template tables that SAS IT Resource Management provides for specific adapters and domain categories. For more information about staged tables, see “Working with Staged Tables” on page 119.

---

**Working with Template Tables**

**What are Template Tables?**

Template tables are representations of adapter-specific tables that are supplied by SAS IT Resource Management for specific IT data sources. Template tables are models that are used to create staged tables. Next, these staged tables are populated by staging transformations when loading and transforming raw data.

Each template table provides the metadata for all regular columns, computed columns, and other attributes (formats, formulas, source code for computed columns, and so on) that a staged table can include when it is created from a template table. The resulting staged table can include all or a subset of this metadata that is provided by the template table.

A template table includes regular columns and computed columns that indicate how raw data is computed and populated into the staged table. This predefined metadata is based on data classifications and metrics that SAS IT Resource Management considers most important for aggregation and reporting in various performance areas. Thus, template tables are the starting point where SAS IT Resource Management begins to add intelligence to raw data. For more information about the metrics that SAS IT Resource Management uses for the various adapters, see the metrics documentation that is located on the SAS IT Resource Management documentation page. To locate the SAS IT Resource Management documentation, use the Products Index A-Z feature at [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html).
**Locate Template Tables**

Template tables are available from the **Folders** tree view. Expand **Products** ⇒ **SAS IT Resource Management** ⇒ **Adapters**. Then, expand an adapter subfolder, the **IT Template Tables** subfolder, and one or more of the subfolders for domain category. SAS IT Resource Management groups the tables by adapter and domain category (such as Disk or Network).

Domain categories are categories of template tables (and aggregation tables) that are organized logically to represent subsets of the IT resource measurements that are available from an adapter. This enables you to identify the template tables that correspond with the performance data that you want to use when creating staged tables.

*Figure 5.1 Template Tables for Disk Performance of the HP Reporter Adapter*
In the previous image from the Folders tree view, the template table PCSDSK is in the Disk subfolder and is therefore related to the disk performance data from the HP Reporter adapter. Using this information, you can determine that this template table provides metadata for staging the data that relates to PCS disk metrics such as disk performance and disk space usage. Other template tables that relate to other facets of disk performance are also in the Disk subfolder.

**Note:** Domain categories also surface in the Staged Table wizard and the Adapter Setup wizard.

**Differentiate between Template Tables and Staged Tables**

Staged tables have the same name as the template tables on which they are modeled. For this reason, identifying an object as a template table or a staged table when working within SAS Data Integration Studio can be confusing.

The following table shows the differentiating factors that enable you to distinguish a template table from a staged table.

**Table 5.2 Distinguishing Template Tables from Staged Tables**

<table>
<thead>
<tr>
<th>Differentiator</th>
<th>Template Tables</th>
<th>Staged Tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icon</td>
<td>Template tables are indicated by the <a href="image">icon</a> in the tree views and the Staged Table wizard.</td>
<td>Staged tables are indicated by the <a href="image">icon</a> in the tree views.</td>
</tr>
<tr>
<td>Location</td>
<td>In the Folders tree view, template tables are in the Products ⇒ SAS IT Resource Management ⇒ Adapters ⇒ &lt;adapter name&gt; ⇒ IT Template Tables ⇒ &lt;domain category&gt; subfolders.</td>
<td>In the Inventory tree view, staged tables are in the Table folder. In the IT Data Marts tree view, staged tables are in the same folder as the corresponding staging job (unless you designated otherwise when creating the staged tables). Staged tables are also stored in the same IT data mart subfolders as their respective staging jobs.</td>
</tr>
<tr>
<td>Job</td>
<td>A template table never appears in a folder of the IT Data Marts tree view or in the process flow diagram of a job.</td>
<td>Each staged table appears as an object in the process flow diagram of a staging job. The following image is an example of how a staged table looks in a process flow diagram.</td>
</tr>
</tbody>
</table>
Template Table Properties

About Template Table Properties
Template tables are distinct tables that are defined to the metadata for SAS IT Resource Management. You cannot modify the properties of template tables because these predefined tables include values and attributes that make up the intelligence for processing raw IT data based on industry research. However, you can view the properties of template tables to determine the template tables from which you want to create staged tables for a given adapter.

To view the properties of a template table, perform the following steps:

1. In the Folders tree view of SAS IT Resource Management, expand Products ➔ SAS IT Resource Management ➔ Adapters. Then expand an adapter subfolder, the IT Template Tables subfolder, and one or more of the domain category subfolders to see the corresponding template tables.

2. Right-click a template table and select Properties. A Properties dialog box appears and enables you to view the template table’s metadata, such as table name, column metadata, and external properties.

![Properties Dialog Box for the PCSDK Template Table](image)

The Properties dialog box contains the following tabs:

- The **General** tab displays information that identifies the template table, such as name, description, folder location, and responsibilities.

- The **Notes** tab displays notes or documents that are associated with the template table.

- The **Advanced** tab displays additional metadata attributes about the template table, such as metadata ID and filename.
• The Authorization tab displays users and groups that have various permissions that are related to the template table.

• The Columns tab displays the metadata for each column in the template table. This tab includes information such as the name and description for each column, the expressions used for any computed columns in the template table, and the type classification for each column in the template table. In addition, this tab displays the length, informat, format, external name, and whether the column is recommended. For more information about the Columns tab for template tables, see “Columns in Template Tables” on page 79.

• The ITRM Options tab identifies the adapter that is associated with the template table. It also identifies any predecessor tables, external names, and data model versions that correspond with the template table. For more information about ITRM Options tab for template tables, see “ITRM Options for Template Tables” on page 81.

Note: You can click Help in the Properties dialog box for more information about each tab.

Columns in Template Tables
The Columns tab of a template table's Properties dialog box enables you to view the specific column metadata for the table. You can use this information to view the types of data that the template table includes. You can also understand how computed columns are formulated and determine whether you want to use the template table for creating a staged table.

Figure 5.3 Sample Columns Tab from the Properties Dialog Box of the PCSDSK Template Table

The following list describes the information that you can view for each column in a template table. Each row on the Columns tab shows the metadata for a single column of the template table. You cannot modify this information because the predefined metadata includes values and attributes that make up the intelligence for processing raw IT data based on industry research.
#
specifies the column's ordinal position in the grid on the Columns tab. Note that the
ordinal position is not necessarily the same as the alphabetic sequence of variable
names.

Name
specifies the name of the column in the template table.

Expression
specifies the combination of functions and mathematical operations that are used to
derive a value for the column. This field is blank unless the column is a computed
column. For more information about computed columns in template tables, see
“Computed Columns in Template Tables” on page 83.

Description
provides a description of the data that populates the column. The description
provides more information about the type of data that the column includes.
The column descriptions in template tables are propagated to staged tables and used
as labels in information maps and aggregations. Therefore, column descriptions for
template tables are standardized to be concise, easily understood, and efficiently
integrated into other objects and SAS products such as SAS Enterprise Guide and
SAS Information Map Studio. Standardizing column descriptions and label names
ensures that equivalent data is labeled the same across all adapters. Standardization
also reduces the need for editing label content in reporting clients.

Here are some of the ways that column descriptions in template tables have been
standardized to be effective labels:

• Character length is reduced by removing spaces between words and capitalizing
  the first letter of each word or term within the description (such as
  ManagementClassLength).

• Character length is typically reduced by removing special characters,
punctuation, and redundant words that do not enhance the meaning of the data.

• Words that indicate performance area or domain category (such as CPU,
  processor, disk, memory, and network) are typically at the beginning of the
description.

• Words that indicate data interpretation and normalization (such as rate, bytes, and
  seconds) are at the end of the description.

• Words are abbreviated if a clear alternative is available (such as Average to Avg).

Type
specifies the data type of the column. Valid types are character and numeric. You can
also identify column types by looking at the Name variable. A round □ icon to the
left of the name indicates that the data in the column is numeric. A pyramid ▲ icon
to the left of the name indicates that the column contains character data.

Length
specifies the maximum length of the data in the column.

Informat
specifies the SAS informat that is used (if needed) to read values for the selected
column. Informats are required for reading fixed-width data.

Format
specifies the SAS format that is used to write values for the selected column.
Template table columns are in NLS format when applicable. NLS formats are
indicated by NL as the first two characters in the format column. For more
information about NLS formatting, see “National Language Support (NLS)” on page 15.

**External Name**

specifies the name by which the staging code maps columns in a staged table to their corresponding variables in the raw data. External names are used by both staged tables and template tables. However, not all columns in a staged or template table have a predetermined external name.

*Note:* For the DT Perf Sentry adapter, the external name is the name of the DT Perf Sentry metric.

**Recommended**

specifies whether the column provides data that SAS IT Resource Management has predefined as critical for reporting and analysis in the performance area of the template table. The Staged Table wizard enables you to use only the recommended columns from a template table when creating a corresponding staged table. This enables you to create staged tables that include only the columns that are recommended and thus not spend resources staging and analyzing data that is likely not relevant. For more information about using the Staged Table wizard, see “Create Staged Tables” on page 121.

The Adapter Setup wizard also uses the recommended columns of a template table to create various levels of output. For example, when using the Adapter Setup wizard, you can choose staging only, minimal, typical, or full output. The wizard creates the appropriate level of output based on your selection and the columns recommended for the corresponding tables. For more information about the Adapter Setup wizard, see “About the Adapter Setup Wizard” on page 257.

*Note:* The Add Domain Category wizard provides the same functionality as the Adapter Setup wizard.

**ITRM Options for Template Tables**

The **ITRM Options** tab of the Properties dialog box for a template table includes information such as what tables are staged before the template table and how the original data collector identifies the data that is used for the template table.
The **ITRM Options** tab includes the following parameters:

**Adapter Key**
 specifies the adapter that is associated with the template table. For adapter names, SAS IT Resource Management uses the latest names that are approved by respective third parties. However, SAS IT Resource Management uses an abbreviation called an adapter key to represent an adapter in the software if necessary. (Use of an adapter key helps handle the constraints of character limitations in software code. It also accommodates organizations that change the names of their products and software.) The adapter key is used by SAS Technical Support for reference and does not require any action from the SAS IT Resource Management user.

*Note:* In some cases, the adapter key does not match the current name of the adapter but instead reflects the former name of the adapter. For example, the adapter key for the BMC Perf Mgr adapter is PATROL, the former name of this adapter.

**Predecessor Tables**
 specifies other tables that are required to be staged in order to produce this table. For example, one of the staged tables (named SAR) for the SAR adapter is a compilation of many SAR tables (predecessor tables). When the SAR table is staged, SAS IT Resource Management programmatically stages the various predecessor tables that make up the resulting SAR staged table. Thus, you do not have to stage each predecessor table individually. If a template table does not require staging predecessor tables, this parameter is blank.

**External Names**
 specifies the names that the original data collector (or other software) uses to identify the data that serves this template table. External names are the means by which the staging code maps a SAS IT Resource Management template table to a table in the raw data. For example, a template table that is named “NTPHDSK” in SAS IT Resource Management might have an external name such as “Physical Disk” in the raw data file. The staging code uses this information to determine that the Physical Disk data in the raw data file belongs in the staged table that is modeled from the NTPHDSK template table.
For MXG adapters in SAS IT Resource Management 3.5 and later, the external table name represents the original IT Resource Management column name before the column names were switched to use the variable names that MXG supplies. The SAS IT Resource Management table and column names are now equivalent to the MXG data set names and columns on which they are based.

*Note:* For best results, do not change the external names of the columns or the tables for MXG adapters. There is no benefit to changing the external names of the tables or columns for MXG adapters.

The staging code for some adapters does not use external names. For example, the table name in the raw data might be the same as the table name in SAS IT Resource Management. The external names for template tables are similar in concept to the external names for staged tables. For more information about using external names for staged tables and columns in staged tables, see “Understanding External Names of Staged Tables and Columns” on page 136.

**Data Model Version** specifies the version of the template table. This is the version from which the staged table is created or updated through the Maintain Staged Tables wizard. For more information about the Maintain Staged Tables wizard, see “About the Maintain Staged Tables Wizard” on page 84.

**Computed Columns in Template Tables**

Computed columns in a table contain data values that are derived from other columns in the table. Template tables contain computed columns for data that is not directly provided in the preferred form by the raw data source. However, the data might be useful for reporting or promoting consistency across various data sources.

*Note:* A computed column should not be used as a source of calculations for other computed columns. The order of calculating values for a series of computed columns in a target table is not guaranteed.

To find a computed column in a template table and view the formula that it uses, click the Columns tab of a template table's Properties dialog box. All computed columns contain an expression in the Expression column of the grid.

Here are some of the reasons for which SAS IT Resource Management might use computed columns in a template table:

- Create datetime derivations such as changing week date and shift values to your local environment.
- Provide normalizations such as converting bytes to kilobytes, seconds to milliseconds, and percentages between 0 and 1 to percentages between 0 and 100.
- Total paired columns to provide a summed value that includes input and output values, or received and sent values.
- Derive opposite values by using a percentage-based computation that typically subtracts one value from another. For example, a computed column might subtract the number of used components from the number of allocated components to determine the number of components that are still available.
- Standardize performance event count to total events across various classifications such as batch jobs, TSO sessions, and started tasks.
- Create class columns when a table contains an instance column that can contain either a global instance or an individual instance of a performance metric. In this case, a computed column such as CpuId or DiskId is created and set to an individual
instance value, or it is set to a blank value for global instances. These new class columns can then be used as targets of filters to divide global and individual instances into appropriate aggregations.

- Convert raw counts to rates.
- Calculate response time counts and percentages.

**Use Template Tables to Create Staged Tables**

The Staged Table wizard and Adapter Setup wizard enable you to create staging jobs that use template tables to create corresponding staged tables. When executed, the staging jobs load the source data into the staged tables. The staged tables can be used as input to an Aggregation transformation or other SAS Data Integration Studio transformations that are used for analysis and reporting.

SAS IT Resource Management enables you to select the template tables that you want to use or accept the template tables that are selected programmatically for a given adapter.

- To select the template tables that you want to use, create a staging job manually. For more information about how to create a staging job, see “Add a Staging Transformation to a Staging Job” on page 115. For more information about how to create a staged table, see “Create Staged Tables” on page 121.

- To have template tables preselected programmatically for a staging job, run the Adapter Setup wizard for a supported adapter. The template tables that the Adapter Setup wizard uses are predetermined by SAS IT Resource Management. They include the data that is most relevant and appropriate for the level of analysis and reporting that you select. For more information about the template tables that are preselected by the Adapter Setup wizard for each adapter and domain category, see “Overview of the SAS IT Resource Management Data Model” on page 548.

**Maintaining Template Tables and Staged Tables Based on Adapter Changes**

**Working with the Maintain Staged Tables Wizard**

**About the Maintain Staged Tables Wizard**

The data collectors on which template tables are based might change over time. These changes can require new columns in a template table or revisions to existing columns, such as label or character length. Therefore, when SAS IT Resource Management provides a new software release or update, the definitions for some template tables might also change. After a software update is installed, a preexisting staged table can differ from the new version of its corresponding template table.

The Maintain Staged Tables wizard enables you to perform the following tasks with software updates to template tables:

- View updates that can be propagated to existing staged tables.
- Commit updates to the corresponding staged tables within an IT data mart.
- Commit updates to the corresponding staged tables across all IT data marts.
- Add new columns and update existing columns to the corresponding staged tables.
Commit only updates that add new columns to the affected staged tables.

Commit only updates to the recommended columns in the corresponding staged tables.

Generate an HTML report of the actions that the wizard performs.

*Note:* If there are no staged tables to maintain, the HTML report is not produced.

**CAUTION:**
After updating your staged tables with the Maintain Tables wizard or with the corresponding BatchMaintainTable command, you must redeploy your staging jobs. Aggregation jobs do not need to be redeployed.

SAS IT Resource Management identifies affected template tables and their associated staged tables by the **DataModelVersion** field for each table. For example, a template table and a staged table are eligible for impact analysis and updates if the current **DataModelVersion** field of the table does not match the version that is associated with the software update.

For more information about using the Maintain Staged Tables wizard to maintain staged tables within an IT data mart, see “Using the Maintain Staged Tables Wizard to Update Staged Tables within an IT Data Mart” on page 85. For more information about using the Maintain Staged Tables wizard to maintain staged tables across all IT data marts, see “Using the Maintain Staged Tables Wizard to Update Staged Tables across All IT Data Marts” on page 91. For more information about maintaining staged tables using a batch process, see “Maintaining Staged Tables in Batch Mode” on page 91.

### Using the Maintain Staged Tables Wizard to Update Staged Tables within an IT Data Mart

After you install software updates for SAS IT Resource Management, you can use the Maintain Staged Tables wizard to see whether any software changes to the template tables affect the staged tables that you use. You can then and propagate these template table changes to their corresponding staged tables. To do so, perform the following steps:

1. In the **IT Data Marts** tree view of SAS IT Resource Management, locate the IT data mart that contains the staged tables for which you want to view or commit updates.

2. Right-click the IT data mart and select **Maintain Staged Tables** to open the wizard.

3. Specify the scope of the operation that you want to perform with the Maintain Staged Tables wizard.
Figure 5.5  Specify Scope of Operation Page in the Maintain Staged Tables Wizard

a. Select **Commit updates with report** to view a report of the template table changes that affect your staged tables and then commit the changes to the corresponding staged tables.

b. Select **Create report only** to view only a report of the template table changes that affect your staged tables but not commit the changes in this instance of the wizard.

c. Click **Next**.

4. Select an adapter for which you want to analyze the impact of table revisions that are available.

*Note:* This page is not displayed when accessing the wizard from a specific template table to commit updates across all IT data marts. For more information about using the Maintain Staged Tables wizard to maintain staged tables across all IT data marts, see “Using the Maintain Staged Tables Wizard to Update Staged Tables across All IT Data Marts” on page 91.
Click the adapter for which you want to analyze updates. The list of adapters includes all of the adapters that SAS IT Resource Management supports. However, you must select an adapter that is used in the IT data mart in order to complete the wizard successfully.

*Note:* You can select only one adapter on this page and must perform updates for another adapter by using a separate instance of the wizard.

b. Click **Next**. If a message states that there are no staged tables that need maintenance, then there are no staged table updates required based on your selections and the latest software updates. You can close the message box and stop here. Otherwise, continue to the next step.

5. Select the staged tables for which you want to view changes or commit updates.
Select the staged tables for which you want to analyze updates. The list of staged tables includes only the staged tables that are associated with the selected adapter.

A tooltip is available for each staged table in the list. The tooltip shows the metadata path of the table in order to help distinguish between tables, especially tables that might have duplicate names.

Note: If there are no updates to the template tables for the selected adapter, then the wizard displays a message to that effect.

Click Next.

Compare table updates with the previous value of the tables and columns and specify the commit options.
a. Expand the folders in the grid to view the version of the tables and the table columns that have been modified or added to the corresponding template tables. The rows in the grid include the table name, version, description, or columns that are affected by the update. This comparison list also shows previous values before the update and the corresponding new values after the update.

New columns that are added to the template table display the previous value as blank because the column did not exist in the previous version. New columns are also preceded by an asterisk (*) in the HTML report that the wizard generates.

Note: Within a specific table, columns are matched by `SASColumnName` and `SASColumnType` (numeric or character). Therefore, if a column's `SASColumnName` or `SASColumnType` has been changed by the user, the column might not be recognized as a supplied column. Also, if a supplied column needs to change its `SASColumnName` or `SASColumn Type` in the supplied template table definition, then it is treated as a new column.

b. If you choose to commit the updates that are detailed on this page, select one or more of the following **Update Options**. These options enable you to refine the scope of changes that you commit:

- **Add new columns as well as update existing columns** commits all of the changes that are detailed on this page of the wizard. In order for other options to be available, deselect this option.
- **Add only new columns** commits only the new columns.
- **Update only recommended columns** commits only the updates that affect the recommended columns in the associated template tables. For more information about recommended columns in template tables and determining which columns are recommended for a given template table, see “Columns in Template Tables” on page 79.

Note: The **Update Options** are interdependent and the availability of each option in this window depends on whether the other options are selected or
deselected. For example, if Add new columns as well as update existing columns is selected, then the other options are not available. If this option is deselected, then the other options are available. Likewise, if Add only new columns or Update only recommended columns is selected, then Add new columns as well as update existing columns is not available for selection.

c. Click Next.

7. View a summary of the impact analysis and update options that you selected for the staged tables.

Figure 5.9 Summary Page in the Maintain Staged Tables Wizard

a. Review the summary and ensure that it reflects the specifications and result that you expect.

b. Click Finish. The wizard then generates an HTML report and saves it to your workstation.

Note: If there are no staged tables to maintain, the HTML report is not produced. On the client, the report is located in a directory that is determined based on the APPDATA environment variable.

On Windows 7, this location is typically C:\Users\userid\AppData \Roaming\SAS\SASITResourceManagement \3.8\MaintainTableReportYYMDDHHMMSS.htm. If you selected Commit updates with report previously in the wizard, then the metadata for the selected staged tables is updated immediately. The physical data sets for these tables are then updated when the associated staging jobs are run.

Note: The data model version of the staged tables is updated and stamped only when you select both Commit updates with report and Add new columns as well as update existing columns in the wizard.
Using the Maintain Staged Tables Wizard to Update Staged Tables across All IT Data Marts

The Maintain Staged Tables wizard enables you to see whether any software changes to the template tables affect the staged tables that you use. You can also propagate these template table changes to their corresponding staged tables across all IT data marts at once. To do so, perform the following steps:

1. In the Folders tree view of SAS IT Resource Management, expand the following folders to locate the template table: Products ➔ SAS IT Resource Management ➔ Adapters ➔ <adapter name> ➔ IT Template Tables ➔ <domain category> that corresponds to the template table for which you want to propagate updates to its corresponding staged tables.

2. Right-click the template table and select Maintain Staged Tables to open the wizard.

3. Complete the Maintain Staged Tables wizard. When you access the wizard from a specific template table as described in the previous steps, you are able to view and commit staged table updates across all IT data marts instead of within a single IT data mart. For more information about how to complete the Maintain Staged Tables wizard, see “Using the Maintain Staged Tables Wizard to Update Staged Tables within an IT Data Mart” on page 85. This topic includes instructions for reading and completing each page of the wizard.

Maintaining Staged Tables in Batch Mode

About Maintaining Staged Tables in Batch Mode

In order to run the Maintain Staged Tables process in batch mode, you need to invoke the command from the server tier where the SAS IT Resource Management data tier has been installed. You cannot perform this action from a client install.

Note: You must use the Maintain Staged Tables wizard if you want to update selected staged tables that are affected by an update. The BatchMaintainTable command does not provide the ability to specify staged tables to update. For more information about maintaining specific staged tables, see “Using the Maintain Staged Tables Wizard to Update Staged Tables within an IT Data Mart” on page 85.

Perform the following steps to maintain the tables in a batch process:

1. Open a command prompt and enter the following command:

   ```
   cd $SAS\SASITResourceManagementDataTier\3.8
   ```

   Note: The locations that are specified in this and in other sections of the following instructions assume that you have installed SAS IT Resource Management at $SAS (C:\Program Files\SASHome).

2. Execute the BatchMaintainTable command, specifying options as required.

   Tip: For best results, set all the options as needed but set the commit option to N. This setting produces a report that lists the actions that might be performed under the current settings of the command. However, if there are no staged tables to maintain, no HTML report is produced. After reviewing the report, if you are satisfied with the additions or updates that might be performed by using the options that you specified, change the commit option to Y. Then rerun the command.
Syntax for the Batch Maintain Table Command Line

BatchMaintainTable
-Commit Y | N
-AdapterName “adapter-name”
<ITDataMartName “ITDataMartName”>
<TemplateTableName “TemplateTableName”>
<AddAndUpdateColumns Y | N>
<AddNewColumnsOnly Y | N>
<UpdateRecommendedColumnsOnly Y | N>
<profile profile>
<user userID>
<password password>
<host hostname>
<port port>
<domain domain>
<help>
specifies whether to commit changes to the staged tables.

- **AdapterName** “*adapter-name*”
specifies the adapter whose staged tables you want to update.

  *Note:* Enclose *adapter-name* in double quotation marks.

- **ITDataMartName** “*IT-data-mart-name*”
specifies the IT data mart where the adapter's staged tables are stored. This option is required if the TemplateTableName option is not set to *Y*.

  *Note:* Enclose *IT-data-mart-name* in double quotation marks.

- **TemplateTableName** *template-table-name*
specifies the template table that you want to update. This option is required if the ITDataMartName option is not set to *Y*.

- **AddAndUpdateColumns** *Y | N*
specifies whether to add new columns and update all existing columns. If the AddAndUpdateColumns option is *N*, then either or both of the AddNewColumnsOnly and UpdateRecommendedColumnsOnly options should be set to *Y*.

  *Note:* Setting this option to *Y* is recommended.

- **AddNewColumnsOnly** *Y | N*
specifies whether to add only new columns. This option is required if the AddAndUpdateColumns option is not set to *Y*.

- **UpdateRecommendedColumnsOnly** *Y | N*
specifies whether to update only recommended columns. This option is required if the AddAndUpdateColumns option is not set to *Y*.

- **profile** *profile*
specifies the metadata server connection profile. This option can be used in place of the host, port, user, and password options.

- **user** *user-ID*
specifies the user login identity. This option is required if the profile option is not set or if the profile does not contain connection credentials.

- **password** *password*
specifies the user login password. This option is required if the profile option is not set or if the profile does not contain connection credentials.

- **host** *host-name*
specifies the metadata server host. This option is required if the profile option is not set.

- **port** *port-number*
specifies the metadata server port. This option is required if the profile option is not set.

- **domain** *domain*
specifies the user authentication domain.

- **?** (or -help)
Note: By default, running the BatchMaintainTable command always produces a report of the results unless there are no staged tables to be maintained. In that case, no HTML report is produced.

Examples of the Batch Maintain Table Command Line

Example 1

This example shows how to run the Batch Maintain Table command on Windows. The command examines the staged tables in an IT data mart called “My IT Data Mart” that were generated for the BMC Performance Manager adapter. New or changed columns that pertain to the staged tables for the BMC Performance Manager adapter are not applied. However, they are included in the report that is produced by the Batch Maintain Table command.

```
"%JAVA_HOME%\bin\java.exe"
-Djava.system.classloader=com.sas.app.AppClassLoader
-DSas.ext.config="$SAS\sas.java.ext.config"
-DSas.app.launch.config="$SAS
 \SASITResourceManagementDataTier
 \3.8\plugins\itrmdatatier\picklist"
-DSas.app.repository.path="$SAS
 \SASVersionedJarRepository\eclipse"
-Dlog4j.configuration="file:///$SAS
 \SASDataIntegrationStudioServerData
 \4.7\log4j.properties"
-DSas.app.class.path=.;"$SAS
 \SASITResourceManagementClient\3.8\build"
-Xmx1024m
-Xss1m
-classpath "$SAS\SASVersionedJarRepository\eclipse\plugins
 \sas.launcher.jar"
com.sas.solutions.itms.batch.maintaintable.BatchMaintainTable
-Commit N
-Adapter "BMC Perf Mgr"
-ITDataMartName "My IT Data Mart"
-AddAndUpdateColumns Y
-profile MyMetadataServerProfile
```

Example 2

This example shows how to run the Batch Maintain Table command on Windows. The command examines tables across all IT data marts on the application server that were generated for the BMC Performance Manager adapter and the PTCACHE template table. Only changes to the recommended columns are made. A report of these updates is produced.

```
"%JAVA_HOME%\bin\java.exe"
-Djava.system.classloader=com.sas.app.AppClassLoader
-DSas.ext.config="$SAS\sas.java.ext.config"
-DSas.app.launch.config="$SAS
 \SASITResourceManagementDataTier
 \3.8\plugins\itrmdatatier\picklist"
-DSas.app.repository.path="$SAS
```
Sample Batch Maintain Table Commands for Windows, UNIX, and z/OS Operating Environments

Batch Maintain Table Command for Windows Operating Environments

"$JAVA_HOME\bin\java.exe"
-Djava.system.class.loader=com.sas.app.AppClassLoader
-Dsas.ext.config="$SAS\sas.java.ext.config"
-Dsas.app.launch.config="$SAS\SASITResourceManagementDataTier\3.8\plugins\itrmdatatier\picklist"
-Dsas.app.repository.path="$SAS\SASVersionedJarRepository\eclipse"
-Dlog4j.configuration="file:///SASDataIntegrationStudioServerData\4.7\log4j.properties"
-Dsas.app.class.path=.;$SAS/SASITResourceManagementClient\3.8\build"
-Xmx1024m
-Xss1m
-classpath "$SAS\SASVersionedJarRepository\eclipse\plugins\sas.launcher.jar"
com.sas.solutions.itms.batch.maintaintable.BatchMaintainTable
-Commit Y
-Adapter "BMC Perf Mgr"
-TemplateTableName PTCACHE
-AddNewColumnsOnly Y
-UpdateRecommendedColumnsOnly Y
-profile MyMetadataServerProfile

Maintaining Template Tables and Staged Tables Based on Adapter Changes 95
Note: Double quotation marks are needed in this command line wherever a part of an address (for example, “Program Files”) contains a space.

**Batch Maintain Table Command for UNIX Operating Environments**

This example is enclosed in a shell script. It was run on the H64 UNIX operating environment.

```bash
#!/bin/sh

export SAS=<full-path-to-SAS directory>
export DISPLAY=<hostname:displaynumber.screennumber>

cd $SAS/SASITResourceManagementDataTier/3.8

$JAVA_HOME/bin/java \
-Djava.system.class.loader=com.sas.app.AppClassLoader \
-Dsas.ext.config=$SAS/sas.java.ext.config \
-Dsas.app.launch.config=$SAS/SASITResourceManagementDataTier \
3.8/plugins/itrmdatatier/picklist \
-Dsas.app.repository.path=$SAS/SASVersionedJarRepository/eclipse \
-Dlog4j.configuration=file://$SAS/SASITResourceManagementDataTier \
3.8/log4j.properties" \
-Dsas.app.class.path=.;$SAS/SASITResourceManagementClient \
3.8/build \ 
-Djava.awt.headless=false \ 
-Xmx1024m \ 
-Xss1m \ 
-classpath $SAS/SASVersionedJarRepository/eclipse/plugins/sas.launcher.jar \ 
com.sas.solutions.itms.batch.maintaintable.BatchMaintainTable \ 
-host <metadata-server-hostname> \ 
-port <metadata-server-port-number> \ 
-user <unrestricted-metadata-server-userID> \ 
-password <password-for-specified-user> \ 
-domain DefaultAuth \ 
-Commit N \ 
-AdapterName "BMC Perf Mgr" \ 
-ITDataMartName "IT Data Mart" \ 
-TemplateName PTCACHE \ 
-AddAndUpdateColumns Y \ 
-AddNewColumnsOnly N \ 
-UpdateRecommendedColumnsOnly N
```

**Batch Maintain Table Command for z/OS Operating Environments**

This example is enclosed in a shell script. It was run on the z/OS operating environment.

```bash
#!/bin/sh

echo JAVA_HOME is $JAVA_HOME
export SAS=<full-path-to-SASHOME-directory>

echo $SAS is $SAS
export DISPLAY=<hostname:displaynumber.screennumber>
```
echo DISPLAY is $DISPLAY

cd $SAS/SASITResourceManagementDataTier/3.8 \  
$JAVA_HOME/bin/java \  
-Djava.awt.headless=false \  
-Djava.system.class.loader=com.sas.app.AppClassLoader \  
-Dsas.ext.config=$SAS/sas.java.ext.config \  
-Dsas.app.launch.config=$SAS/SASITResourceManagementDataTier \  
/3.8/plugins/itrmdatatier/picklist \  
-Dsas.app.repository.path=$SAS/SASVersionedJarRepository/eclipse \  
-Dlog4j.configuration="file://$SAS/SASITResourceManagementDataTier \  
/3.8/log4j.properties" \  
-Dsas.app.class.path=.;$SAS/SASITResourceManagementClient \  
/3.8/build \  
-Xmx1024m \  
-Xss1m \  
-classpath $SAS/SASVersionedJarRepository/eclipse/plugins/sas.launcher.jar \  
com.sas.solutions.itms.batch.maintaintable.BatchMaintainTable \  
-host <metadata-server-hostname> \  
-port <metadata-server-port-number> \  
-user <unrestricted-metadata-server-userID> \  
-password <password-for-specified-user> \  
-domain DefaultAuth \  
-Commit N \  
-AdapterName "BMC Perf Mgr" \  
-ITDataMartName "IT Data Mart" \  
-TemplateTableName PTCACHE \  
-AddAndUpdateColumns Y \  
-AddNewColumnsOnly N \  
-UpdateRecommendedColumnsOnly N
Chapter 6
Formulas and Formats

About Formulas

What Is a Formula?
A formula is an expression that calculates the value for a computed column in a staged or aggregation table.

There are two types of formulas: supplied formulas and user-defined formulas.

- Supplied formulas are provided by SAS IT Resource Management and are created when the SAS IT Resource Management software is installed. Supplied formulas cannot be modified. However, you can copy a supplied formula and modify the copied version, thus creating a user-defined formula.

- User-defined formulas are created by using features of the IT Resource Management solution.

How Can a Formula Be Used?
Formulas can be used in all SAS IT Resource Management tables in order to calculate new computed columns.
Computed columns can be used for various purposes. Some examples are to standardize the measurement units or time zones of related data or to establish datetime-related constructs such as WEEKDATE and SHIFT.

- Computed columns are supplied with the template tables for supplied adapters.
- Computed columns can be generated and added to staged or aggregation tables.

For more information about computed columns, see “Specify Computed Columns” on page 178.

**How Are User-Defined Formulas Created?**

There are two ways to create a user-defined formula.

- A user-defined formula can be created by using the New Formula wizard, which is invoked by selecting Formula from the File Æ New Æ IT Resource Management menu of SAS IT Resource Management.

- A user-defined formula can be created by copying a supplied formula and pasting it into a folder to which you have Write privileges. The newly copied formula retains its name unless it is pasted into a folder that already contains a formula with the same name. In that situation, the formula is named “Copy of formula name.” After it is pasted into the target folder, the formula can be renamed and modified.

**How Can Formulas Be Accessed?**

Formulas can be accessed from several folders in the Folders tree of the SAS IT Resource Management client and can be used when specifying the expression that defines a computed column.

- **Products** is a folder that contains formulas that are supplied with SAS IT Resource Management software.

  Note: Formulas in the Products folder can be used to restore the formulas in the Shared Data folder (or another folder) to those formulas that are supplied by SAS IT Resource Management. These supplied formulas cannot be changed in the Products folder. However, they can be copied to another folder where they can be modified.

  To access these supplied formulas from the Folders tree, expand Products Æ SAS IT Resource Management Æ IT Formulas.

- **Shared Data** is a folder that contains formulas that are supplied with SAS IT Resource Management software, as well as those user-defined formulas that are shared by users at your site. Formulas that are in this folder can be modified.

  To access these formulas from the Folders tree, expand Shared Data Æ SAS IT Resource Management Æ IT Formulas.

- **My Folder** is a folder that contains user-defined formulas that you have saved in that location. My Folder is the private folder of the person, or owner, who is currently logged on to SAS IT Resource Management. The contents, including formulas, are not accessible to anyone other than the owner.

- The **Users** folder contains the private folders of all the users who are registered users of the metadata repository to which you are connected. The only folder that you can access in the Users folder is your own, private folder. It is the folder that belongs to the person who is logged in to SAS IT Resource Management.
The following display shows the **IT Formulas** tab of the Expression Builder window. You can expand **My Folder, Shared Data**, or your private folder within the **Users** folder and use any of those formulas in your expression. Alternatively, you can select the **Inventory** tab and from the list that is displayed, use any of those formulas in your expression.

![IT Formulas Tab of Expression Builder](image)

**Figure 6.1**  *IT Formulas Tab of Expression Builder*

*Note:* The **IT Formulas** tab of the Expression Builder window is available only when you are editing columns of a staged or aggregation table from the Properties dialog box in the process flow diagram.

**How to Access the Expression Builder Window**

You can use the Expression Builder window to add a new computed column to a table or to modify an existing computed column in a table.

To access the Expression Builder in order to add a new computed column to a table, perform the following steps:

1. From the IT data mart that contains the table, double-click the job that uses the table. The job opens on the **Diagram** tab of the Job Editor window.
2. Select the table to which you want to add a column. Right-click the table to display the Properties dialog box of that table and click **Properties**.
3. Click the **Columns** tab to display the columns that make up the table.
4. Click **New** to add a new column to the table. From the drop-down menu, click **Computed column**.
5. Double-click the enabled **Expression** field for the new field to display an ellipsis (…).
6. Click the ellipsis (...). The Expression Builder window appears.
To access the Expression Builder in order to modify a computed column in a table, perform the following steps:

1. From the IT data mart where the table is stored, double-click the job that uses the table. The job opens on the Diagram tab of the Job Editor window.
2. Select the table whose column you want to modify. Right-click the table to display the Properties dialog box of that table and click Properties.
3. Select the Columns tab to display the columns that make up the table.
4. Select the Expression field of the column that you want to change.
5. Double-click the enabled Expression field for the field to display an ellipsis (...).
6. Click the ellipsis. The Expression Builder window appears.

For more information about the Expression Builder window, press the F1 key or select Help from within that window.

---

**Working with Formulas**

You can create, rename, delete a formula. You can also modify a formula and change its expression.

**Creating a Formula**

**How to Create a Formula**

You can create a formula in two ways:
- by invoking the New Formula wizard
- by copying an existing formula to a folder, renaming it, and modifying it

You can create a formula and save it in any of the Formulas folders to which you have Write privileges. For example, you can create a formula in the Formulas folder of Shared Data or in your private folder within My Folder.

If you want to use a formula in a wizard, you can specify the location of that formula. If the formula is not found in your specified location, then the wizard searches for the formula in this location: Shared Data/SAS IT Resource Management/IT Formulas. If the formula is still not found, the wizard searches for it in this location: Products/SAS IT Resource Management/IT Formula.

**Create a Formula By Using the New Formula Wizard**

To create a formula using the New Formula wizard, perform the following steps:

1. From the menu bar of the SAS IT Resource Management client, select File → New → IT Resource Management → Formula to open the New Formula wizard.
2. On the General Information page of the New Formula wizard, specify the name, description, and location of the new formula.
   - The Name field can contain a maximum of 60 characters. A value is required in this field and it must be unique within its folder.

   **Note:** The wizard automatically generates a name for this new formula. You can either delete the system-generated name and enter a more meaningful name for this formula or you can retain the system-generated name.
• The **Description** text box can contain no more than 200 character. A value is optional in this field.

• The **Location** field is automatically generated and, by default, specifies `/Shared Data/SAS IT Resource Management/IT Formulas`. Click **Browse** to navigate to another folder to use as the location for your new formula.

**TIP** User-defined formulas are more easily accessed if they are all stored in a location that is identified as a “Formulas” folder.

3. **On the Expression** page of the New Formula wizard, enter the expression that specifies the combination of functions and mathematical operations that are used to derive a value. A value is required in this field.

   You can enter the expression for a formula in any one of these three ways:

   • Enter the expression in the text area of the **Expression** field.
   • Copy and paste the expression text from the **Expression** tab of an existing formula to the **Expression** text area of the new formula.
   • Copy and paste the computation from the **Expression** tab of the computed column into the **Expression** text area of the new formula.

   SAS IT Resource Management supports conventional rValue expressions. (An rValue expression is an expression that consists of code that is appropriate only for the right-hand side of an assignment statement.) However, it also supports more complex expressions. For example, your expression can use SAS code that might include loops, IF statements, and so on. As shown in the following display, this code must be written in valid SAS DATA step syntax.

   **Note:** You can use a SAS macro in a formula expression or in the expression for a computed column. The SAS macro definition needs to be available to the SAS session that executes the staging or aggregation job that populates the computed column. For example, you might need to add a new autocall library using the SASAUTOS SAS option in the SAS configuration.

   ![Figure 6.2 Expression Page of the New Formula Wizard](image)

4. The final page of the New Formula wizard is a summary page that displays the following information about the formula that you specified. Click **Finish** to store the formula that you created in the folder that you specified in the **Location** field.

---

**Create a Formula By Copying an Existing Formula**

To create a formula by copying an existing formula, perform the following steps.
1. In the **Folders** tree of the SAS IT Resource Management client, navigate to an **IT Formulas** folder (or to a folder that contains formulas). You can then locate the formula that you want to use as a template for the new formula.

   **TIP** User-defined formulas are more easily accessed if they are all stored in a location that is identified as a “Formulas” folder.

2. Right-click the formula that you want to copy. From the list that is displayed, select **Copy**. Then navigate to the folder where you want to store your new formula and click **Paste**.

   If you are copying and pasting the formula to the same folder, then the name of the new formula is retained unless a formula of the same name already exists at this location. In that situation, **Copy of** is appended to the original name of the formula. This ensures that the formula name is unique within its folder.

   **Note:** You can select the **Copy to Folder** option, which opens the Select a Location dialog box. In this dialog box, you can navigate to the folder where you want to store the copied formula. You can also select the **Move to Folder** option, which opens the Select a Location dialog box. In this dialog box, you can navigate to the folder where you want to store the formula.

3. On the new copy of the formula, modify the fields as required. For information about changing the fields of a formula, see “Modifying a Formula” on page 104.

---

**Deleting a Formula**

You can delete formulas only from the folders for which you have Write privileges.

To delete a user-defined formula, perform the following steps:

1. In the **Folders** tree of the SAS IT Resource Management client, navigate to an **IT Formulas** folder or a folder where the formula that you want to delete is located.

2. Right-click the formula. From the list that is displayed, select **Delete**.

3. In the confirmation dialog box, click **Yes** to delete the formula. Otherwise, click **No**.

   Deleting a formula does not change the expression that used the formula. In addition, the columns that are computed by using that expression are not affected. The columns continue to be created according to the specified expression. However, when a formula that is used in an expression no longer exists, then modifications to that expression can no longer be performed simply by changing the formula. The modifications must be changed in every column where the expression is used.

---

**Modifying a Formula**

You can change any formula to which you have Write privileges. To do so, perform the following steps:

1. Double-click the formula to open the Properties dialog box, where you can change the name, description, location, and expression of the formula.

   • Select the **General** tab to change the name, description, or location of the formula.

   • To change the name or description of the formula, enter your modifications in the corresponding fields.
• To change the location of the formula, click **Browse** to open the Select a Location dialog box where you can navigate to another folder.

2. Select the **Expression** tab to change the combination of functions and mathematical operations that are used to derive a value.

If you modify the expression text for a formula, then the system checks to see whether the original formula is used by any computed column of any table. If the formula is being used, an Update Formula dialog box opens that lists the computed columns that would be affected by the change. You can select **Yes** to change the formula in the computed columns that use it or **No**. If you click **Yes**, then the modified expression for the formula is saved and applied in all instances where it is used.

*Note:* Computed columns in staged tables or aggregation tables are calculated using the latest version of the formula.

3. Select the **Notes** tab to enter additional information about the formula.

**CAUTION:**

Do not change the information that is displayed on the Advanced or Authorization tabs. The **Advanced** tab contains information about the metadata for this formula. The **Authorization** tab contains information about the groups, users, and permissions that are in effect for this formula. This information should not be changed.

4. Click **OK** to make your changes take effect.

---

**Consequences of Changing a Formula**

Formulas can be shared across multiple computed columns and across multiple IT data marts. For example, the SHIFT computed columns for a particular IT data mart can all be based on the same SHIFT formula. If you want to change the site-specific definition of SHIFT, you can make a change to the SHIFT formula and click **OK**. If this expression is used in any other formula, the Update Formula dialog box appears and displays the computed columns where this formula is used. Click **Yes** to cause all computed columns that use the formula to inherit the change. Otherwise, click **No**.

Computed columns in staged or aggregation tables are calculated using the latest version of the formula. For example, you might change the expression for a computed column in a staged table or an aggregation table and redeploy the job. Then, the next time the job is run, the values for that column in that staged table or aggregation table are computed according to the new expression. This computation occurs whether the expression is from a formula or only for that computed column.

**CAUTION:**

If the expression of a computed column is changed and if that column was already used as input to a subsequent transformation that in turn created a target table, then the values in that table are not automatically re-created.

To make the old and new values of the computed columns consistent with each other, redeploy and rerun all the previous ETL jobs that contain the new formula. Do so according to the following guidelines.

• Case 1: The change to the expression of a formula needs to be reflected in all the tables, including the aggregation tables. This situation might occur if an erroneous expression was entered and needs to be corrected. Previously aggregated data is affected and must be changed.
Solution: Purge the aggregation tables. Then redeploy and rerun all the staging jobs and all the aggregation jobs that contain the data that uses the altered expression to create a new column. Thus, you re-create the aggregation tables.

- Case 2: The change to the expression of a formula should be reflected only from this time forward. This situation might occur if there has been a change to the billing rate. Previous aggregated data is not affected.

  Solution: Redeploy the staging job that uses the altered expression. You do not have to redeploy and rerun the aggregation jobs whose source tables use the altered expression to create a new column.

For example, consider the following situation:

- There is a computed column RATE in a staged table, where RATE=BYTES/SECOND (that is, RATE equals BYTES divided by SECOND).
- There is an aggregation with statistics based on that RATE column (for example, the mean RATE).
- Data for the RATE column and the mean RATE column has already been aggregated.

If you subsequently change the expression for RATE to RATE=BYTES/MINUTE, and redeploy the job, in the next ETL, the values of the staged table's RATE column are computed according to BYTES/MINUTE. However, the values in the aggregation table that already exist (that is, they were already aggregated) still reflect the previous BYTES/SECOND calculation. Therefore, if you want the generated statistics to reflect the rate change in the aggregated data, rerun all the associated staging and the aggregation jobs.

### Renaming a Formula

Renaming a formula does not affect the tables that use it. To rename a formula, perform the following steps:

1. In the Folders tree of the SAS IT Resource Management client, navigate to the IT Formulas folder where the formula that you want to rename is located.
2. Right-click the formula. From the list that is displayed, select Rename. The name of the formula is highlighted.
3. Enter the new name of the formula. The name can contain no more than 60 characters. The name must be unique within its folder.
4. Click Enter.

### Formats

#### What Is a Format?

A format is a pattern or set of instructions that SAS uses to determine how the values of a variable (or column) should be written or displayed. SAS provides a set of standard formats. For example, the DATE7. format, formats date values so that they follow the pattern DDMMMYY and look like 21SEP95. SAS also gives customers the ability to define their own formats. These are referred to as user-defined formats.
SAS formats can be stored in the Admin library within the Administrative folder of the IT data mart.

Where Are User-Defined Formats Stored?

• For supplied adapters

Your user-defined formats can be stored in the FORMATS catalog in the Admin library of your IT data mart. You can also store your formats in your own catalog. In that case, you need a LIBNAME statement for that library. You then need to add that information to the FMTSEARCH option to point to your formats. To do so, use the INSERT option.

For example: `options insert=(fmtsearch=(mylib.formats));`

The FORMAT catalog can be specified using a SAS configuration file. For information about configuration files, see the Operating Environment Specific Information (that is, the Companion) for your SAS installation at http://support.sas.com/documentation/onlinedoc/base/index.html.

Note: The NOFMTERR option is set for you so that processing does not fail if there is a missing format. For information about the INSERT or NOFMTERR options, see SAS 9.4 System Options: Reference.

• For user-defined adapters

Starting in SAS IT Resource Management 3.5, the SAS FMTSEARCH option is automatically set in the User-Written Staging transformation. It is set to include the FORMATS catalog from the current Admin library for this IT data mart and the ITMS_FORMATS catalog from SASHELP. You can also include your own FORMATS catalog.

The following code is an example of how to search in your own catalog: `options fmtsearch=(&admin.formats mylib.formats sashelp.itms_formats);`

Note: Use the INSERT SAS System option to insert this code into the User-Written Staging transformation using the INSERT SAS System option. For more information, see “Guidelines for Processing Data with User-Written Staging Transformations” on page 334.
# Chapter 7

## Staging the Data

---

**About Staging the Data**
- Why Stage the Data? .................................................. 110
- Methods for Staging the Data ................................... 110

**Working with Staging Transformations**
- What is a Staging Transformation? .................................. 111
- Properties of Staging Transformations ............................. 114
- Add a Staging Transformation to a Staging Job ................. 115
- Edit a Staging Transformation ..................................... 119
- Delete a Staging Transformation .................................. 119

**Working with Staged Tables**
- What Is a Staged Table? ............................................. 119
- Properties of a Staged Table ....................................... 120
- Task List for Staged Tables ........................................ 121
- Create Staged Tables ............................................... 121
- Add an Existing Staged Table to a Job ............................ 128
- Erase a Staged Table ............................................... 128
- Delete a Staged Table from a Tree View .......................... 129
- Delete a Staged Table from a Job ................................ 129
- Purge the Content of a Staged Table .............................. 130
- Modify a Staged Table .............................................. 130
- Publish a Staged Table as Template _________________________ 132

**Columns in Staged Tables** ........................................ 133

**Computed Columns in Staged Tables** .................................. 134

**Staging VMware Data Using Local Time**
- About Staging VMware Data Using Local Time .................... 135
- Change the Formula Expression for the IT Formula VMwareDatetime ................................................. 135
- Change the Expressions for Other Datetime-related Computed Columns in Your Staged Tables ................................. 136

**Understanding External Names of Staged Tables and Columns**
- About External Names of Staged Tables and Columns ............ 136
- Change the External Name of a Table or a Variable ............. 136
- View the External Names of Tables ................................ 137
- View the External Names of Columns .............................. 137
- External Names for MXG Adapters ................................ 138

**How to Add Columns to Existing MXG Staged Tables** ............... 138
- About Adding Columns to Existing MXG Adapter Staged Tables ...................................................... 138
- How to Capture the MXG Tables ................................. 139
About Staging the Data

Why Stage the Data?

IT performance data is created and processed by unique IT systems, methods, management utilities, and code. Therefore, SAS IT Resource Management must stage the raw data that is created by these various utilities so that the IT performance data is standardized and comparable. For example, the formats for timestamps and units of measurement must be standardized, duplicate data must be processed based on business needs, and so on.

SAS IT Resource Management uses the following two components of a job to prepare and stage raw data:

• staging transformations (including user-written staging transformations)
• staged tables

Note: The VMware vCenter adapter uses two staging transformations (VMware Data Acquisition and VMware vCenter) to prepare and stage raw data. For information about the VMware Data Acquisition staging transformation, see “VMware Data Acquisition Jobs” on page 737.

Staging transformations generate the code that extracts raw data, transforms it to a standardized format, and loads it into staged tables. These staged tables are based on template tables that are supplied for supported adapters. For more information about template tables, see “Working with Template Tables” on page 75.

You can review the specifications of staging transformations and staged tables. You can also configure elements of the extraction and staging process to accommodate the requirements of your raw data and business environment. For more information about staging transformations, see “What is a Staging Transformation?” on page 111. For more information about staged tables, see “What Is a Staged Table?” on page 119.

Methods for Staging the Data

To administer the staging process and specify parameters for your environment, create and deploy one or more jobs that include an associated staging transformation for the adapter that you use. Staging transformations are included in staging jobs in order to create the SAS programs that stage the data and populate the staged tables. These staging jobs create SAS staged tables in the IT data mart. The SAS staged tables serve as the basis for all performance management, capacity planning data management, analysis, and reporting that you perform when using SAS IT Resource Management.

SAS IT Resource Management provides the following methods for staging IT performance data to create and populate staged tables:

• using the Adapter Setup wizard to create staging transformations and staging jobs automatically for a given adapter. When these staging transformations are executed within a job, a set of staged tables is created based on the parameters set in the
Adapter Setup wizard. For more information about using the Adapter Setup wizard to stage data, see “Using the Adapter Setup Wizard” on page 259.

- creating and modifying jobs with staging transformations manually and using the Staged Table wizard to create customized staged tables. For more information about performing these tasks, see the following topics:
  - “Add a Staging Transformation to a Staging Job” on page 115
  - “Create Staged Tables” on page 121

You can also create staging transformations and staged tables to stage data from any input source based on the unique specifications of any business environment. SAS IT Resource Management provides a user-written staging transformation for user-written code. For more information about the user-written staging transformation, see “User-Written Staging Transformations” on page 333.

SAS Data Integration Studio tools such as the Process Designer can also help create the staging code and the staging job that is necessary to support any input source. For more information about using these tools to create user-written staging code, see “User-Written Staging Transformations” on page 333.

---

**Working with Staging Transformations**

**What is a Staging Transformation?**

A staging transformation generates a SAS program that loads raw data into staged tables. Before loading raw performance data into staged tables, the staging transformation performs the processing that creates a SAS program that converts the raw data into standardized, normalized values. For example, the staging transformation might perform the following functions:

- provide code that supports the input of single files, directories, or databases
- detect and handle duplicate data
- normalize measurement units
- standardize timestamps
- generate computed columns from the input data

When a staging transformation is executed by a job in SAS IT Resource Management, the SAS program accesses the parameters that are specified in the staging transformation and the metadata for the staged table that it is to populate. The SAS program uses this information to populate the staged table that can be used as input to an Aggregation transformation or other transformations. Every time a staging transformation is executed, any existing data in the staged table is removed, and the new data is loaded.

You can also modify a staging transformation to include additional staged tables that are supported by a given adapter. This feature is accessed from the Properties dialog box of the staging transformation. The feature enables the system to process data from various staged tables for a given data source via the same staging transformations and aggregations. For more information about aggregations, see “Working with Aggregation Transformations” on page 198.

SAS IT Resource Management provides a unique staging transformation for each adapter that it supports. The staging transformations that are supplied for each adapter are available in the **SAS IT Resource Management** folder of the Transformations.
tree view of SAS IT Resource Management, as shown in the following display. (Other SAS IT Resource Management transformations are also in this list, such as Aggregation, Exception, Information Map, and Performance Report.)
Figure 7.1  Supplied Transformations in SAS IT Resource Management Folder
Properties of Staging Transformations

Staging transformations specify the staging parameters that are pertinent for the adapter on which they are based. Because raw data sources differ in format, file structure, and type of data collected, the staging parameters that are necessary for each adapter vary as well. Staging parameters enable you to indicate how you want to handle certain types of data based on your needs. For example, you can specify how to handle duplicate or future data in a raw data source. Staging parameters can also have different default values that are based on the adapter.

To access the staging transformation properties, right-click a staging transformation in the process flow diagram and select Properties. A Properties dialog box appears and enables you to view the staging transformation properties and specifications for the staging code that the transformation generates.

Figure 7.2  Sample Properties Dialog Box for a DT Perf Sentry Staging Transformation

The Properties dialog box contains the following tabs:

- The General tab displays information that identifies the staging transformation such as name and description.
- The Staging Parameters tab displays the staging and duplicate-data checking parameters that are pertinent for the adapter on which the staging transformation is based. (If you specify the User-Written Staging transformation, user-written parameters are also available on the Staging Parameters tab.) The parameters that are available on this tab vary based on the requirements of each adapter. You can click the value field of a parameter to modify the value. If there is a defined set of values available for this parameter, a drop-down list appears and enables you to select a value. For more information about staging parameters, see “Staging Parameters” on page 478.

Note: If you modify the value of any parameter in the source code of a job, that modification is not updated in the SAS Metadata Repository. In addition, the new value is not reflected on the Staging Parameters tab. However, you can save the modified version of the source code to the local file system.

- The Options tab displays information about how to further customize and generate the code.
• The **Code** tab enables you to manage the code that is generated for the transformation.

• The **Precode and Postcode** tab enables you to specify that user-written code should be inserted at the beginning or end of the current job or transformation.

• The **Parameters** tab enables you to manage prompts or prompt groups.

• The **Notes** tab displays any notes or documents that are associated with the transformation.

• The **Extended Attributes** tab displays the custom properties that are available for the transformation.

For more information about the tabs that are available from the Properties dialog box, see the Help for SAS IT Resource Management.

**Add a Staging Transformation to a Staging Job**

You can use the Adapter Setup wizard to create staging jobs automatically for a supplied adapter. The Adapter Setup wizard provides a convenient way to create staging jobs. It also creates the other jobs and the components that are necessary to stage and summarize the IT resource data that an adapter loads. The wizard guides you through the process of specifying the staging parameters. It also creates the necessary staging transformation, staging job, and other jobs that are required for the adapter that you select. For more information about using the Adapter Setup wizard, see “About the Adapter Setup Wizard” on page 257.

You can also create a staging job manually by adding a staging transformation to a job. To do so, perform the following steps:

1. Open the job that is to contain the new staging transformation. The job shows on the **Diagram** tab of the Job Editor window.

   *Note:* If you want to add a staging transformation to a new job, you must first create the job. For more information about how to create a job, see “Create a Job” on page 370.

2. In the Transformations tree of SAS IT Resource Management, expand the **SAS IT Resource Management** folder and locate the staging transformation for the adapter that you want to work with.

3. Drag and drop the staging transformation onto the Job Editor window. The staging transformation appears in the process flow diagram for the job.
4. Right-click the staging transformation and select **Add New Staged Table** from the Properties dialog box. You can choose to create the new staged table from one of the supplied templates or from a user-defined template.
Figure 7.4  Templates for the New Staged Table

The Staged Table wizard opens. This wizard enables you to specify the parameters for the staged tables that the staging transformation code populates. For more information about using the Staged Table wizard, see “Create Staged Tables” on page 121.

Note: A staging transformation can process output for multiple staged tables. To add more staged tables, repeat this step as needed.

5. Right-click the staging transformation and select Properties.

6. Use the Staging page of the Staging Parameters tab to specify the staging parameters such as the location of the raw data, how to handle future data, and so on. You must specify all parameters that are marked with an asterisk (*) before the staging transformation is complete.

On the Duplicate Checking page of the Staging Parameters tab, you can specify how you want duplicate data to be handled.

Note: Select Enable duplicate checking to access the duplicate checking parameters associated with the adapter that you are specifying.

When the transformation is complete and ready to run in a staging job, the staging transformation object is marked with a green check in the process flow diagram.
If you are working with a user-defined adapter, use the User-Written page of the Staging Parameters tab to access the user-written parameters associated with that adapter.

For more information about the staging parameters for each adapter, see “Staging Parameters” on page 478.

Figure 7.5 Sample Job with a Complete Staging Transformation and Staged Tables

Note: The location of the raw data input for the staging transformation is specified in the staging transformation properties. Thus, a staging transformation object does not have an input object in the process flow diagram. (The only exception to this rule is the VMware vCenter staging transformation that has the data acquisition table as input).

7. If you are adding an ASG TMON2CIC or IBM SMF staging transformation, you must specify the associated spin library. Use the Spin Library tab (available only for these two staging transformations) to view and modify the parameters for the corresponding spin library. For more information about setting the spin library parameters, see “Data Sources Supported by SAS IT Resource Management Adapters” on page 397.

8. Run the staging job to generate the staging code, execute the code, and load the staged tables.

Note: You can also generate the staging code without executing it. To do so, click the Code tab of the Job Editor window. You can then select from the Code generation mode options on this tab to edit the code manually before executing it.

9. Click the Log tab of the Process Designer window to check the SAS log and confirm that there were no errors or warnings during processing.

After the staging job executes successfully, you can view the staged data in the staged tables. To do so, right-click a staged table in the process flow diagram and select Open.
Edit a Staging Transformation

To edit the parameters that a staging transformation uses to locate and stage raw data, perform the following steps:

1. In the IT Data Marts tree, double-click the job that contains the staging transformation that you want to edit.
2. Right-click the staging transformation in the process flow diagram and select Properties. A Properties dialog box appears and enables you to modify the various parameters that are specified for the staging transformation and the staging code that it generates.

   Note: The name of a staging transformation should not contain double quotation marks.

   For more information about staging transformation properties, see “Properties of Staging Transformations” on page 114.
3. Click OK to save your changes.

Delete a Staging Transformation

Deleting a staging transformation disassociates it permanently from the staged tables in the job.

CAUTION:
If you delete a staging transformation and then try to re-create or reconnect it to the staged tables, the staged tables might lose computed columns or experience other errors. For best results, make a copy of the staging job before deleting or modifying the staging transformation or any other components that you do not want to lose.

To delete a staging transformation from a job, perform the following steps:

1. In the IT Data Marts tree, double-click the job that contains the staging transformation that you want to delete.
2. Right-click the staging transformation in the process flow diagram and select Delete. The staging transformation object is deleted from the job. However, the staged tables that were associated with the staging transformation remain in the job.
3. Select File \ Save to save your changes, or close the job and select Yes when prompted to save your changes.
adapters and domain categories. For more information about template tables, see “Working with Template Tables” on page 75.

The data in a staged table is accumulated according to rules that are specified by a staging transformation. The IT performance data resides in the staged table after the data is refined and loaded into a SAS data set that is ready for aggregation and reporting. Likewise, the staged table determines how the data appears after it has completed the staging process.

You can create a staged table by using the Adapter Setup wizard, the Staged Table wizard, or a user-written staging transformation. When a staged table is created, it is associated with a staging transformation in a staging job. By default, it is stored in the same subfolder of the IT Data Marts tree as the staging job. This practice enables you to keep track of the staged tables and their corresponding jobs as they are stored together.

*Note:* If you manually create your own user-defined tables using one of the Designer tools of SAS Data Integration Studio, then consider saving these tables in a similar manner to maintain consistency.

When a staging job executes, the staging transformation reads the raw IT performance data from an input data source, processes it, and loads it into the corresponding staged tables. These tables can then be read into Aggregation transformations.

The staged table is generally used as input to an Aggregation transformation. However, a user can change this process flow by using the manual methods that are available in SAS IT Resource Management.

SAS IT Resource Management supplies adapters that provide staging transformations, template tables, and staged tables for many diverse data sources.

*Note:* The New Table wizard of SAS Data Integration Studio can create other tables that stage raw data from any other input data sources.

For information about the adapters that SAS IT Resource Management supports, see “Supported Adapters” on page 66.

**Properties of a Staged Table**

The metadata about a staged table, such as how raw data is computed and formed into a SAS data set structure, is available from the Properties dialog box of a staged table.

To view the properties of a staged table, complete the following steps:

1. Navigate to the folder in the IT Data Marts tree that contains the staging job and staged table.
2. Open the staging job that includes the staged table.
3. Right-click the staged table in the process flow diagram and select **Properties**.

*Note:* You can also right-click a staged table in the tree view of SAS IT Resource Management to access the staged table properties. However, the set of properties that are available when using this method differs slightly from the properties that are available from the process flow diagram. For best results when viewing and modifying relevant properties, access the properties from the staged table object in the process flow diagram as explained in the preceding steps.
The following list includes all of the staged table properties. It also indicates whether a property is available only from the staged table in the tree view or the staged table in the process flow diagram:

- The **General** tab displays information that identifies the staged table name, description, location, and associated responsibilities.
- The **Columns** tab displays the metadata for each column in the staged table. For more information about the properties that are available from the **Columns** tab of a staged table, see “Columns in Staged Tables” on page 133.
- The **Indexes** tab displays any indexes that have been created for this staged table. For each column, the name, description, length, and type are stored.
- The **Keys** tab displays any keys that have been created for this staged table. However, the values displayed on this tab are ignored by SAS IT Resource Management.
- The **Parameters** tab displays any prompts or groups that have been created for this staged table. This tab is available from the tree view only.
- The **Physical Storage** tab displays information about the physical name of the table and the library and DBMS where it is located.
- The **Options** tab displays table options such as compressing observations in a SAS data set, additional security options, and rules for overwriting data sets.
- The **Notes** tab displays any notes or documents that are associated with this staged table.
- The **Extended Attributes** tab displays information about any custom property that is not part of the standard metadata for this staged table. This tab includes any external names for a table, if available.
- The **Authorization** tab, available only from the tree view, displays the settings that define access to the staged table. This tab is available from the tree view only.
- The **ITRM Options** tab displays the adapter, template table, data model version, and predecessor tables that are associated with the staged table. This tab is available from the process flow diagram only.

For information about the contents of these tabs, click **Help** in the dialog box.

**Task List for Staged Tables**

When you right-click a staged table, you gain access to several actions that you can perform for that table. For example, you can analyze data, update metadata, or perform delete, copy, move, or export tasks. The tasks that are available differ depending on whether you right-click the staged table in the tree view or the process flow diagram. For information about these tasks, see the Help that is available for these topics in SAS IT Resource Management.

**Create Staged Tables**

SAS IT Resource Management does not enable you to create a staged table without associating it with a staging transformation. Thus, you must have a staging job that includes a staging transformation before creating a staged table.

You might want to create additional staged tables for the BMC Perf Mgr, DT Perf Sentry, MS SCOM, or SNMP adapters, other than the tables that are included in the staged table templates for those adapters. You can specify and then run macros to do so.
These macros create the metadata for the staged table and attach that metadata to the staging transformation in your job.

- To create staged tables for BMC Perf Mgr, see “%RMMSBMCP” on page 596.
- To create staged tables for DT Perf Sentry, see “%RMMSDTPS” on page 598.
- To create staged tables for MS SCOM, see “%RMMSSCOM” on page 604.
- To create staged tables for SNMP, see “%RMMSSNMP” on page 608.

**Note:** For best results, always create or add staged tables to a job from the New Staged Table wizard as described in this topic. You might lose valuable components of the table (such as computed columns) under these conditions:

- by copying an existing table from another IT data mart or job and moving it into a different job
- by attempting to reattach a staged table to its original staging transformation after it was removed

To create the metadata for a staged table, perform the following steps:

1. Open a staging job that includes a staging transformation. For more information about creating a staging transformation, see “Add a Staging Transformation to a Staging Job” on page 115.

2. Right-click the staging transformation in the process flow diagram and select **Add New Staged Table**. Then select the type of template that you want to work with:
   - From Supplied Template
   - From User-Written Template

   The type of template that you select governs the templates that are available to you on the second page of the wizard. (A message is displayed if no user-written templates have been created.)

   The Staged Table wizard opens and prompts you to enter the information that is required to create a staged table.

3. On the first page of the wizard, you can specify an IT data mart, storage location, and formulas.
a. Confirm and specify the IT data mart and the location where the staged tables are to be stored. The **IT Data Mart** and **Location** fields default to the IT data mart name and location of the current staging job. You must specify a location for the staged table that is within the IT data mart that is specified in the **IT Data Mart** field.

You can use the **Browse** option to select a different location for the staged table or to create subfolders inside the IT data mart for storing the staged tables. However, the Adapter Setup wizard creates and stores staged tables in the same folder as the staging job, so you might choose to accept the default values for consistency.

b. Specify the location for any user-written formulas that you want the Staged Table wizard to use in addition to those supplied by SAS IT Resource Management. The default location directs the Staged Table wizard to the supplied formulas. This field does not allow manual entries. Use **Browse** to navigate to the appropriate folder as needed.

The default location for the formulas folder is the **IT Formulas** folder, which is located here: *Shared Data/SAS IT Resource Management/IT Formulas*.

*Note:* If you select or create a folder location where the formulas that are required for the staged table are not found in the folder location or its subfolders, the column is not created. The failure to create the column is noted in the SAS log file.

4. On the second page of the wizard, you can select template tables. Based on the adapter for the staging transformation, a list of available template tables and their descriptions are displayed within domain categories of table types.
a. Use the check boxes to select the template tables that you want to use to generate staged tables. (You can click + to expand a folder or click – to collapse a folder.) If you select a folder, all of the subfolders and template tables within that folder are automatically selected. The check box then displays a check (√) next to the folder and its template tables. If you select an individual template table within a folder, but not all template tables within the given folder, then the check box for the parent folder shows a darkened box with a check ( ). This indicates that some, but not all, template tables within the folder are selected.

The **Number of selected template tables** maintains a real-time count of the template tables that you select.

**CAUTION:**

The more template tables that you select and staged tables that you add to a job, the longer it takes to create the staged tables and later run the job. If you select more than 100 template tables, then a warning message is displayed. The message explains that creating a large number of staged tables at once can result in long processing times or processing errors.

b. Select **Include only recommended columns in the new staged tables** if you want only the recommended columns to be included in the staged tables that you are creating. Recommended columns are those that SAS IT Resource Management has predefined as critical or relevant for reporting and analysis in the performance area of the staged table. If this option is not checked, the staged tables include all available columns.

**Note:** You can view the recommended columns in a template table from the **Columns** tab of the Properties dialog box for a given template table. For more information about how to access and view the recommended columns of a template table, see “**Columns in Template Tables**” on page 79.

c. Click **Next** to continue.
5. Specify the SAS library parameters for the staged tables and their staging transformation.

*Note:* This page appears only if you are creating the first staged tables for a staging transformation. If you have already created staged tables for the staging transformation, then the wizard skips this page. Library parameters are set once for a staging transformation and all staged tables for that transformation use the same library parameters. However, if all staged tables are later removed from the staging transformation and new staged tables are subsequently added, then the **Specify SAS Library** page is displayed again in the wizard. In this case, the staged tables in the subsequent iteration are placed in a different library from the first set of tables.

**Figure 7.8 Specify SAS Library Page of the Staged Table Wizard**

a. Specify the **Name** and **Description** for the SAS library. The SAS library name must be unique within its folder in the application server. The Staged Table wizard uses the naming convention `<adapter name> + Staging <unique number>` to name SAS libraries. You can accept the default name or enter a new name for the library. However, library names must be unique within the application server.

b. Confirm that the **Server** field shows the server that is associated with the selected IT data mart where this library is to be stored. This field does not enable modifications.

c. Specify the **Libref** that is associated with the staged table library. The Staged Table wizard uses the naming convention `STG + <the same number generated for the library>` to name the libref. You can accept the default name or enter a new libref name.

*Note:* The following naming rules apply to the libref:

- The libref can consist of no more than eight characters.
- The libref must begin with a letter (A through Z) or an underscore (_).
• The remaining characters of the libref must be letters (A through Z), numerals (0 through 9), or an underscore (_). The libref cannot contain spaces.

d. Specify the Path Specification for the location of the library and thus where the tables for this library are stored. The default value is based on the combination of the default path that is specified for the IT data mart, and the operating system of the server. The characters stg<unique number> are also appended to the path, where the unique number is the same as that generated for the preceding library.

For example, if the default path for an IT data mart on Windows is C:\SAPJob1, then the default value for a new staging library might be C:\SAPJob1\stg27416, as shown. If the default path for an IT data mart on UNIX is /u/<user ID>/Sample52, then the default value for a new staging library might be /u/<user ID>/Sample52/stg27416.

You can accept the default path, enter a new path, or click Browse to select a path.

Note: Browse is disabled when the selected application server is running on a machine using the z/OS operating system. When entering a z/OS path manually, you can use either a prefix for a traditional z/OS file system path (MY.DATAMART) or a root directory in the zFS hierarchical file system (/u/mynname/datamart).

e. Click Next to continue. The completed Staged Table wizard creates one SAS library that stores all of the tables and catalogs from the staging transformation. This includes staged tables, control tables for data duplication, and the compiled macro code for the transformation.

6. Specify the z/OS attributes that allocate file space in the operating environment if the application server is running on z/OS. The Staged Table wizard skips this page for operating environments that are not z/OS. For more information about these parameters, see the Help for SAS IT Resource Management.

7. Review the details of the staged tables and storage parameters that you entered.
If you want to change anything that you entered, click Back to return to the parameter that you want to change.

Note: You cannot change the name of a staged table because it is automatically assigned the same name as the template table on which it is modeled.

8. Click Finish to create the metadata for the new staged table and SAS library (if applicable). The staged tables appear in the process flow diagram for the staging job.
The staged tables in the process flow diagram show the name and the description of the staged table.

9. Select **File ⇒ Save** to save the changes to the job.

*Note:* The metadata for the staged tables is saved in the staging job. However, the physical staged tables are created only after the staging job is run.

**Add an Existing Staged Table to a Job**

SAS IT Resource Management does not enable you to create a staged table without associating it with a staging transformation. For best results, always create or add staged tables to a job from the New Staged Table wizard. If you copy an existing table from another IT data mart or job, copy or move it into a different job, or attempt to reattach a staged table to its original staging transformation, then you might lose valuable components of the table, such as computed columns. For more information about using the Staged Table wizard to add a staged table to an existing job, see “Create Staged Tables” on page 121.

**Erase a Staged Table**

Erasing a staged table deletes the physical table, its contents, and its metadata.

**CAUTION:**

If you erase a staged table that serves as a source table in other jobs, then these associated jobs might not execute because they are missing a source table. Simply erasing a staged table does not affect the metadata of the associated aggregation or information map jobs. However, if you erase a staged table and re-run
the staging job, then the data for the deleted staged table is not created. Thus, the jobs that used that table will fail due to a missing source table.

To erase a staged table, perform the following steps:
1. In a tree view of SAS IT Resource Management, locate the staged table that you want to erase.
2. Right-click the staged table that you want to erase and select Erase. The staging job that includes the staged table must be closed and currently not in use before erasing.
3. In the confirmation dialog box, click Yes to erase the staged table. The staged table disappears from both the tree view and the process flow diagram for the job.

**Delete a Staged Table from a Tree View**

Deleting a staged table from the tree view in SAS IT Resource Management removes the metadata object. This action does not delete the physical data set or the library that is associated with the staged table.

**CAUTION:**

If you delete a staged table that serves as a source table in other jobs, then these associated jobs might not execute because they are missing a source table. Simply deleting a staged table does not affect the metadata of the associated aggregation or information map jobs. However, if you delete a staged table and re-run the staging job, then the data for the deleted staged table is not created. Thus, the jobs that used that deleted table will fail due to a missing source table.

To delete a staged table from a folder in a tree view of SAS IT Resource Management, perform the following steps:
1. In a tree view of SAS IT Resource Management, locate the staged table that you want to delete.
2. Right-click the staged table that you want to delete. The staging job that includes the staged table must be closed and currently not in use before deleting.
3. Select Delete.
4. In the confirmation dialog box, click Yes to delete the staged table. The staged table disappears from the tree view and the process flow diagram for the job.

**Note:** If you modify or delete a physical table without using the process described in this topic, the metadata for the table is not updated.

**Delete a Staged Table from a Job**

Deleting a staged table from a job removes it from the job so that it is no longer associated with the transformation in the job. This action removes the staged table from the job but does not delete the table's metadata, the physical table, or the library that is associated with the staged table.

**CAUTION:**

If you delete a staged table that serves as a source table in other jobs, then these associated jobs might not execute because they are missing a source table. Simply deleting a staged table from a job does not affect the metadata of the associated aggregation or information map jobs. However, if you delete a staged table and re-run the job, then the data for the deleted staged table is not created.
Thus, the jobs that used the deleted staged table (or any existing tables that used the deleted staged table) fail due to a missing source table.

To delete a staged table from a job, perform the following steps:

1. In the IT Data Marts tree view of SAS IT Resource Management, locate the job that includes the staged table that you want to delete.
2. Double-click the job to open it on the Diagram tab of the Job Editor window.
3. Right-click the staged table object in the process flow diagram and select Delete. The staged table is no longer visible in the process flow diagram of the job.

**Purge the Content of a Staged Table**

To purge the contents of a staged table while keeping the physical table and its metadata intact, perform the following steps:

1. In the IT Data Marts tree view of SAS IT Resource Management, locate the job that includes the staged table that you want to purge.
2. Double-click the job to open it on the Diagram tab of the Job Editor window.
3. Right-click the staged table object in the process flow diagram and select Purge.
4. In the confirmation dialog box, click Yes to purge the staged table.

**Modify a Staged Table**

To modify a staged table, navigate to and open the job that contains the staged table that you want to modify.

**CAUTION:**

For best results, always modify staged tables from the process flow diagram. If you access a staged table's Properties dialog box by opening a staged table from a tree view in SAS IT Resource Management, then you might not see all modification options that are available for a staged table.

Perform the following steps:

1. In the process flow diagram of the job, right-click the staged table that you want to modify.
2. Select Properties to open the Properties dialog box.
3. On the General tab, you can change the name and description of the table.
4. On the Columns tab, you can modify an existing table by adding a new column or a computed column to the staged table.

**Add a New Data Column to the Staged Table**

a. Select New ⇒ Data Column. A new line is added to the grid.

b. Click the corresponding cells in the new grid line to enter the name (must be unique), description, type, length, informat, and format for the new data column.
Note: The Expression cell is not available because the new column is a data column and not a computed column.

Add a New Computed Column to the Staged Table

a. Select New ⇒ Computed Column. A new line is added to the grid.

b. In the new grid line, enter the name (must be unique), expression, description, type, length, informat, and format for the new data column.

Note: You can use a SAS macro in a formula expression or in the expression for a computed column. The SAS macro definition needs to be available to the SAS session that executes the staging or aggregation job that populates the computed column. For example, you might need to add a new autocall library using the SASAUTOS SAS option in the SAS configuration.

Import a Column from Another Table into the Staged Table

a. Click to open the Import Columns dialog box.

b. In the Available columns list, navigate to the table that contains the column that you want to import.

Note: “User” is a reserved word in SQL and should not be the name of any imported column.

c. Highlight the column that you want to import.

Note: Data and computed columns from other SAS IT Resource Management staged and aggregation tables can be imported, as well as columns from supplied template tables.

d. Click the right arrow to transfer the column into the Selected columns list.

e. Click OK when you are satisfied with your list of selected columns to import. The new columns appear in the grid.
Note: After you import the column, you must run the staging job before you can view the data in the new column. When the staging job runs, the data is propagated to the physical table and is available for viewing.

Modify the Properties of a Column in the Staged Table

a. Locate the column that you want to modify and double-click the cell that you want to change.

b. Enter the new name (must be unique), expression, description, type, length, informat, or format value for the column. The Expression cell is not available for data columns. The External Name cell is not applicable for all columns.

Note: You can also use the icons in the top row of the Columns tab to manage, move, and modify additional properties of each column of the staged table. For more information about using these features, click Help on the Columns tab.

Delete a Column in the Staged Table

a. Locate the column that you want to delete and right-click the column name.

b. Select Delete. The column is immediately removed from the grid and no confirmation message is displayed.

Note: If you delete an instanced variable from a staged table, then the staging code might not run successfully later.

5. On the other properties tabs (Indexes, Keys, Physical Storage, Options, Notes, Extended Attributes, and ITRM Options), you can view additional properties for the staged table. For more information about the parameters on these tabs, click Help on each tab.

Note: The values displayed on the Keys tab are ignored by SAS IT Resource Management.

6. When you are finished, click OK to save your changes.

Publish a Staged Table as Template

To publish a staged table as a template, perform the following steps:

1. Locate the staging transformation that generates the staged table that you want to publish as a template. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the staging transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the staged table that you want to publish.

3. From the drop-down list, select Publish as Template. The Publish as User-Defined Template - Staged dialog box appears.

4. The Name field contains the name of the table that you want to publish.

   (Optional) Enter a name and a description, that is more meaningful to you.

5. In the Location field, accept the default location or click Browse. This action opens the Select a Location dialog box where you can navigate to another location. Select the location that you want to use and click OK.

   Note: The Location field must be the default location or a location that is underneath it.

6. Click OK to create the template.
7. Save the job.

In order for your changes take effect, you must redeploy the job. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.

Columns in Staged Tables

The Columns tab is available from the Properties dialog box of a staged table. It enables you to view the specific column metadata for the table. You can use this information to view the types of data that the staged table includes and understand how computed columns are formulated.

The following list describes the information that you can view for each column in a staged table. Each row on the Columns tab shows the metadata for a single column of the staged table.

Note: To access the Properties dialog box and Columns tab of a staged table, you can right-click a staged table in the tree view or in the process flow diagram. However, the properties that are available differ with each method. For best results, access the properties from the staged table object in the process flow diagram.

# specifies the column's ordinal position in the grid on the Columns tab.

Name specifies the name of the column in the staged table. The name of a computed column can exceed eight characters.

Expression specifies the combination of functions and mathematical operations that are used to derive a value for the column. The field is blank unless the column is a computed column. For more information about computed columns in staged tables, see “Computed Columns in Staged Tables” on page 134.

This field is available only when opening the Properties dialog box from the process flow diagram.

Description provides a description of the data that populates the column. The description provides more information about the type of data that the column includes.

The column descriptions in staged tables are used as labels in information maps and aggregations.

Type specifies the data type of the column. Valid types are Character and Numeric. You can also identify column types by looking at the Name variable. A round icon to the left of the name indicates that the column is numeric. A pyramid icon to the left of the name indicates that the column contains character data.

Length specifies the maximum character length of the data in the column.

Informat specifies the SAS informat that is used (if needed) to read values for the selected column. Informats are required for reading fixed-width data.
Format

specifies the SAS format that is used to write values for the selected column. If the staged table column was instantiated from a template table, the format is in NLS format when applicable. NLS formats are indicated by NL as the first two characters in the format column. For more information about NLS formatting, see “National Language Support (NLS)” on page 15.

External Name

specifies the name of the corresponding field in the raw data that is used to populate this column. External names are the means by which the staging code maps columns in a staged table to their corresponding variables in the raw data. Not all columns in a staged or template table have a predetermined external name. A value is optional in this field for these columns. However, if the column is associated with an adapter that uses external names, do not change an external name that is provided. For more information about external names, see “Understanding External Names of Staged Tables and Columns” on page 136.

Note: This field is available only when opening the Properties dialog box from the process flow diagram.

Is Nullable

indicates whether a column can contain null or missing values.

This field is available only when opening the Properties dialog box from the tree view.

Summary Role

indicates the intended role of the column in summary data.

This field is available only when opening the Properties dialog box from the tree view.

Sort Order

defines how the values in the column are sorted, such as ascending or descending.

This field is available only when opening the Properties dialog box from the tree view.

Note: The Data Column, Computed Column, or Import Columns options might be disabled if you used the up or down arrows to change the sort order of the columns. To re-enable these options, click the # icon that appears in the grid of columns.

Computed Columns in Staged Tables

Computed columns in a table contain data values that are derived from other columns in the table. Staged tables contain computed columns for data that is not directly provided by the raw data source. Instead, the computed columns might be useful for reporting or promoting consistency across various data sources. For example, a data source normally has a datetime stamp and from that datetime stamp, SAS IT Resource Management might provide a computed column that calculates weeks or months.

Note: A computed column should not be used as a source of calculations for other computed columns. Using a computed column as a source for a computation can be problematic because the order of computing the values for the computed column is not guaranteed.

To find a computed column in a staged table and view the formula that it uses, right-click the staged table in a process flow diagram and select Properties. Then, open the
Columns tab of the staged table's Properties dialog box. This method is the only way to view the Expression column.

Note: If you open a table from a folder view or from the IT Data Marts view, and select the Columns tab, the columns of the table are displayed. However, the expressions that are associated with the columns are not displayed.

All computed columns contain a formula or expression in the Expression column of the grid.

Note: You can use a SAS macro in a formula expression or in the expression for a computed column. The SAS macro definition needs to be available to the SAS session that executes the staging or aggregation job that populates the computed column. For example, you might need to add a new autocall library using the SASAUTOS SAS option in the SAS configuration.

You can double-click an expression to modify it for the column. To open the Expression Builder, click the ellipsis button in the cell. For information about how to work with the Expression Builder, click Help in the Expression Builder window.

Note: Aggregation tables also use computed columns. You can use the computed columns that are provided for these tables and you can create your own. For more information about creating and using computed columns, see “Specify Computed Columns” on page 178.

**Staging VMware Data Using Local Time**

**About Staging VMware Data Using Local Time**

All datetime stamps are stored in Coordinated Universal Time (UTC) or Greenwich Mean Time (GMT) in the VMware vCenter database. However, you can convert the datetime-related values in your staged tables (and thus in your IT data mart) to use local time instead of UTC or GMT.

Note: The following procedures apply only to the data processed by the VMware vCenter adapter.

To change the datetime-related values in your IT data mart from UTC to local time, perform the following steps:

1. Change the formula expression for the IT Formula VMwareDatetime.
2. Change the expressions for other datetime-related computed columns in your staged tables. To do so, change the computed column expression from `<datetime-related variableName> + 0` to `<datetime-related variableName> + GMT offset`.

**Change the Formula Expression for the IT Formula VMwareDatetime**

You can change the values for the DATETIME column in your VMware staged tables from UTC to local time. To do so, modify the expression for the IT Formula, VMwareDatetime, by adding the GMT offset to the formula expression.

By changing the expression for the VMwareDatetime IT Formula, the datetime value adjustments are made during staging for the DATETIME column in all VMware staged tables. For example, to adjust the DATETIME variable from UTC to Eastern Daylight...
Time in your staged tables, change the expression for the VMwareDatetime IT Formula from \texttt{DATETIME + 0;} to \texttt{DATETIME - 14400}.

\textit{Note:} In SAS statements, expressions that contain a subtraction function should not end with a semicolon.

\textbf{Change the Expressions for Other Datetime-related Computed Columns in Your Staged Tables}

To change the other datetime-related values in your staged tables from UTC to local time, change the expressions for those datetime-related computed columns in your staged tables. To do so, change the computed column expression from \texttt{<datetime-related variableName> + 0} to \texttt{<datetime-related variableName> + GMT offset}. For example, to adjust the CREATETIME variable in the Events staged table from UTC to Eastern Daylight Time during staging, change the computed column expression from \texttt{CREATETIME + 0;} to \texttt{CREATETIME - 14400}.

\textit{Note:} In SAS statements, expressions that contain a subtraction function should not end with a semicolon.

\textit{Note:} If you modify any one of the datetime-related columns so that it is adjusted with a GMT offset, then all of the datetime-related columns in your staged tables should be adjusted with the same GMT offset.

The following list shows the datetime-related values that can be changed for each type of VMware staged table:

- All VMware staged tables - DATETIME variable
- EVENTS staged table - CREATETIME
- TASKS staged table - QUEUETIME, STARTTIME, COMPLETETIME

\textbf{Understanding External Names of Staged Tables and Columns}

\textit{About External Names of Staged Tables and Columns}

Staged tables and the columns in a staged table can each have an external name. These external names are the means by which the staging code maps the SAS IT Resource Management staged tables and columns to the tables and variables in the raw data. For example, a staged table that is named NTPHDSK in SAS IT Resource Management has an external name of PhysicalDisk. The staging code uses this information to determine that the PhysicalDisk data in the raw data file belongs in the NTPHDSK staged table. The same is true for columns and the external names for their corresponding variables.

\textit{Note:} The SAR adapter is the only supported adapter that does not require external names.

You can view the external names that are associated with a staged table and its columns from the Properties dialog box of the staged table.

\textbf{CAUTION:}

For best results, do not modify the external names of a staged table or column that is associated with an adapter that uses external names. Changing the
external names that are associated with adapters that use external names can cause
errors when the raw data is staged. The staging code for these adapters relies on
external names to associate the raw data file with the appropriate staged tables and
columns. However, you can modify the external names of staged tables and columns
that are associated with the SAR adapter, because this adapter does not use external
names. The SAR adapter ignores the values for external names, so there is no danger
of corrupting the staging metadata.

Change the External Name of a Table or a Variable

**CAUTION:**
Do not change the external name that is prepopulated for a staged table or
variable unless instructed to do so by a SAS representative. You should change
the external name of a table or a variable only if the data source has changed the
table or variable name that is written in the raw data, and if the external name of the
SAS IT Resource Management table or variable has not been updated to reflect that
change.

For most adapters, SAS IT Resource Management uses the external names in order to
map the tables and variables in the raw data to the SAS IT Resource Management table
and column names. For example, previous versions of the Demand Technologies
Performance Sentry collector wrote an object to the log file as `SQLServer-Locks`.
However, in later versions, this object name changed to `SQLServer:Locks`. In order to
process data for the new object, the external name value for the SAS IT Resource
Management table `NTSLCKS` should be changed from `SQLServer-Locks` to
`SQLServer:Locks`. In the preceding example, the mapping could not take place and
the updated table or variable could not be processed.

If you expect to process log files that contain only the new table or variable external
names, then you can resolve the situation by opening the table properties. Then replace
the existing table or variable external name with the new table or variable external name.
(This is a rare situation and you should change external names only when this particular
condition occurs.)

View the External Names of Tables

To view the external name for a staged table, perform the following steps:

1. Right-click a staged table in the tree view or in a process flow diagram.
2. Click **Properties** to open the Properties dialog box.
3. Select the **Extended Attributes** tab. The **ExternalName** field shows the external
   name that is assigned to the staged table.

   **Note:** Do not change the external name for a staged table unless instructed to do so
   by a SAS representative.

View the External Names of Columns

To view the external name for a column in a staged table, perform the following steps:

1. Right-click a staged table in the process flow diagram.
2. Click **Properties** to open the Properties dialog box.
3. Select the **Columns** tab. The **External Name** field provides the external names of the variables that are associated with the columns in a staged table. Not all columns have an external name that is predetermined. You can add a value in the **External Name** field for these columns.

*Note:* Do not change an external name that is prepopulated for a column unless instructed to do so by a SAS representative.

---

**External Names for MXG Adapters**

For MXG adapters in SAS IT Resource Management 3.4 and later, the SAS IT Resource Management table and column names are now equivalent to the MXG data set names and columns on which they are based.

*Note:* For best results, do not change the external names of the columns or the tables for MXG adapters. There is no benefit to changing the external names of the tables or columns for MXG adapters.

For more information about working with MXG data and adapters, see “Data Sources Supported by SAS IT Resource Management Adapters” on page 397.

---

**How to Add Columns to Existing MXG Staged Tables**

**About Adding Columns to Existing MXG Adapter Staged Tables**

SAS IT Resource Management staged tables are built based on a specific version of MXG. To identify the version of MXG for which the SAS IT Resource Management data models were created, see “Data Sources Supported by SAS IT Resource Management Adapters” on page 397 or SAS Usage Note 8131: “Considerations for SAS® IT Resource Management sites that are upgrading to a new version of MXG.”

For MXG adapters in SAS IT Resource Management 3.4 and later, staged tables share the same names and columns (variables) as the data sets that are stored in an MXG PDB. If you install a more recent version of MXG than the version that generated your staged tables, you can add new columns from that more recent version of MXG to your SAS IT Resource Management staged tables. (The more recent version of MXG is the version from which the SAS IT Resource Management data models for MXG adapters were created.)

To add new columns to your existing staged table, specify the MXG column name under the Name column. Specify the attributes of the new column—that is, informat, format, length, and so on.

*Note:* The External Name is not required because it is not used by SAS IT Resource Management. If the External Name column is present for columns in the table, they are the column names that were used prior to SAS IT Resource Management 3.4 and should be left unmodified.

This enables you to synchronize your SAS IT Resource Management staged tables with more recent tables and columns of the MXG adapter, before the release of SAS IT Resource Management data model updates.
Note: All staged tables contain certain columns that are required by SAS IT Resource Management. Exercise caution when modifying existing columns to avoid impacting SAS IT Resource Management.

To import new columns into staged tables, perform the following tasks:

- Create the MXG data sets that contain the columns that you want to import. For information about creating the MXG data sets, see “How to Capture the MXG Tables” on page 139.
- Register the MXG data sets from which you want to import columns. For information about registering the MXG data sets, see “How to Register MXG Data Sets from More Recent MXG Versions” on page 139.
- Import the columns from a table in the MXG data set into the SAS IT Resource Management staged table. For information about importing these columns, see “How to Import the Columns from an MXG Table into a Staged Table” on page 140.

Note: The addition of new columns will increase your disk space requirement. For more information, see “Insufficient Disk Space” on page 142.

How to Capture the MXG Tables

To capture the MXG tables, perform the following steps:

1. Double-click the staging job that contains the MXG table to open it in the process flow diagram.
2. Right-click the staging transformation and select Properties.
3. Click the Precode and Postcode tab.
4. Check the Postcode box and enter this code:

   ```
   libname mxgtemp 'userid.mxgtemp.fromwork';
   proc copy in=work out=mxgtemp;
      select <mxg_dataset_list>;
      run;
   libname mxgtemp clear;
   ```

   In this code, `mxg_dataset_list` is the list of tables from which you want to import new columns. In addition, the “userid.mxgtemp.fromwork” library must already exist in this scenario.

How to Register MXG Data Sets from More Recent MXG Versions

The MXG data sets must physically exist in a SAS library that is accessible to the SAS IT Resource Management client.

To register the MXG tables in metadata, perform the following steps:

1. In the SAS IT Resource Management client, select File ➜ Register Tables.
2. In the Register Tables dialog box, select SAS ➜ Next.
3. In the SAS Library field, specify the SAS library where the MXG data sets are stored. You can select an existing library from the list or click New to register a new library.
If you choose to register a new library, respond to the prompts of the New Library Wizard, as follows:

a. Enter the name of your library. For example, you might enter MXGTEMP.

b. Select your SAS IT Resource Management application server. To do so, use the right arrow to move it from the Available column to the Selected column.

   Note: The default application server is SASITRM.

c. Choose a libref to be associated with this SAS library (MXGTEMP, for example).

d. Choose a path specification by moving it from the Available items column to the Selected items column. Alternatively, click New to register a new path. If you want to do this, enter the path to the SAS library where the MXG data sets are stored and then click OK.

If you choose to use an existing library, perform the following steps:

a. Use the drop-down arrow in the field to display the existing libraries.

b. Select the library that you want to use. Click Next.

4. A list of tables appears that represents the MXG data sets in the SAS library that you specified. Specify the location of the metadata folder where you want your MXG tables to be registered, or note the default path that is presented. Select the tables that you need and click Next.

5. Click Finish. Your MXG data sets are registered in metadata.

How to Import the Columns from an MXG Table into a Staged Table

To import columns from an MXG table into a SAS IT Resource Management staged table, perform the following steps:

1. Select the IT data mart that contains the staged table that you want to update. Expand the Staging folder.

2. Right-click the staged table that you want to update and select Properties. The Properties dialog box appears.

3. Select the Columns tab. Then, click the Import columns icon ( ). The Import Columns dialog box appears.
4. In the **Folders** tab of the Available column, navigate to the folder that contains the MXG data sets that you registered.

5. Select the table from which you want to import a column. Click the plus sign to expand the list of columns in that table. (To select the columns that you want to import, use the right arrow to move those columns from the Available column to the Selected column.)

6. Click **OK** to close the Import Columns dialog box. Click **OK** to close the Properties dialog box.

7. Redeploy the staging job.

8. The imported columns are added to the staged table metadata. The columns are not created in the physical table until the staging job is run. When the staging job for the updated staged table runs successfully, the data in the columns can be viewed in the SAS IT Resource Management client.

**CAUTION:**

Do not import columns into the table that have the same name as existing columns in that table. Doing so can cause unpredictable results.

---

### How to Use Imported Columns

Columns can be directly imported into the SAS IT Resource Management staged tables. These columns can be used in the following objects:
• aggregation tables
  (For more information, see “Overview of the Aggregation Transformation” on page 144.)

• information maps
  (For more information, see “About Information Maps” on page 308.)

• exception definitions
  (For more information, see “Overview of Exception Analysis Processing” on page 209.)

• performance report definitions
  (For more information, see SAS IT Resource Management 3.8: Reporting Guide.)

Using these imported columns in aggregations, information maps, exceptions
definitions, and performance report definitions requires care when migrating or
upgrading to SAS IT Resource Management versions that include data model updates.

Note: For more information about upgrading your IT data mart to the newest data
model, see Chapter 5, “Data Model Upgrade,” in the SAS IT Resource Management
3.8: Migration Guide.

---

**Insufficient Disk Space**

If there is not enough disk space to run a staging job, then the job fails. A message
indicates that there was a failure writing to the disk. If this occurs, then point the failing
staging library to an alternate path that has more space available or delete unwanted files
from that library. Then, rerun the staging job.
Chapter 8
Aggregating the Data

Overview of the Aggregation Transformation .......................... 144

About Aggregation Tables ...................................................... 145
  What Is an Aggregation Table? ........................................... 145
  How Is the Metadata for an Aggregation Table Created? ............ 147
  How Is the Physical Aggregation Table Generated? .................. 149
  What Are the Properties of an Aggregation Table? .................. 149

Preparing to Create an Aggregation Table ................................ 157
  Set Up the Aggregation Transformation in the Process Flow Diagram 157

Creating an Aggregation Table with the Simple Aggregation Table Wizard ... 158

Creating Aggregation Tables with the Summarized Aggregation Table Wizard 160
  How to Enter General Information about the Aggregation Table ........ 160
  How to Specify Library Information ...................................... 160
  How to Select a Filter and Enable Data Duplication Checking ........... 161
  Specify Aging Columns .................................................... 162
  Specify Class and ID Columns ............................................ 164
  Specify Statistics Columns .............................................. 165
  Specify Percentiles Columns ............................................. 168
  Specify Percent Change Columns ......................................... 169
  Specify Moving Statistic Columns ....................................... 171
  Specify Ranking Columns ............................................... 172
  Specify Join Columns .................................................... 176
  Specify Computed Columns .............................................. 178
  How to Complete the Specification of the Summarized Aggregation Table ... 182

Creating Aggregation Tables with the Aggregations through Template Wizard 182

Cloning an Aggregation Table ............................................ 184

Adding a New Column to an Aggregation Table .......................... 186
  Special Considerations When Adding a New Column to an Aggregation Table 186
  Changing the Aging Column in an Aggregation Table ................ 187
  How to Add a New Column to an Aggregation Table .................. 188

Deleting an Aggregation Table ............................................ 189
  Delete an Aggregation Table from an Aggregation Transformation ...... 189
  Delete an Aggregation Table from the IT Data Mart .................. 190
  Erase an Aggregation Table ............................................. 190

Editing or Modifying an Aggregation Table ............................. 191

Publishing an Aggregation Table as Template .......................... 194
Overview of the Aggregation Transformation

The Aggregation transformation provides a graphical user interface for the purpose of accumulating data. The Aggregation transformation is invoked from within a job. Right-clicking the transformation provides access to its properties and to various other functions such as creating an aggregation table by means of aggregation wizards.

SAS IT Resource Management supports two types of aggregation tables:

- Summarized aggregation tables:
  
  Summarized aggregation tables consist of data from the source table that is summarized in accordance with the rules that are specified in the Aggregation transformation. Summarized aggregation tables also include statistics, percentiles, moving statistics, and more that are calculated and stored for the categories of data that you specify. By means of the summarized aggregation wizard, the Aggregation transformation enables you to do the following:

  - specify the name, table name, and description of the table
  - define filters to limit the input data
  - specify if and how the data should be aged
  - assign source columns as class or ID columns
  - define statistics and percentiles
  - calculate the percent change for statistic, and percentile columns
  - define moving statistics
• generate ranks on all columns or across specified class columns
• define join columns
• generate computed columns

Note: You must use the Edit function of an existing aggregation table to add or delete a computed column to that table. (The New and Delete buttons are not available on the Specify computed columns page of the wizard when the aggregation table is being created.)

• modify column labels and formats
• Simple aggregation tables:
  Simple aggregation tables consist of data from the source table that is simply appended to the target table. Like summarized aggregations, simple aggregations support aging, join columns, and computed columns. Simple aggregations are analogous to the detail tables of the performance data warehouse (PDB) in SAS IT Resource Management 2.7.

---

**About Aggregation Tables**

**What Is an Aggregation Table?**

Aggregation tables contain data that is collected and accumulated according to rules that are defined to an Aggregation transformation. These rules pertain to columns from the source table and are used to classify, organize, and calculate columns such as statistics, percentiles, and moving statistics about IT data. The target table that is produced by an Aggregation transformation is used for further data management, analysis, or report processes.

With SAS IT Resource Management, you can perform the following actions:

• generate a simple or a summarized aggregation table

  To generate a summarized or simple aggregation table, you must first set up the Aggregation transformation. For information about setting up the Aggregation transformation, see “Preparing to Create an Aggregation Table” on page 157.

You can then invoke one of the three wizards that enable you to specify the aggregation table.
For information about creating simple aggregation tables, see “Creating an Aggregation Table with the Simple Aggregation Table Wizard” on page 158.

For information about creating a summarized aggregation table, see “Creating Aggregation Tables with the Summarized Aggregation Table Wizard” on page 160.

For information about creating an aggregation table using a template, see “Creating Aggregation Tables with the Aggregations through Template Wizard” on page 182.

- add a column to an aggregation table
- clone an aggregation table
- delete an aggregation table
- edit (or modify) an aggregation table
- publish an aggregation table as a template
- purge an aggregation table
- rename an aggregation table

The tables in SAS IT Resource Management 3.2 and later are sorted in this order: <Alphabetic List of Class Columns> <Aging Column>.

Note: If you want to perform BY-group processing on the data in any other order, sort it into a work table. Then perform the task using the work table or a view that accesses that work table.
How Is the Metadata for an Aggregation Table Created?

Methods for Creating Metadata for an Aggregation Table

The metadata for an aggregation table can be created in these ways:

- automatically, by means of the Adapter Setup wizard
- automatically, by means of the Add Domain Category wizard
- directly, by invoking one of the three aggregation wizards from an Aggregation transformation
  - Summarized Aggregation Table wizard
  - Simple Aggregation Table wizard
  - Aggregations through Template wizard

Creating Metadata with the Adapter Setup Wizard

Using the Adapter Setup wizard, you can specify the adapter, domain category, and time periods for which you want to generate reports. The Adapter Setup wizard creates the metadata for the appropriate Staging and Aggregation transformations, according to your specifications.

To invoke the wizard, from the menu bar, select New ➔ IT Resource Management ➔ Adapter Setup.

Note: The Adapter Setup wizard prompts for other input, such as the IT data mart where the job is to be stored, the location of the formulas that should be used when creating computed columns, and information about where the reports are to be stored. For more information about the Adapter Setup wizard and the other objects that it creates, see “About the Adapter Setup Wizard” on page 257.

The following display shows the Disk Aggregation job that was generated by the Adapter Setup wizard for the SAR adapter. It contains a SAR Disk Aggregation transformation that specifies the creation of five aggregation tables.

Figure 8.2 SAR Disk Job That Generates Multiple Aggregation Tables
Note: The Adapter Setup wizard can generate multiple aggregation tables from a single Aggregation transformation.

**Creating Metadata with the Add Domain Category Wizard**
The Add Domain Category wizard enables you to add domain categories to an existing staging transformation that was generated by the Adapter Setup wizard. For each new domain category, the wizard creates metadata for the appropriate Aggregation transformations according to your specifications. The wizard prompts you for information such as the domain category, time period, the location of the formulas that should be used when creating computed columns, and information about where the reports are to be stored. For more information about the Add Domain Category wizard and the other objects that it creates, see “About the Add Domain Category Wizard” on page 291.

**Creating Metadata with the Aggregation Wizard**
To create an aggregation table with an aggregation wizard from an Aggregation transformation, you must first open a job in the Diagram tab of the Job Editor window. Then drag and drop the Aggregation transformation onto the process flow diagram. For information about how to perform these steps, see “Set Up the Aggregation Transformation in the Process Flow Diagram” on page 157.

To invoke an aggregation wizard, right-click the Aggregation transformation and select **Add Aggregation Table** from the drop-down list. You can then choose to create one of the following wizards:

- **Summarized Aggregation Table**
- **Simple Aggregation Table**
- **Aggregations through Template**

**Note:** From this option, you can choose to create an aggregation table from either a supplied table template or a user-defined table template.

Respond to the prompts of the selected wizard in order to specify how the aggregation table is to be generated. When the wizard is successfully completed, the metadata for the aggregation table is generated and stored in the folder of the IT data mart in which the job resides.) The Diagram tab of the Job Editor window is updated to display the job that, when run, generates the aggregation table that you specified.
The following display shows a job called MyJob that was generated by directly invoking the Summarized Aggregation Table wizard. It contains an Aggregation transformation that is specified to create a single aggregation table.

**Figure 8.3** Table Generated by the Summarized Aggregation Table Wizard

Note: An aggregation wizard that is directly invoked can generate only one aggregation table for each invocation of the wizard. However, you can invoke the wizard multiple times on the same Aggregation transformation, each time generating another aggregation table.

**How Is the Physical Aggregation Table Generated?**

Aggregation transformations are contained in jobs that generate physical aggregation tables when the jobs are successfully run. For information about how to run a job immediately, see “Running Jobs” on page 375. For information about how to deploy a job for batch scheduling, see “Run a Job Immediately” on page 376.

**What Are the Properties of an Aggregation Table?**

CAUTION:

Except for defining an index, do not make changes to an aggregation table from the Properties dialog box. For all changes other than index definition, use the Edit wizard to make changes to an aggregation table. This ensures that all metadata is properly updated.

To open the Properties dialog box of an aggregation table, right-click the aggregation table in the process flow diagram. The following menu appears:
From the drop-down menu that is displayed, select **Properties**.

The following display shows the Property dialog box for the DayDisk aggregation table, which was displayed by right-clicking the DayDisk aggregation table image on the
process flow diagram. (The metadata for this table is one of many tables that are generated by the Disk Aggregation transformation of the SAR adapter.)

**Figure 8.4** Properties for the DayDisk Aggregation Table

Note: Unlike other SAS Data Integration Studio transformations, there is no Mapping tab. The aggregation wizards manage this function.

The Properties dialog box consists of the following tabs:

- The **General** tab contains the identifying information about the table.

The following display shows the **General** tab of an aggregation table.

For items in the preceding display, the following definitions apply.

**Name**
identifies the name of the aggregation table.
Description

describes the aggregation table.

Location

specifies the location of the aggregation table in the metadata folder hierarchy. Click Browse to select a path to the table from the Select a Location dialog box that displays the metadata directory structure.

• The Columns tab contains a grid that provides information about each column of the table. For each aggregation table, the aggregation wizards supply the following three columns:

• ContribCount is a numeric column in summarized aggregation tables. The value of ContribCount is the number of input observations (rows of data) that were used in computing this summarized row of data

• LastUpdated is the system datetime of when this row of data was last updated. This column is in simple and summarized aggregation tables.

• CompletedDay is a single character, set to 'Y', 'N', or blank. If the Completed Day processing is not enabled, it is always set to blank. If the Completed Day processing is enabled, this column is set to 'Y' if the value of DATETIME indicates that this row of data represents a completed day. Otherwise, this column is set to 'N', which indicates an incomplete day. A day is considered complete if any input row of data has a time portion of the datetime value that is greater than the specified cutoff time.

The following display shows the Columns tab of an aggregation table.

**Figure 8.5 Columns Tab of an Aggregation Table (partial listing)**

For items in the preceding display, the following definitions apply.

#

specifies the column's ordinal position in the grid on the Columns tab.
Name
specifies the name of the column.

If the Key icon appears next to the name, then that column is used as a primary, unique, or foreign key.

Expression
specifies the combination of functions and mathematical operations that are used to derive a value for the column. This field is blank unless the column is a computed column.

Description
describes the column.

Type
specifies the data type of the column. Valid types are character and numeric. You can also identify column types by looking at the Name column. A round icon to the left of the name indicates that the column is numeric. A pyramid icon to the left of the name indicates that the column contains character data.

Length
specifies the length of the column. The length of numeric columns is from 2 through 8. The length of character columns is from 1 through 32,767.

Informat
specifies the SAS informat that is used (if needed) to read values for the selected column. Informats are not used by the Aggregation transformation.

Format
specifies the SAS format that is used to write or display values for the selected column.

Summary Role
specifies the type of the column. It is not used by SAS IT Resource Management.

CAUTION:
The New, Import, and Delete buttons at the top of the grid should not be used. The preferred method of adding, deleting, or modifying a column is to do so from the appropriate aggregation wizard. Using the wizard ensures that the metadata is properly updated.

- The Indexes tab contains a list of the columns (and their descriptions, types, and lengths) that can be selected to use as indexes. Indexes can improve queries that use the aggregation table.
The following display shows the **Indexes** tab of an aggregation table.

**Figure 8.6  Indexes Tab of an Aggregation Table**

For more information about indexes, see “Indexing an Aggregation Table” on page 195.

- The **Keys** tab is not used by SAS IT Resource Management, and its values are ignored.
- The **Physical Storage** tab contains information about where the table is stored.

The following display shows the **Physical Storage** tab of an aggregation table.

**Figure 8.7  Physical Storage Tab of an Aggregation Table**

For items in the preceding display, the following definitions apply.

**Physical name**

specifies the name of the physical table. The name must follow the rules for table names in the DBMS that is selected in the DBMS field. For example, if SAS is the selected DBMS, the name must follow the rules for SAS data sets. If you
select another DBMS, the name must follow the rules for tables in that DBMS.
Note the check boxes for DBMS names below.

*Note:* SAS IT Resource Management does not use this field.

**Enable case-sensitive DBMS object names**
specifies whether case-sensitive names for tables and columns are to be supported in the metadata for the current table. If the check box is deselected, no support is provided. If the check box is selected, support is provided.

*Note:* Do not select or modify this field.

**Enable special characters within DBMS object names**
specifies whether special characters in names for tables and columns are to be supported in the metadata for the current table.

*Note:* Do not select or modify this field.

**Create as view**
is valid only if the table is specified as an output in a SAS IT Resource Management job. If this option is selected, the table is created as a view, if that is possible. If it is not possible to create a view, a physical table is created even when the Create as view option is selected. Deselect this option to specify that the table should be created as physical table instead of a view.

*Note:* SAS IT Resource Management does not use this field.

**Library**
specifies a library that can be used to access the table. To create a new library, click New, which opens the New Library wizard. To edit the properties of the existing library, click Properties, which opens the properties window for the data library.

**DBMS**
displays the database management system (DBMS) format of the library that is selected in the Library field.

*Note:* Do not select or modify this field.

**Schema**
is for DBMS software other than SAS. It specifies the database schema that is associated with the table that is specified in the Name field.

*Note:* Do not select or modify this field.

- The Notes tab contains areas where you can annotate the table.
- The Extended Attributes tab contains a custom property that is not part of the metadata for the table.
The following display shows the **Extended Attributes** tab of an aggregation table.

**Figure 8.8  Extended Attributes Tab of an Aggregation Table**

For items in the preceding display, the following definitions apply.

- ****: adds a row to the attribute table. A number and a default name are provided, but you must enter the value and description.
- **X**: deletes a selected attribute from the list.
- **↑**: If present, enables you to reorder rows by moving a selected row up in the table.
- **↓**: if present, enables you to reorder rows by moving a selected row down in the table.
- **#**: specifies the number of the extended attribute.
- **Field Name**: specifies the attribute name to be defined.
- **Value**: specifies the value for the attribute that is specified in the **Field Name** column.
- **Description**: describes the attribute and value.

**CAUTION:**
Do not delete or modify the AgeLimit field from the Extended Attributes tab. In addition, do not delete the Filter field from the Extended Attributes tab. Modifying or deleting these fields can cause processing errors.
Preparing to Create an Aggregation Table

Set Up the Aggregation Transformation in the Process Flow Diagram

To create an aggregation table, you must first set up the Aggregation transformation in a job and then invoke one of the aggregation wizards. To set up the necessary Aggregation transformation, perform the following steps:

1. Locate the job that you want to contain this Aggregation transformation. From the IT Data Marts tree, navigate to the IT data mart and folder that contains the job that you want to use. Double-click the job to open it on the Diagram tab of the Job Editor window.

   If you want to create a new job, see “Jobs That Process IT Data” on page 365.


3. Drag and drop the Aggregation transformation onto the process flow diagram.

   Note: A job can contain multiple Aggregation transformations.

4. Drag and drop a source table onto the process flow diagram and using the cursor, connect the table to the left side of the aggregation image.

   Note: The source table is usually a staged table that was created by a SAS IT Resource Management staging transformation, but it can be any SAS table. If the input source is a view and is not associated with a library, be sure to assign a libref to the view. (A libref is a name that is associated with the physical name of a SAS library.) You can issue a LIBNAME assignment, which associates a libref with a view, in the public code. You can also issue it as PRE-Code on the Aggregation transformation, or as pre-assigned libraries to the SAS session that runs the job.

5. Right-click the aggregation image and, from the drop-down menu that is displayed, select Add Aggregation Table.

6. Select the type of aggregation table that you want to create. (If you click Cancel on any page of an aggregation wizard, a confirmation dialog box is displayed. If you do not want to cancel, click No.)

   • Select Simple Aggregation Table to invoke the Simple Aggregation Table wizard. For information about using this wizard, see “Creating an Aggregation Table with the Simple Aggregation Table Wizard” on page 158.

   • Select Summarized Aggregation Table to invoke the Summarized Aggregation Table wizard. For information about using this wizard, see “Creating Aggregation Tables with the Summarized Aggregation Table Wizard” on page 160.

   • Select Aggregations through Template to invoke the Aggregations through Template wizard. This wizard enables you to choose one of the following template sources:

     • From Supplied Template

     • From User-Defined Template
For information about using this wizard, see “Creating Aggregation Tables with the Aggregations through Template Wizard” on page 182.

Note: You can create multiple summarized aggregation tables. The aggregation wizard provides a unique suffix for each table that is created.

Creating an Aggregation Table with the Simple Aggregation Table Wizard

To create an aggregation table with the Simple Aggregation Table wizard, respond to the wizard's prompts.

1. To enter general information about the table, see “How to Enter General Information about the Aggregation Table” on page 160.

2. If this aggregation table is the first target table that is specified for this Aggregation transformation, an additional page of the wizard opens. This page prompts you for the physical target location and for information about the SAS library where the data is to be stored. For information about specifying a library, see “How to Specify Library Information” on page 160.

3. Filters can limit the amount of data that is read into an aggregation table. On the Select filter and enable data duplication checking page, you can specify a filter and specify that data duplication checking is to be performed. For information, see “How to Select a Filter and Enable Data Duplication Checking” on page 161.

4. On the Specify aging page, you can specify aging and purging criteria. For information, see “Specify Aging Columns” on page 162.

5. On the Specify target columns page, you can specify the columns from the source table that are to be included in the target aggregation table. To select columns for the target table, highlight the columns in the Available source columns panel. Then click the right arrow to move those columns into the Selected source columns.
You can select the entire list of available source columns by clicking the double right arrow. Back arrows can be used to deselect one, several, or all columns.

If aging is to be performed for this simple aggregation table, then the selected aging column is automatically added to this list. It cannot be deleted while it is still in use as the aging column.

6. On the Specify column details page, you can modify the Target Column Name and Target Column Label fields for any of the source columns that you are including in the target aggregation table. To do so, enter the new value in the field.

To modify the Target Column Format, double-click in the field and select the new format from the drop-down list.

7. On the Specify join columns page, you can specify columns from other aggregation tables in this Aggregation transformation to join with columns in this target table. For information, see “Specify Join Columns” on page 176.

Note: The Specify join columns page is available from the Simple Aggregation Table wizard only if there are columns from separate target tables that are eligible for joining.

8. On the Specify computed columns page, you can create, modify, or delete computed columns.

Note: You must use the Edit function of an existing aggregation table to add or delete a computed column. (The New and Delete buttons are not available on the Specify computed columns page of the wizard when the aggregation table is being created.)

For information about how to add, modify, or delete computed columns, see “Specify Computed Columns” on page 178.
9. The final page of the wizard displays the details for the simple aggregation table that you specified. If you are satisfied with your choices, click **Finish**. Click **OK** to return to the process flow diagram.

---

**Creating Aggregation Tables with the Summarized Aggregation Table Wizard**

To create an aggregation table (that is, the target table) with the Summarized Aggregation Table wizard, respond to the wizard's prompts. Whenever you have completed your specifications for the aggregation table and want to skip the remaining pages of the wizard, click **Finish** (if that button is enabled). This action updates the Aggregation transformation with this new aggregation table and returns you to the process flow diagram. For information, see “How to Complete the Specification of the Summarized Aggregation Table” on page 182.

**How to Enter General Information about the Aggregation Table**

To specify general information about the aggregation table, perform the following steps:

1. Enter the name of the table in the **Name** field. This field can contain up to 60 characters. It must be unique within the metadata folder. It must also be unique among all other table names within the application server. A value is required in this field.

   *Note:* The name of this aggregation table is displayed on subsequent pages of the wizard.

2. (Optional) Enter the identifying information in the **Description** field. This field can contain up to 200 characters.

3. (Optional) In the **SAS table name** field, you can accept the default value, or enter the physical name of the aggregation table.

4. The **IT data mart** contains the job in which the Aggregation transformation is located. (It cannot be changed.)

5. (Optional) In the **Location** field, you can accept the default value, or enter the metadata path to the metadata folder where the job that contains the Aggregation transformation is stored.

   **CAUTION:**
   
   *Use only English characters when entering textual information in the fields of the wizard.* Non-English characters can cause processing errors.

**How to Specify Library Information**

If this aggregation table is the first target table that is specified for this Aggregation transformation, an additional page of the wizard opens. This page prompts you for the physical target location and for information about the SAS library where the data is to be stored. When this page opens, the following fields are already specified with default values. If you want to modify these fields, perform the following steps:
1. In the Name field, enter the name of the library that contains all aggregation tables that are associated with the Aggregation transformation that you are working with. This field can contain up to 60 characters. A value is required in this field.

2. In the Description field, enter the information that describes the library. It can contain no more than 200 characters. It is an optional field.

3. In the Server field, enter the application server that you specified for the IT data mart that you are working with. The default application server is the SASITRM server. A value is required in this field.

4. In the Libref field, enter the name that is temporarily associated with the library. The libref or an aggregation library is a concatenation of AGG and a random number (for example, AGG27040). A value is required in this field. The libref name must be unique within the application server.

   Note: The following naming rules apply to the libref:
   - The libref can consist of no more than eight characters.
   - The libref must begin with a letter (A through Z) or an underscore (_).
   - The remaining characters of the libref must be letters (A through Z), numerals (0 through 9), or an underscore (_). The libref cannot contain spaces.

5. In the Path specification field, enter the location where the tables for this library are to be stored. You must specify a location for the tables that is within the IT data mart that is specified in the IT Data Mart field.

   Enter this field manually or click Browse to select a location from the Select a Directory dialog box that displays the directory structure on the server's file system. A value is required in this field.

   Note: On UNIX and on z/OS using zFS locations, you can use paths that contain symbolic links. Using symbolic links would be useful if you want to retain flexibility for changing the real physical location of libraries. See the UNIX ‘ln’ command for additional details.

---

**How to Select a Filter and Enable Data Duplication Checking**

Filters can limit the amount of data that is read into an aggregation table. To select a filter and a column for data-duplication checking, perform the following steps:

1. From the drop-down list in the Select filter field, select the filter that you want to use. The selected filter is displayed in the Select filter field and its corresponding expression is displayed in the Expression field.

2. The Expression field displays the formula that defines the filter. It cannot be changed from this location. For information about how to modify the expression field of a filter, see “Modify a Filter of an Aggregation Transformation” on page 205.

If you want to create a new filter to use for your aggregation table, perform the following steps:

1. Click the Add New button to open the Add Filter dialog box.

2. In the Name field, enter the name of the new filter. The name field can contain no more than 60 characters.

3. In the Expression field, enter the formula.
4. Click **OK**.

*Note:* For more information about how to work with filters, see “Working with Aggregation Transformation Filters” on page 202.

Also available on this page is the box to select the **Enable data duplication checking** for the aggregation table. Select this box to indicate that you want to aggregate only data items from the source table that have a value for LSTPDATE that is newer (greater in value) than the most recent (greatest) value of the LastUpdated column in the aggregation table. If selected, this option prevents duplicate data items from being aggregated into the target table.

*Note:* The LSTPDATE column represents the last date and time that data was staged. This option is enabled only if LSTPDATE is found in the source table. (By default, this option is deselected.)

### Specify Aging Columns

**Managing Your Data: Aging and Purging Options**

SAS IT Resource Management provides several ways of managing the amount of data that is kept in the aggregation tables of your IT data mart. You can apply the aging and purging functions to both simple and summarized aggregations. The selection of the aging and purging attributes for a simple aggregation table or a summarized aggregation table can be performed on the Specify aging page of the wizard.

- **Purge target table before loading new data**
  Purging the data from the target table before the new data is loaded.

- **Perform aging for target table**
  You can specify whether and how you want to age your data when you create the Aggregation table.

  By entering a value for the **Age limit in days**, you are specifying the age range that data is to be present in the table. The minimum number of days is 1; the maximum number of days is 9999.

  *Note:* Columns that are used for aging are DATETIME columns. For these columns, one day of aging extends over 24 hours of data collection, which might extend over one or more days.

  You are not specifying that the data is to be aged out after that number of days. Instead, the value that you specify is the number of days of data that you want to keep. Calculate what is aged out by subtracting the value of the **Age limit in days** from the latest date of the new or existing data. The resulting date is the date before which data will age out. For example, in the following figure, Day 9 is the latest date of the data. The **Age limit in days** is seven.

**Figure 8.10 Example of How Data Is Aged Out**

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Day 7</th>
<th>Day 8</th>
<th>Day 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>Data</td>
<td>Data</td>
<td>No data was loaded</td>
<td>Data</td>
<td>Data</td>
<td>Data</td>
<td>No data was loaded</td>
<td>Data</td>
</tr>
</tbody>
</table>

Data is aged out. Data is kept.
All data from Day 2 and earlier is aged out. All data from Day 3 through Day 9 is kept. However, no data was loaded on Day 4 and Day 8. Therefore, only five days of data are kept, namely the data for Day 3, Day 5, Day 6, Day 7, and Day 9.

Note: If you reduce the aging value, the change takes effect the next time the job is run, even if there is no new data.

How to Specify Purging Criteria
To purge the target table before you load new data, check the corresponding check box. This action removes the data that was processed in previous executions of the job.

How to Specify Aging Criteria
You can specify whether and how you want to age your data when you define the aggregation target table. Based on these specifications, data is kept in the aggregation table or aged out of it. To specify aging criteria for the target table, perform the following steps:

1. To perform aging for the target table, check the corresponding check box. This action enables you to select the column to be used for aging and to specify the format of that column.
   - The **Column** field displays a list of the columns from the source table that are available to use for aging the data. From the drop-down list, select the column that you want to use. It is displayed in the **Column** field. The format of the selected field is displayed.
     
     **Note:** If you want to specify percent change or moving statistic columns, you must select an aging column. SAS IT Resource Management uses that aging column in order to calculate the period-to-period changes for that column. The selected aging column is automatically added to the list of class columns for a summarized aggregation table.
   
   - The **Date** or **Datetime** option is automatically selected, based on the contents of the column that you selected for aging. Changing this option is permissible, but it is not recommended.
     
     **Note:** Specify the option that reflects the type of column that you chose. For DATE values, the aging counts by days. For DATETIME values, the aging counts by the number of seconds in a day.

2. Use the spinner to select the number of days age limit.

3. To specify the completed day, check the corresponding check box. This action enables you to select the column to use to determine whether a day is complete. (This option is enabled if aging has been specified for this aggregation table and the source table has a column called DATETIME.)
   
   This feature is useful only for tables where the aging column represents a DAY or less. For example, this feature is not useful for WEEKDATE aggregations.

   **Note:** If the **Apply completed day** option is deselected on an existing aggregation table that previously selected that option, the rank columns of that table are analyzed. If they depend on Completed Day being selected, a message is displayed that lists the rank columns that would be affected. The deselection of the Completed Day option is not permitted.

4. Use the **Cut off time** field to specify when a day is completed. Use the spinners to specify the hours, minutes, and whether the time is a.m. or p.m.
Specify Class and ID Columns

About Specifying Class and ID Columns
On the Specify class and ID columns page, you can specify the columns from the source table that are to be included in the target aggregation table as class columns and as ID columns.

• A class column is used to group or classify data. For example, the value of a class column could be a device address.

At least one column must be selected as a class column.

Note: When designing aggregation tables, select class columns carefully. For each unique value of each class column, an observation is created in that table. To ensure that aggregation tables have meaningful observations, select class columns for which the values are not highly variable.

Note: If aging is specified for this target aggregation table, then the aging column is automatically added to the list of class columns. The aging column cannot be deleted from the list of class columns. If aging is turned off, the column can be removed from the list of class columns.

• An identification (ID) column contains an alternate identifier for the data in a class column. For example, the value of the corresponding ID column could be the name of a particular device.

The value that is assigned to the ID column is the last value that is read into the group that is defined by the unique combination of class columns.

ID columns are not required.

Note: If an input column is given a role as a class column, ID column, or a statistic, it cannot simultaneously be assigned a different role. Therefore, it is not available for selection. If all available columns are assigned as class or ID columns, then no columns are available to be used as statistic, percentile, percent change, moving statistics, or rank columns. In that case, the wizard does not display the pages that enable you to specify those columns.

How to Specify Class and ID Columns
To specify class or ID columns, click New to open the Add New Class and ID Columns window.

• To select class columns for the target aggregation, highlight the columns in the Available columns panel that you want to select as class columns. Then click the right arrow to move those columns into the Selected class columns.

• To select ID columns for the target table, highlight the columns in the Available columns panel that you want to select as ID columns. Then click the right arrow to move those columns into the Selected ID columns.

You can select the entire list of available columns by clicking the double right arrow. Back arrows can be used to deselect one, several, or all columns.

Tip After your data has been aggregated, you can change the class list. If you remove columns from the class list, the existing data in the summarized aggregation table is merged again so that it matches the new class list. If you add new columns to the class list, then these new columns in the table will have a missing value (for numeric) or blank value (for character) in the existing data.
Note: If you add a column to a class list that is associated with a source table that is used in a join operation, then you must also ensure that the column is also included in the class or ID list of the destination table. If not, an error message is displayed during code generation that identifies the columns that are not present in the destination table. You cannot remove a class or ID column if it is used to satisfy a join column in another aggregation table. Similarly, you cannot remove a class or ID column if it is used as the source column of a rank column in this aggregation table.

How to Modify the Fields of a Class or ID Column
After the class and ID columns have been selected, you can modify the name, label, and format for any of the input columns that you are including in the target aggregation table.

• To modify the Target Column Name and Target Column Label, enter the new value in the field that you want to change. The Target Column Name can be any legal SAS column name. However, it must be unique within its table.

• To modify the Target Column Format, double-click in the field and select the new format from the drop-down list.

Specify Statistics Columns

About Specifying Statistics
On the Specify statistics page, you can calculate or delete one or more statistics on analysis columns that you selected on the previous page. These columns are displayed in a grid format, which contains a row for each analysis column. The grid contains the following columns: Analysis Column and Statistics, Weight By, Target Column Name, Target Column Description, and Target Column Format. Except for the Analysis Column and Statistics column, the columns of the grid are blank until the statistic is specified. (The Analysis Column and Statistics column displays the names of the selected analysis and statistics columns.)

Note: For the list of statistics that SAS IT Resource Management enables you to create, see Appendix 11, “Statistics,” on page 681.

How to Create Statistics for an Analysis Column
To create statistics for an analysis column, perform the following steps:

1. Click New, which opens the Add New Statistics window.

2. In the Select analysis variables panel, check the box next to the analysis column for which you want to specify statistics. (Checking multiple analysis columns enables you to specify the same statistics for all the analysis columns that you selected. Otherwise, check an analysis column and specify the statistics for it individually.)

3. To specify unweighted statistics, in the Statistic Types panel, check the statistics that you want to create. The counter that is next to All Selected Statistics displays the number of statistics that you selected.

4. To specify weighted statistics, in the Weighted Statistic Types panel, select the column that you want to use from the Weighted by drop-down list. Then check the weighted statistics that you want to create.

5. In the following display, Count, Geometric Mean, Weighted Geometric Mean, and Weighted Mean statistics for the DATETIMEONEMIN analysis column are to be created.
6. Click **OK** to add the requested and any underlying statistics to the grid under the analysis column. The row displays these statistics along with its attributes, such as **Weight By**, **Target Column Name**, **Target Column Description**, and **Target Column Format**. These fields contain the default values that are associated with the statistics. To modify a field on this grid, highlight it, and change it as needed by entering the revision in the field.

7. The following display shows the newly added Count, Geometric Mean, Weighted Geometric Mean, and Weighted Mean statistics that are generated for the DATETIMEONEMIN analysis column.
Figure 8.12  Specify Statistics Window with Newly Added Statistics

How to Modify a Statistic Column
You can modify only the Target Column Name, Target Column Description, and Target Column Format fields on the grid. (The Weight By column cannot be modified.)

To modify a field, enter the revision into the field. The Target Column Name can be any legal SAS column name. However, it must be unique within its table.

Note: For best results, do not change the Target Column Format column. If you do change it, make sure that the value that you enter in the Target Column Format is a valid SAS format.

How to Delete a Statistic Column
To delete a statistic column from the list of statistic columns that are to be created for an analysis column, perform the following steps:

1. Select the statistic. (Deleting a statistic column that uses another (underlying) statistic column does not delete that underlying statistic column.)

2. Click Delete.

Note: If the column that you want to delete is used to calculate another column in this table or a join column in another table, a dialog box is displayed showing where the column is used. You must remove those columns before you can delete this column.

How to Delete Multiple Statistics Columns
In some instances, you might want to delete multiple columns at the same time. For example, you might want to delete all of the statistic columns for a particular analysis
column, or only some of them. You can delete all of the statistic columns for a particular analysis column by either selecting all the statistic columns individually, or by selecting the analysis column itself. Either action accomplishes the same purpose.

However, if your selection of columns to delete includes an analysis column and some, but not all, of the statistic columns for that analysis column, a message is displayed. The message states that you selected conflicting choices and that no columns are to be deleted. The message advises you to select either an analysis column or one or more statistics columns.

Specify Percentiles Columns

About Specifying Percentiles

Percentile measurements in SAS IT Resource Management enable IT organizations to quantify and analyze utilization, availability, performance, and capacity characteristics of IT infrastructure components. These measurements can be compared with other components or other time periods in the infrastructure so that IT organizations can prioritize and resolve current day and potential problems.

Note: Jobs that calculate percentile columns might require longer processing times because the data might have to be read multiple times. For best results, minimize the number of percentile columns that you specify.

On the Specify percentiles page, you can request that multiple percentiles be generated for an input metric. Percentile information is displayed in a grid format, which contains a row for each percentile that is being calculated. The grid contains the following columns: Input Column and Percentiles, Round To, Target Column Name, Target Column Description, and Target Column Format.

Note: Each requested percentile for a given analysis column must use the same precision of granularity, that is, it must specify the same rounding. If you specify a different precision of granularity for the same analysis column, a message is displayed indicating that the granularity will be changed to that of the first analysis column.

Percentiles are calculated from the rounded values using the same guidelines as PROC UNIVARIATE with PCTLDEF=5, which is the default for UNIVARIATE. The calculated percentile value is one of the discrete rounded values, unless the requested percentile position falls between two values. In that case, the calculated value is the average of the two points.

How to Create Percentiles for an Analysis Column

To create percentiles for an analysis column, perform the following steps:

1. Click New, which opens the Add New Percentiles window.

2. In the Select analysis columns panel, check the box next to the analysis column for which you want to specify percentiles. (Checking multiple analysis columns enables you to specify the same percentiles for all the analysis columns that you selected. Otherwise, check an analysis column and specify the percentile characteristics for it individually.)

3. In the Requested percentile field, enter the numeric value of the percentile that you want to calculate. This value applies to all the columns that you checked. The percentile must be greater than or equal to zero and less than or equal to 100.

Note: The zero percentile would be the same as the MINIMUM statistic, rounded to the granularity that is requested for the percentile. The 100th percentile would be
the same as the MAXIMUM statistic, rounded to the granularity that is requested for the percentile.

4. In the **Round to nearest** field, enter the numeric value of the precision of granularity that you want to calculate. This value applies to all the columns that you checked.

5. Click **OK** to add the requested percentiles to the grid. The row displays these percentiles along with their attributes, such as **Round To**, **Target Column Name**, **Target Column Description**, and **Target Column Format**.

**How to Modify a Percentile Column**

You can modify only the **Target Column Name**, **Target Column Description**, and **Target Column Format** fields on the grid. (The **Round To** column cannot be modified.)

To modify a field, enter the revision into the field. The **Target Column Name** can be any legal SAS column name. However, it must be unique within its table.

**Note:** For best results, do not change the **Target Column Format** column. If you do change it, make sure that the value that you enter in the **Target Column Format** is a valid SAS format.

**How to Delete a Percentile Column**

To delete a percentile column from the list of columns that is to be created for an analysis column, perform the following steps:

1. On the grid, select the percentile.
2. Click **Delete**.
   
   **Note:** If the column that you want to delete is used to calculate another column in this table or a join column in another table, a dialog box is displayed showing where the column is used. You must remove those columns before you can delete this column.

**How to Delete Multiple Percentile Columns**

In some instances, you might want to delete multiple columns at the same time. For example, you might want to delete all of the percentile columns for a particular analysis column, or only some of them. You can delete all of the columns for a particular analysis column by either selecting all the columns individually, or by selecting the analysis column itself. Either action accomplishes the same purpose.

However, if your selection of columns to delete includes an analysis column and some, but not all, of the percentile columns for that analysis column, a message is displayed. The message states that you selected conflicting choices and that no columns will be deleted. The message advises you to select either an analysis column or one or more percentile columns.

**Specify Percent Change Columns**

**About Specifying Percent Change**

You can calculate the percent change of a resource’s given statistic or percentile in specified time periods and compare the results from one time period to another. This enables you to see the percent change of the statistic or percentile column for a resource in one time period. You can then compare it to the same statistic or percentile for this same resource in another time period. The percent change metric is useful for capacity planning.
Percent change information is displayed in a grid format, which contains a row for each statistic that is being calculated. The grid contains the following columns: Statistic and Percentile, Weight By, Input Column, Target Column Name, Target Column Description, and Target Column Format.

**T I P** If you want to specify percent change for a column, you must have selected an aging column. SAS IT Resource Management uses that aging column in order to calculate the period-to-period changes for that column.

All statistics, percentiles, percent change, moving statistics, ranks, and computed columns are recomputed each time the Aggregation transformation is executed.

**How to Specify Percent Change for a Statistics Column or a Percentile Column**

To calculate the percent change for a statistic or percentile, perform the following steps:

1. Click New, which opens the Add New Percent Change Columns window.
2. From the list under Select columns, select the statistics and percentile columns for which you want to calculate the percentage of change. Use the arrow to transfer those statistics to the Selected columns.
3. Click OK. The selected columns are added to the Percent Change grid, and you are returned to the Specify Percent Change page.

**How to Modify a Percent Change Column**

You can modify only the Target Column Name, Target Column Description, and Target Column Format fields on the grid. (The Weight By cannot be modified.)

To modify a field, enter the revision into the field. The Target Column Name can be any legal SAS column name. However, it must be unique within its table.

**Note:** For best results, do not change the Target Column Format column. If you do change it, make sure that the value that you enter in the Target Column Format is a valid SAS format.

**How to Delete a Percent Change Column**

To remove the calculation of percent change for a statistics or percentile column, perform the following steps:

1. On the percent change grid, select the statistics or percentile column.
2. Click Delete.

**Note:** If the column is used to calculate another column in this table or a join column in another table, a dialog box is opened that is displayed showing where the column is used. You must remove those columns before you can delete the percent change column.

**How to Delete Multiple Percent Change Columns**

In some instances, you might want to delete multiple columns at the same time. For example, you might want to delete all of the percent change columns for a particular analysis column, or only some of them. You can delete all of the columns for a particular analysis column by either selecting all the columns individually, or by selecting the analysis column itself. Either action accomplishes the same purpose.

However, if your selection of columns to delete includes an analysis column and some, but not all, of the percent change columns for that analysis column, a message is displayed. The message states that you selected conflicting choices and that no columns
will be deleted. The message advises you to select either an analysis column or one or more percent change columns.

Specify Moving Statistic Columns

About Specifying Moving Statistics
Moving statistics enable IT organizations to identify and establish baseline and threshold measurements for the many performance measurements that they want to measure. This statistic can also be used to monitor characteristics of the SAS IT Resource Management system. For example, it can help monitor the growth in the number of systems for which data is analyzed. Similarly, it can help monitor the volume of reports that are created by each SAS IT Resource Management report job (if measures on those items are retained and managed using SAS IT Resource Management).

On the Specify moving statistic page, you can request that multiple moving statistics be generated for a statistic or a percentile. (Moving statistics cannot be created directly on an input column.) The following types of moving statistics can be created:

Moving Average
an arithmetic mean computed on a subset (typically the N-most recent points) of data instead of the entire population of data. Moving averages are used to smooth out short-term fluctuations, and highlight longer-term trends.

Moving Standard Deviation
a standard deviation computed on a subset (typically the N-most recent points) of data instead of the entire population of data.

All moving statistics are recomputed each time the Aggregation transformation is executed.

Moving statistic information is displayed in a grid format, which contains a row for each moving statistic that is being calculated. The grid contains the following columns: Statistic and Percentile, Input Column, Number of Periods, Moving Statistic Type, Target Column Name, Target Column Description, and Target Column Format.

How to Create Moving Statistics for a Statistic or Percentile Column
To create moving statistics for a statistic or percentile column, perform the following steps:

1. Click New, which opens the Add New Moving Statistic Columns window.
2. In the Select columns panel, check the box next to the statistic or percentile column for which you want to specify moving statistics. (Checking multiple statistic or percentile columns enables you to specify the same moving statistics for all the columns that you checked. Otherwise, check a statistic or percentile column and specify the moving statistics and its characteristics individually.)
3. Check the Moving Average box if you want to create a moving average for each of the selected columns. Moving averages are created for all the columns that you checked.
4. Check the Moving Standard Deviation box if you want to create a moving standard deviation for each of the selected columns. Moving standard deviations are created for all the columns that you checked.
5. In the Number of periods field, enter the number of periods for which you want to calculate the selected moving statistic. This value applies to all the columns that you checked.
6. Click **OK** to add the requested moving statistics to the grid. The row displays these moving statistics along with their attributes, such as **Number of Periods**, **Moving Statistic Type**, **Target Column Name**, **Target Column Description**, and **Target Column Format**.

   **Note:** If more than one moving statistic is specified for the same column, a number is appended to the **Target Column Name**. This number is incremented by one for every new moving average that is specified for a column. For example, if you specified a moving average column of name CPUBusyPct_MA, then if another moving average column is requested for CPUBusyPct, then by default it should be called CPUBusyPct_MA1.

### How to Modify a Moving Statistics Column

You can modify only the **Target Column Name**, **Target Column Description**, and **Target Column Format** fields on the grid. (The other columns cannot be modified.)

To modify a field, enter the revision into the field. The **Target Column Name** can be any legal SAS column name. However, it must be unique within its table.

**Note:** For best results, do not change the **Target Column Format** column. If you do change it, make sure that the value that you enter in the **Target Column Format** is a valid SAS format.

### How to Delete a Moving Statistics Column

To delete a moving statistics column from the list of columns that are created for an analysis column, perform the following steps:

1. On the grid, select the moving statistics column.
2. Click **Delete**.

   **Note:** If the column that you want to delete is used to calculate another column in this table or a join column in another table, a dialog box is displayed showing where the column is used. You must remove those columns before you can delete this column.

### How to Delete Multiple Moving Statistics Columns

In some instances, you might want to delete multiple columns at the same time. For example, you might want to delete all of the moving statistics columns for a particular analysis column, or only some of them. You can delete all of the columns for a particular analysis column by either selecting all the columns individually, or by selecting the analysis column itself. Either action accomplishes the same purpose.

However, if your selection of columns to delete includes an analysis column and some, but not all, of the moving statistics columns for that analysis column, a message is displayed. The message states that you selected conflicting choices and that no columns will be deleted. The message advises you to select either an analysis column or one or more moving statistics columns.

### Specify Ranking Columns

#### About Ranking

You can specify ranking for class, ID, statistics, percentiles, percent change, and moving statistics columns. The ranking of data determines the position of the value of a column or a value within a selected group of class columns. You can specify that ranks be
computed on class columns, ID columns, or statistical columns. Only numeric columns can be ranked.

SAS IT Resource Management computes a dense rank, which means that the rank numbers are sequentially numbered, without gaps. The ranks start with 1 and are incremented by 1. Ties receive the same rank. For more information about ranking, see “The RANK Procedure” chapter in the *SAS Viya Utility Procedures Guide*.

Ranks are computed before the calculation of computed columns so that ranks can be used in the calculation of a computed column.

On the Specify ranking page, you can specify the columns that you want to rank and how these columns should be ranked. You can also delete a rank column. Rank columns are displayed in a grid format, which contains a row for each defined rank column. The grid contains the following columns: **Input Column**, **Target Column Name**, **Target Column Description**, **Rank Order**, **Rank Grouping**, and **Completed Days**, which are all initially blank until you add a ranking specification for a column.

*Note:* Jobs that calculate rank columns might require longer processing times because the data might have to be read multiple times. For best results, minimize the number of rank columns that you specify.

**How to Specify Ranking for a Column**

To specify ranking for a column, perform the following steps:

1. Click **New** to open the Add New Rank window.

2. To rank columns over all the data, click the corresponding option. As shown in the following display, the list of columns with this option includes numeric class and ID columns that you selected from the source table. The list of columns also includes the statistics, percentile, percent change, and moving statistic columns that you specified on the previous page.
Then, under **Select columns to rank**, check the columns that you want to rank.

3. Alternatively, to rank columns over specific class columns, click the corresponding option. As shown in the following display, the list of columns with this option includes only the statistics columns that you specified on the previous page.
In the **Rank over the following class columns** box, check the class columns over which you want to rank selected columns.

Then, in the **Select columns to rank** column, check the columns that you want to rank.

**Note:** You can select any class columns over which to rank the selected statistic. However, you should leave at least one class column deselected. The class columns that are not selected are the columns over which the statistic is to be ranked. For example, you might have an aggregation table of average CPU Utilization, and the class columns are DAYDATE, DOMAIN, and MACHINE. If you request a descending rank of Average CPU Utilization using a Rank Grouping of DAYDATE and DOMAIN, then that request would result in a ranking of Average CPU utilization for all machines within the DOMAIN for the given DAYDATE. Thus, the observation where the rank value is 1 would be the machine with the highest average CPU utilization, ranked separately for each unique DOMAIN and DAYDATE combination. Alternatively, if you request a descending rank of Average CPU Utilization using a Rank Grouping of DAYDATE, DOMAIN, and MACHINE, then that request would result in a ranking of Average CPU utilization for a single row of data. That ranking would not be useful.

4. In the **Rank Order** box, click **Ascending** or **Descending**.

**Note:** In a descending rank, the largest value gets a rank of 1. The next largest value gets a rank of 2, and so on. In an ascending rank, the smallest value gets a rank of 1, and the next smallest value gets a rank of 2, and so on.
5. To rank only completed days, check the corresponding box.

   *Note:* This option is available only if the **Apply completed days** option was selected on the Specify aging page of this wizard. Furthermore, if a rank is defined as having completed days, then you cannot disable the **Apply completed days** option, and you cannot disable aging.

6. Click **OK** to add the rank to the list of rank columns.

**How to Modify a Rank Column**

You can modify only the **Target Column Name** and **Target Column Description** fields on the grid. (The **Rank Column**, **Rank Grouping**, and **Completed Day** columns cannot be modified.)

To modify a field, enter the revision into the field. The **Target Column Name** can be any legal SAS column name. However, it must be unique within its table.

**How to Delete a Rank Column**

To delete a rank column, perform the following steps:

1. Select the column that you want to delete.
2. Click **Delete**.

   You cannot delete a rank column if it is used as the source for a join column in another aggregation table. You must first delete the join column from the other table before deleting the rank column.

**CAUTION:**

   Rank columns are often used as filters in information maps. If you remove a rank column that is used as a filter in an information map, then the information map, the information map job, and the report jobs that depend on that filter might fail to run. To avoid processing errors, delete any reference to a deleted rank column in any information map, report, or transformation that uses that column.

**How to Delete Multiple Rank Columns**

In some instances, you might want to delete multiple columns at the same time. For example, you might want to delete all of the rank columns for a particular analysis column, or only some of them. You can delete all of the columns for a particular analysis column by either selecting all the columns individually, or by selecting the analysis column itself. Either action accomplishes the same purpose.

However, if your selection of columns to delete includes an analysis column and some, but not all, of the rank columns for that analysis column, a message is displayed. The message states that you selected conflicting choices and that no columns will be deleted. The message advises you to select either an analysis column or one or more moving statistics columns.

**Specify Join Columns**

**About Join Columns**

The following rules govern the join function:

* Simple aggregations cannot serve as the source of a join column.
* Only ID, statistic, percentile, percent change, moving statistics, and rank columns can be joined from a summarized aggregation.
A simple aggregation (the destination) can join columns from a summarized aggregation (the source) if and only if every class column in the source table exists as a column in the destination table.

A summarized aggregation can join columns from another summarized aggregation if and only if the complete class list of the source table is a proper subset of the union of class and ID list of the destination table.

Note: Jobs that include joined columns might require lengthy processing time. For best results, minimize the number of joined columns that you specify.

Information about join columns is displayed in a grid format, which contains a row for each column that is to be joined. The grid contains the following columns: Source Columns, Target Column Name, Target Column Description, and Target Column Format. The entries in the grid are initially blank.

On the Specify join columns page, you can specify columns from other aggregation tables in this Aggregation transformation to join with columns in this target table.

**CAUTION:**
If you changed the list of class columns for an aggregation table, you might have made the join invalid. This case would break the fourth rule of the rules that govern a join.

Note: The Specify join columns page is available only if there are columns from separate target tables that are eligible for joining.

• If you use the Next button to traverse the pages in the Summarized Aggregation wizard, the Join Columns page does not appear if there are no tables eligible to join.

• If you use the Edit feature to jump directly to the Join Columns page, an error message appears if there are no tables eligible to join.

**How to Specify Join Columns**
To add a join column from an existing table to the table that you are specifying, perform the following steps:


2. Select columns from the list in the Available Columns. Use the arrow to transfer those columns to the Selected Columns panel and click OK. The selected columns are entered automatically into the appropriate cells of the grid, along with their corresponding default values for Target Column Name, Target Column Description, and Target Column Format.

Note: By default, the first character of the name of the resulting join column (the Target Column Name) is the first letter of the aging column of the source table. So the join column default name would be: `<first character of aging column of source table>`_<column name from source table>`.

**How to Modify a Join Column**
You can modify only the Target Column Name, Target Column Description, and Target Column Format fields on the grid.

To modify a field, enter the revision into the field. The Target Column Name can be any legal SAS column name. However, it must be unique within its table.

Note: For best results, do not change the Target Column Format column. If you do change it, make sure that the value that you enter in the Target Column Format is a valid SAS format.
How to Remove Join Columns
To delete join columns, perform the following steps:
1. Highlight the join column in the grid of columns to be joined.
2. Click Delete.

How to Delete Multiple Join Columns
In some instances, you might want to delete multiple columns at the same time. For example, you might want to delete all of the join columns from a particular table, or only some of them. You can delete all of the columns for a particular table by either selecting all the columns individually, or by selecting the table itself. Either action accomplishes the same purpose.

However, if your selection of columns to delete includes a source table and some, but not all, of the join columns for that table, a message is displayed. The message states that you selected conflicting choices and that no columns will be deleted. The message advises you to select either a source table or one or more join columns.

Specify Computed Columns

About Computed Columns
A computed column stores the results of computational tasks. For example, a computed column can be used to convert unit measurements so that all the data uses the same standardized units of measurement. You can add, modify, or delete computed columns on the Add or modify computed columns page. This page is available in the Summarized Aggregation Table wizard or the Simple Aggregation Table wizard. By default, a computed column is numeric.

Note: If you change a computed column, the values for the computed column are recalculated for that column in all rows of the data when the job is executed. (This recalculation is performed even if no new data is added to the aggregation table.) The Specify computed columns page displays a grid that shows the following fields for each computed column: Name, Expression, Description, Length, Type, Informat, and Format.

TIP A computed column called TimePeriod is automatically added to every simple and summarized aggregation table. Its value is always the same as the aging column, and you can refer to TimePeriod instead of referring to the aging column directly. This technique simplifies reporting, especially in those instances where you do not know the name of the aging column. (If no aging is specified for the target table, then the field is set to missing.) The expression for this column is defined when the aggregation wizard is completed. For example, if the aging column of an aggregation table is DAYDATE, the expression for the TimePeriod computed column is DAYDATE and its expression is TIMEPERIOD=DAYDATE;

On the Specify computed columns page, you can create, modify, or delete computed columns.

How to Add a Computed Column
To add a computed column to the aggregation table, you must use the Edit function. (The New and Delete buttons are not available on the Specify computed columns page of the wizard when the aggregation table is being created.)
Right-click the existing aggregation table to which you want to add a computed column. On the Properties dialog box, click Edit. From the list of pages, select the **Computed Columns** entry and perform the following steps:

1. Click **New**. A new line is displayed on the grid that contains default values for the following attributes: name, length, type, informat, and format. (The default value for the name of the column is “Untitled<n>”, where <n> is the nth computed column for this aggregation.)

   ![Figure 8.15 Specify Computed Columns]

   2. Enter the values that you want to use for the **Name**, **Expression**, and **Description** fields. You can enter values for the **Length**, **Type**, **Informat**, and **Format** fields, or you can accept the default values for these fields.

   **Note**: You can use a SAS macro in a formula expression or in the expression for a computed column. The SAS macro definition needs to be available to the SAS session that executes the staging or aggregation job that populates the computed column. For example, you might need to add a new autocall library using the Sasautos SAS option in the SAS configuration.

### How to Modify a Computed Column

To modify a computed column, perform the following steps:

1. Select the column from the drop-down list. You can change the values of this column as needed.

2. In the **Name** field, you can change the name of your computed column. The name of the computed column can be any legal SAS name. It must be unique within the target table.
3. In the Expression field, you can specify a modified computation for this computed column by entering it in this field or by using the Expression Builder function. Double-click in the field and click ... to open the Expression Builder window.

**Figure 8.16** Expression Builder Dialog Box with IT Formulas Tab

Many functions are available from the Functions and Data Sources tabs of this window. In addition, the Expression Builder window provides another tab to assist you in defining the computation for this column—the IT Formulas tab.

- The Functions tab of the Expression Builder window lists a variety of functions, conversions, and other actions that you can specify in your expression. Select the function that you want to use in the expression and click Insert.

- The Data Sources tab of the Expression Builder window lists all the columns that are generated in the aggregation table output. Select the column that you want to use in the expression and click Insert.

For simple aggregations, the Data Source tab displays all the output columns that you selected for the simple aggregation table. For the summarized aggregation table, the Data Source tab displays all the class, ID, statistic, percent change, rank, and join columns that you selected for the summarized aggregation table. In addition, it displays the system-generated LastUpdated, CompletedDay, and ContribCount columns.

All column names that are used in the computation are the output column names. For example, if you choose to use an input column named SYSTEM as a class column, you might rename it MACHINE. Then, if you want to use that column when defining a computed column, you should refer to that column as MACHINE, not SYSTEM.
The IT Formulas tab lists the formulas that you have defined as well as the formulas that are supplied with SAS IT Resource Management. Select the formula that you want to use and click Insert.

An rValue expression is an expression that consists of code that is appropriate only for the right-hand side of an assignment statement. In addition to the conventional rValue expression, SAS IT Resource Management also supports more complex expressions. For example, your expression can use SAS code that might include loops, IF statements, and so on. This code must be written in valid SAS DATA step syntax.

*Note:* You can use a SAS macro in a formula expression or in the expression for a computed column. The SAS macro definition needs to be available to the SAS session that executes the staging or aggregation job that populates the computed column. For example, you might need to add a new autocall library using the SASAUTOS SAS option in the SAS configuration.

When you are satisfied with the expression that you defined, click OK in the Expression Builder window. This action closes that window and places the expression in the appropriate field of the computed column.

*Note:* If invoked from the Filters tab of an Aggregation transformation, the Expression Builder window does not contain the IT Formulas tab. This tab is available only when the window is invoked from the Add or modify a computed column page of the wizards for summarized and simple aggregations.

For more information about the Expression Builder window, click the F1 key or Help from within that window.

4. In the Description field, you can change the descriptive information about the computed column.

5. In the Type field, you can change the type of the computed column. Double-click in the field and use the arrow to display the drop-down list of valid types (either character or numeric). From this list, you can select the appropriate type for this computed column. Fields that are the result of a calculation should be specified as numeric. By default, the computed column is numeric.

6. In the Length field, you can change the length of the computed column. For numeric type columns (not character type columns), this numeric value must be from 2 through 8. (Reducing the length of a numeric computed column might introduce precision errors.) For character computed columns, the length can be from 1 through 32767.

7. The Informat field is not used by the Aggregation transformation.

8. In the Format field, you can change the SAS format of the computed column. Double-click in the field and from the drop-down list of valid formats, select the format for this computed column.

You can also enter a format name if it will be available when you execute the job or when you view the data in SAS.

### How to Delete a Computed Column

Deleting a computed column removes it from the metadata for a table. The column is no longer to be generated when the Aggregation transformation job is run. However, deleting a computed column does not remove the column from the physical tables of aggregated data that have already been generated.
Note: You must use the Edit function to add or delete a computed column. (The New and Delete buttons are not available on the Specify computed columns page of the wizard when the aggregation table is being created.)

To delete a computed column from an aggregation table, right-click the aggregation table. On the Properties dialog box, click Edit. Select the Computed Columns entry and perform the following steps:

1. Select the computed column that you want to delete.
2. Click Delete.

When you have finished working with your computed columns, click Next to continue to the final page of the wizard.

Note: After the job is redeployed and executed, changes to the computed columns will be reflected in the physical table. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.

How to Complete the Specification of the Summarized Aggregation Table

The final page of the wizard displays the details for the summarized aggregation table that you specified. If you are satisfied with your choices, click Finish. Click OK to return to the process flow diagram.

In the metadata, aggregation tables are stored in sorted order, with an asserted SORTEDBY= data set option. The SORTEDBY assertion reflects that the data is stored in the following order:

1. alphabetical list of the remaining class columns
2. aging column

BY-group processing can be performed using the class list, if the BY-group list matches the same SORTEDBY assertion. With SAS IT Resource Management, you can leverage SAS Data Integration Studio to define additional indexes for use where BY-group processing is required. If you require a sorted aggregation table, you can read that table to a SORT transformation and store the resulting table wherever you want.

For information about indexes, see “Indexing an Aggregation Table” on page 195.

Creating Aggregation Tables with the Aggregations through Template Wizard

The Aggregations through Template wizard enables you to create aggregation tables by using supplied templates or user-defined templates.

Note: User-defined templates are tables that are created by users. These tables are located in the /Shared Data/SAS IT Resource Management/IT User-defined Templates/Aggregation folder.

To create an aggregation table with the New Aggregation Table through Templates wizard, respond to the wizard's prompts.

Note: The template that you are using might have join columns that require the creation of dependent tables. When the wizard is invoked, a list of these tables might be...
presented in a dialog box. If you want to bypass the creation of these tables, click Yes. None of the tables that are listed are created.

1. On the Specify location page, you can view the metadata location of the folder within the IT data mart where the newly created table is saved.

   You can override the default value for this folder by clicking Browse. Then select a path to the table from the Select a Location dialog box that displays the metadata directory structure.

   Note: The IT data mart field displays the name of the IT data mart where the job is located. It cannot be modified.

2. On the Select templates page, check the template tables that you want to use to create aggregation tables. The Total number of selected template tables field is updated to reflect the number of template tables that you selected.

Figure 8.17 Select Templates Page

Some staged tables are designed to contain data that is already summarized to an hourly interval. For these tables, you cannot successfully select aggregations that attempt to summarize the data to smaller intervals. When you specify an aggregation table that summarizes data for a time period that is shorter than the source table normally provides, a warning message is displayed. The message states that the aging column cannot be created. In that case, the aggregation table is not created. To avoid this situation, make sure that your source table provides the appropriate level of summarized values for the aggregation that you want to generate. For example, you might want to specify an aggregation table such as FifteenMinAcctTcodeSy. In that case, make sure that the source data (that is, the staged table) is summarized no higher that 15 minutes and import the DATETIMEFIFTEENMINUTE computed column into the staged table. (For information about importing a column into a staged table, see “Modify a Staged Table” on page 130.)

Note: If the templates that you select have a dependency on other templates, an information box is displayed that lists the additional aggregations that are to be created. Click OK to continue.
3. If this aggregation table is the first target table that is specified for this Aggregation transformation, an additional page of the wizard opens. This page prompts you for the physical target location and for information about the SAS library where the data is to be stored. When this page opens, the following fields are already specified with default values. (However, you can modify these fields.)

- The **Name** field contains the name of the library that contains all aggregation tables that are associated with the Aggregation transformation that you are working with. This field can contain up to 60 characters and should be unique within the IT data mart. A value is required in this field.

- The **Description** field contains the information that describes the library. It can contain no more than 200 characters. It is an optional field.

- The **Server** field contains the application server that you specified for the IT data mart that you are working with. The default application server is the SASITRM server. A value is required in this field.

- The **Libref** field contains the name that is temporarily associated with the library. The libref for an aggregation library is a concatenation of AGG and a random number (for example, AGG27040). A value is required in this field.

- The **Path specification** field contains the location where the tables for this library are to be stored. You must specify a location for the tables that is within the IT data mart that is specified in the **IT Data Mart** field.

    Enter this field manually or click **Browse** to select a location from the Select a Directory dialog box that displays the directory structure on the server's file system. A value is required in this field.

4. The final page of the wizard displays the details for the aggregation tables that you specified. If the aggregation job that you specified adds more than 20 tables to an existing job, a warning message is displayed. The message suggests that you might want to remove some tables in order to experience better performance. Click **Yes** to continue to generate the tables. Click **No** to return to the Select templates page, where you can change your selections. If you are satisfied with your choices, click **Finish**.

    Click **OK** to return to the process flow diagram.

    **Note:** Some aggregation templates require other aggregation tables to be created. If so, a dialog box appears that notes the dependency and asking for confirmation before proceeding.

---

**Cloning an Aggregation Table**

Within an Aggregation transformation, if you have defined an aggregation table, you might want to create another one that is similar to it. To do so, you can clone the existing table and modify it as needed. For example, you might have an existing aggregation table for the WeekHourMachineCPU aggregation. If you want to add an aggregation table for MonthHourMachineCPU, it is more efficient to clone and edit the existing aggregation than to create a new one using the Aggregation wizard.

To clone an aggregation table, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to clone. To do so, from the **IT Data Marts** tree, navigate to the IT data mart
that contains the job where the Aggregation transformation is located. Double-click the job to open it on the **Diagram** tab of the Job Editor window.

2. Right-click the aggregation table that you want to clone.

   **Figure 8.18  Aggregation Table Properties**

3. From the drop-down list, select **Clone**. If you are cloning a summarized aggregation table, the Clone Summary Aggregation Table dialog box appears. If you are cloning a simple aggregation table, the Clone Simple Aggregation Table dialog box appears.

   **Note:** The dialog boxes contain the same fields and are specified the same way.

4. The **Name** field contains the following text by default: “the name of the original table Clone”, where n is the nth table that is cloned from the original aggregation table.

   (Optional) Enter a name and a description that are more meaningful to you.

5. The dialog box displays the default values for the column to use for aging, its format, and whether the column represents the date or the datetime. (These values reflect the original table from which you created this cloned table.)

   To change the aging criteria for the cloned table, check the corresponding box. This action enables you to select a different **Column to use for aging**.

   • From the drop-down menu, select the column to use for aging.

   • The **Format** field displays the format for the selected column. It cannot be changed.
• If possible, the system selects the appropriate **Date** or **Datetime** format.

When you specify datetime values, one day of aging extends over 24 hours of data collection. This period might extend over one or more days.

**Note:** If the system cannot determine whether the field represents a **Date** format or a **Datetime** format, both of these options are enabled so that you can select the appropriate one.

• The **SAS table name** field displays the unique name of the physical file that is associated with this new cloned table. It can be changed. However, the new SAS table name must be unique within its associated SAS library.

6. Click **OK** to create the cloned table.

**Note:** If you changed the column used for aging, a message appears that asks whether you are sure that you selected the correct **Date** or **Datetime** format. If your selection is correct, click **Yes**. Otherwise, click **No** and correct the **Format** field.

7. Save the job.

In order for your changes to take effect, you must redeploy the job. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.

---

**Adding a New Column to an Aggregation Table**

**Special Considerations When Adding a New Column to an Aggregation Table**

After an aggregation target table is defined and the ETL job that starts aggregating data is run, you might decide to add additional columns to it. For existing observations in the target table, there might be missing values for the new columns, depending on the column type. These missing values can persist unless additional incoming observations are encountered for that existing class combination. If the change results in missing values for the new aging column in some observations, those observations are immediately aged out at the next ETL.

This is especially important if you change the aging column to a new aging column that is not in the target table. For more information, see “Changing the Aging Column in an Aggregation Table” on page 187.

The following table describes how a newly added column is treated:

<table>
<thead>
<tr>
<th>Type of Added Column</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>A class column that is not in the target table</td>
<td>All pre-existing rows show a missing value for that new class column. (See the following discussion about the special impact on aging columns.)</td>
</tr>
<tr>
<td>An ID column that is not in the target table</td>
<td>All pre-existing rows show a missing value for that new ID column, even though the input record has missing values. This condition persists until a new input observation that has a nonmissing value for the same class combination as an existing row is read.</td>
</tr>
<tr>
<td>Type of Added Column</td>
<td>Result</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>A new statistic that is derived directly from one or more input table columns</td>
<td>All pre-existing rows show a missing value for that new base statistic, even though the input record has missing values. This condition persists until a new input observation that has a nonmissing value for the same class combination as an existing row is read.</td>
</tr>
<tr>
<td>A new percentile</td>
<td>Pre-existing rows might have a nonmissing value under either of these conditions:</td>
</tr>
<tr>
<td></td>
<td>• The new percentile is for the same analysis column and at the same granularity as an existing percentile.</td>
</tr>
<tr>
<td></td>
<td>• A new input observation that has a nonmissing value for the same class combination as an existing row is read.</td>
</tr>
<tr>
<td></td>
<td>Otherwise, the pre-existing rows show a missing value for that new percentile.</td>
</tr>
<tr>
<td>A new statistic that is derived from other statistics, or a new computed column that</td>
<td>Pre-existing rows might have a nonmissing value for the new column if all of the other columns that the calculation depends on are nonmissing. Otherwise, the pre-existing rows show a missing value for that new statistic.</td>
</tr>
<tr>
<td>is derived from other columns</td>
<td></td>
</tr>
<tr>
<td>A new join column</td>
<td>The values depend entirely on the values as they are calculated for the table from which the join column is derived.</td>
</tr>
</tbody>
</table>

**Changing the Aging Column in an Aggregation Table**

Changing the aging column in an existing aggregation table can produce different results depending on whether there are already nonmissing values for the new aging column in the existing table. If the new aging column that you select does not exist in the table, a message appears that enables you to continue with the change or to cancel it. If you continue, all observations are discarded, except for the incoming ones. Some examples follow:

- Data exists for the new aging column

Suppose that the previous aging column is DayDate, but WeekDate is already being kept as an ID variable and therefore has valid nonmissing values. In that case, if the user changes the aging column from DayDate to WeekDate, then no unexpected aging occurs at the next ETL. No aging occurs because the transformation has valid values for WeekDate on which to age the data.

*Note:* However, the next ETL results in fewer observations because the number of class combinations is fewer for WeekDate than for DayDate.

- Data does not exist for the new aging column

Suppose that the change results in a new aging column for which there is no previous data.

For example, the user changes the aging column from DayDate to WeekDate and there was no previous data for WeekDate. In that case, the pre-existing rows are immediately aged out at the next ETL because the pre-existing data has missing values.
values for WeekDate. The transformation cannot invent nonmissing values for WeekDate for those pre-existing rows.

**How to Add a New Column to an Aggregation Table**

To add a new column to an aggregation table, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to modify. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the aggregation table that you want to modify. From the list that is displayed, select **Edit**.

   *Note:* If the aggregation table is not associated with an Aggregation transformation, then the **Edit** option is not available.

3. The first page of the wizard appears. The **Jump to Page** option enables you to display the list of pages that were specified for this table. To go directly to the page that you want to change, select it from the drop-down list. The following display shows the list of pages that are available.

   *Figure 8.19 Jump to Percent Change Page for the DayDisk Summarized Aggregation Table*

   ![Jump to Percent Change Page](image)

   *Note:* To add a column, jump to the page of the wizard where that column is specified. For example, if you want to add a class or ID column, go to the page called Select class and ID columns. Similarly, to add a statistics column, go to the Statistics page, and so on, for the other columns.

4. Select the page that contains the specifications that you want to modify and click **Next**.
5. Modify the contents of the page that you selected. (For information about which fields can be changed, follow the instructions that apply to the creation of the type of table that you want to modify.)

- For information about creating summarized aggregation tables, see “Creating Aggregation Tables with the Summarized Aggregation Table Wizard” on page 160.

- For information about creating simple aggregation tables, see “Creating an Aggregation Table with the Simple Aggregation Table Wizard” on page 158.

Note: If you try to delete a column that is used to create a statistic, percentile, percent change, moving statistic, rank, or join column, a warning message is displayed. The message lists the column, where it is used, and its table name. If a column was deleted using the Columns tab of the Properties dialog box, then the next time the aggregation wizard is opened on that table, a message appears that identifies any columns whose source column is no longer available. Click Yes to delete the columns from the table and continue to edit the table. Click No to keep the columns. In that case, the wizard does not open.

6. Click through the remaining pages of the wizard until the summary page appears.

7. Click Finish to save your changes and return to the process flow diagram.

In order for your changes to take effect, you must redeploy the job. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.

CAUTION:

Do not define a new staged table and use it as the source for an existing Aggregation transformation. Doing so changes the metadata identity of the columns of the source table so that the Aggregation transformation cannot process the source table correctly. If new columns were added to the staged table, you might want to include them in an associated aggregation table. In that case, modify that aggregation table by using the Edit function for that table. (To modify or add a column to an existing staged table, modify the properties of the table or use the Maintain Tables function. For information about modifying a staged table, see “Modify a Staged Table” on page 130. For more information about the Maintain Staged Tables wizard, see “About the Maintain Staged Tables Wizard” on page 84.)

Deleting an Aggregation Table

Delete an Aggregation Table from an Aggregation Transformation

To delete an aggregation table from an Aggregation transformation, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to delete. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the aggregation table that you want to delete.

3. From the drop-down list, select Delete. The table is removed from the Aggregation transformation that is displayed in the process flow diagram. However, the metadata for that table and the library are not deleted from the IT data mart. For information
In order for your changes to take effect, you must redeploy the job. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.

**CAUTION:**
To avoid processing errors, delete any reference to this table, as a source or target for any transformation in any other job. For example, Information Map transformations that use the deleted table as a source table should be deleted.

---

**Delete an Aggregation Table from the IT Data Mart**

To delete an aggregation table from an IT data mart, perform the following steps:

1. Locate the aggregation table that you want to delete. To do so, from the **IT Data Marts** tree, navigate to the IT data mart that contains the job where the aggregation table is generated.
2. Expand that IT data mart and navigate to the aggregation table that you want to delete. Right-click the table.
3. From the drop-down list, select **Delete**.
4. Click **Yes** to confirm that you want to delete this table. The table is removed from the IT data mart. However, the associated library is not deleted.

*Note:* This delete action does not delete the physical table. It deletes the metadata of the table.

**CAUTION:**
Deleting a table can break join columns if the table that you delete is the source for another table.

---

**Erase an Aggregation Table**

Erasing an aggregation table deletes the physical table, its contents, and its metadata. To erase an aggregation table, perform the following steps:

1. In a tree view of SAS IT Resource Management, locate the aggregation table that you want to erase.
2. Right-click the aggregation table that you want to erase. The aggregation job that includes the aggregation table must be closed and currently not in use before erasing.
3. Select **Erase**.
4. Click **Yes** to confirm that you want to erase this aggregation table.

**CAUTION:**
If you erase an aggregation table that serves as a source table in other jobs, then these associated jobs might not execute because they are missing a source table. Simply erasing an aggregation table does not affect the metadata of the associated aggregation or information map jobs. However, if you erase an aggregation table and rerun the aggregation job, then the data for the deleted aggregation table is not created. In addition, the jobs that used that table fail due to a missing source table.
CAUTION:
Do not define a new staged table and use it as the source of an existing Aggregation transformation. To do so changes the metadata identity of the columns of the source table so that the Aggregation transformation cannot process the source table correctly. If new columns were added to the staged table, you might want them to be included in an associated aggregation table. In that case, modify that aggregation table by using the Edit function for that table.

Use the Edit function to add or delete a computed column. (The New and Delete buttons are not available on the Specify computed columns page of the wizard when the aggregation table is being created.)

If you need to modify an aggregation table, for best results do so from within the aggregation job. (If you want to edit an aggregation table that was created by the Simple Aggregation Table wizard, the Summarized Aggregation Table wizard, or the Aggregation through Template wizard, you must first save the job that created that aggregation table.) To modify a simple or a summarized aggregation table, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to modify. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the aggregation table that you want to modify.
From the list of properties that is displayed, select **Edit**.

*Note:* If the aggregation table is not associated with an Aggregation transformation, then the **Edit** option is not available.

3. Use the **Jump to Page** option to go directly to the page of the aggregation wizard that you want to change. Use the drop-down list to display the pages to which you can go directly.
4. Select the page that contains the specifications that you want to modify and click **Next**.

5. Modify the contents of the page that you selected. (For information about which fields can be changed, follow the instructions that apply to the creation of the type of table that you want to modify.)
   - For information about creating summarized aggregation tables, see “Creating Aggregation Tables with the Summarized Aggregation Table Wizard” on page 160.
   - For information about creating simple aggregation tables, see “Creating an Aggregation Table with the Simple Aggregation Table Wizard” on page 158.

   **Note:** If you try to delete a column that is used to create a statistic, percentile, percent change, moving statistic, rank, or join column, a warning message appears. The message lists the column, where it is used, and its table name. If a column was deleted using the **Columns** tab of the Properties dialog box, then the next time the aggregation wizard is opened on that table, a message appears that identifies any columns whose source column is no longer available. Click **Yes** to delete the columns from the table and continue to edit the table. Click **No** to keep the columns. In that case, the wizard does not open.

6. Click through the remaining pages of the wizard until the summary page appears.

7. Click **Finish** to save your changes and return to the process flow diagram.

In order for your changes take effect, you must redeploy the job. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.
Publishing an Aggregation Table as Template

To publish an aggregation table as a template, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to publish as a template. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the aggregation table that you want to publish.

3. From the drop-down list, select Publish. If you selected a summarized aggregation table, the Publish as User-Defined Template - Summarized Summary Aggregation dialog box appears. If you selected a simple aggregation table, the Publish as User-Defined Template - Simple Aggregation dialog box appears.

4. The Name field contains the name of the table that you want to publish.
   (Optional) Enter a name and a description, that is more meaningful to you.

5. In the Location field, accept the default location or click Browse. This action opens the Select a Location dialog box where you can navigate to another location. Select the location that you want to use and click OK.

   Note: The Location field must be the default location or a location that is underneath it.

6. Click OK to create the template.

7. Save the job.

Purging Contents of an Aggregation Table

Purge Data from an Aggregation Table from the Process Flow Diagram

To purge data from an aggregation table, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to modify. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the aggregation table whose data you want to purge.

3. From the drop-down list, select Purge.

4. Click Yes to confirm that you want to purge the data from this aggregation table.

Purge Data from an Aggregation Table on the IT Data Marts Tab

You can also purge the contents of an aggregation table by performing the following steps:
1. Locate the Aggregation transformation that generates the aggregation table that you want to modify. To do so, from the **IT Data Marts** tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located.

2. Right-click the aggregation table whose data you want to purge.

3. From the drop-down list, select **Purge**.

4. Click **Yes** to confirm that you want to purge the data from this aggregation table.

---

### Renaming an Aggregation Table

**CAUTION:**

You can change the name of the physical aggregation table only by using the **Edit Aggregation wizard**. Changing the name of the table on the **General** tab of the Properties dialog box does not change the name of the physical table.

To rename a simple or a summarized aggregation table, perform the following steps:

1. Locate the Aggregation transformation that generates the aggregation table that you want to modify. To do so, from the **IT Data Marts** tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the **Diagram** tab of the Job Editor window.

2. Right-click the aggregation table that you want to rename.

3. From the drop-down list, select **Edit**. This action opens the Summarized Aggregation Table wizard or the Simple Aggregation Table wizard.

4. To change the name of the table in the metadata, enter the new name of the aggregation table in the **Name** field on the first page of the wizard.

   To change the name of the physical table, enter the new name of the aggregation table in the **SAS Table Name** field.

5. Click **Next** to proceed through all the pages of the wizard. Then click **Finish**.

6. Click **OK** to save your changes and return to the process flow diagram.

**Note:** This task changes the name of the table in the metadata. The name of the physical SAS data set is changed when you click **Finish**. In order for your changes to take effect, you must redeploy the aggregation job. In addition, even though the metadata linkage to that renamed table still exists, it is advisable to redeploy the information map job that uses the renamed table as input. For more information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.

---

### Indexing an Aggregation Table

#### Introduction to Indexes

An index is a component of a SAS data set that enables SAS to access observations in the SAS data set quickly and efficiently. The purpose of SAS indexes is to optimize WHERE clause processing and to facilitate BY-group processing. SAS IT Resource Management supports indexes for summarized and simple aggregation tables.
• Summarized Aggregations: You can create additional indexes manually.

**CAUTION:**
Do not create unique indexes for summarized aggregation tables.

• Simple Aggregations: Indexes are not automatically created for input columns that are specified for aggregation tables. However, you can create indexes manually.

For more information about indexes, see *SAS Data Integration Studio: User's Guide* or the Help for SAS Data Integration Studio.

**How to Access an Index**

Indexes are physically created when the aggregation job is run. To access an index, perform the following steps:

1. Right-click the aggregation table and select **Properties** from the drop-down list.
2. Select the **Indexes** tab.

The left panel of the **Indexes** tab contains a list of the columns that can be used to index the data.

**Note:** Any columns that are in the table can also be in the index. For a simple aggregation table, these columns were previously specified as input columns for the table. For a summarized aggregation table, these columns were previously specified as class, ID, statistic, rank, percent change, join, or computed columns for the table.

The right panel contains the indexes that are specified for this aggregation.

In the following display, an index called TimeIndex has already been created. A new index called Index2 is in the process of being created.

**Figure 8.22 Indexes Tab of an Aggregation Table**

From the **Indexes** tab, you can create, rename, and delete indexes.

**Create an Index**

To add an index, perform the following steps:
1. Navigate to the **Index** tab of the aggregation table for which you want to create an index. For information about how to access an index, see “How to Access an Index” on page 196.

2. Click **New**. An index entry (Indexnr) opens in the right panel.
   
   *Note:* In the preceding display, the new index was given the default name Index2.

3. From the left panel, select the columns that you want to index. An index must have at least one column.

4. Use the right arrow to include them under the index entry in the right panel.

5. Do not specify that the values of an index are to be unique, because this might interfere with the processing of the transformation.

6. To specify that the values of an index should not include missing values, highlight the index in the right panel and click **No missing values**.

7. When you finish specifying the columns that you want to index, you might want to rename the index so that it is more informative. Otherwise, click **OK** to save your changes and return to the process flow diagram.

   *Note:* At this time, if the name of a simple index is not the same as the column that is being indexed, a message box appears. It asks whether you want to change the name to conform to the name of the column. You must click **Yes** and change the name. Then you can save the index.

In the following display, the new index, called Index2, is specified for the column Machine. It contain only unique values and does not contain missing values.

*Figure 8.23  Newly Created Index Named Index2*

---

**Delete a Column from an Index**

To delete a column from an index, perform the following steps:

1. Navigate to the **Index** tab of the aggregation table that you want to work with. For information about how to access an index, see “How to Access an Index” on page 196.
2. From the right panel, expand the indexes that are displayed. Select the column that you want to delete.
3. Click Delete.
4. Click OK to save your changes and return to the process flow diagram.

Delete an Index

To delete an index, perform the following steps:
1. Navigate to the Index tab of the aggregation table whose index you want to delete. For information about how to access an index, see “How to Access an Index” on page 196.
2. Select the index that you want to delete.
3. Click Delete.
4. Click OK to save your changes and return to the process flow diagram.

Rename an Index

To rename the index, perform the following steps:
1. Navigate to the Index tab of the aggregation table whose index you want to rename. For information about how to access an index, see “How to Access an Index” on page 196.
2. Right-click the index entry.
3. From the drop-down list, select Rename.
   
   Note: From this drop-down list, you can also add and delete indexes.
4. Enter the new name of the index. If the index contains only one column, it is a simple index. For simple indexes, the name of the index must be the same as the column that is being indexed.
   Press the Enter key.
5. Click OK to save your changes and return to the process flow diagram. At this time, if the name of a simple index is not the same as the column that is being indexed, a message box appears. It asks whether you want to change the name to conform to the name of the column. You must click Yes and change the name. Then you can save the index.

Working with Aggregation Transformations

Properties of an Aggregation Transformation

To access an Aggregation transformation, from the IT Data Marts tree navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window. Right-click the Aggregation transformation and select Properties.
Note: SAS IT Resource Management does not support the Propagate columns function that is listed on the Properties dialog box. Do not use the Propagate columns action. Column mappings must be performed only within the Aggregation transformation. To do so, in the Job Editor window, select the target (output) table that you want to modify. Right-click Edit to modify the table and its columns.

The Properties dialog box appears. It consists of the following tabs:

- The General tab contains the identifying information about the transformation. The fields on this tab can be modified.

The following display shows the General tab of an aggregation table.

**Figure 8.24 General Tab of an Aggregation Transformation**

For items in the preceding display, the following definitions apply:

- **Name** identifies the name of the Aggregation transformation.

- **Description** describes the Aggregation transformation.

- The ITRM Options tab enables you to view, add, modify, and delete filters for an Aggregation transformation. It also enables you to specify that the Aggregation transformation should purge data from the source table after the Aggregation transformation has executed successfully.

**Figure 8.25 ITRM Options Tab of an Aggregation Transformation**
Name
The Name column displays the list of filters that are available for an Aggregation transformation. (You can apply only zero or one filter to an aggregation target table.) A value is required in this field.

Expression
The Expression field displays the definition or the calculation of the filter. A value is required in this field.

New
Clicking the New option adds a new row in the table that displays all the available filters. This action enables you to specify a filter that can be applied to a table that is read into an Aggregation transformation.

Delete
Clicking the Delete option deletes the selected filter.

Purge source table after the successful execution of this transformation
Checking the Purge source table after the successful execution of this transformation option removes the data from the source table after the aggregation tables are processed.

• The Options tab on the Aggregation transformation Properties dialog box both enables you to view and specify the options that pertain to the Aggregation transformation. The options that are marked with an asterisk (*) require a value.

Select Additional Options in the left panel to view and specify the following options:
• The Reset to defaults button sets all the options for the Aggregation transformation to the default values.
• The Create SYSLAST macro variable option specifies whether to create the SYSLAST macro variable to hold the name of the output table.
  Use the down arrow to select Yes or No. The default value for this option is Yes.
• The Generate indexes on target tables option specifies whether to automatically generate the code that creates the target table indexes.
  Use the down arrow to select Yes or No. The default value for this option is Yes.
• The Use formats and informats in column definitions option specifies that the generated code for this Aggregation transformation is to include column definitions with format and informat information.
  The value for this option is Use job level setting. No other value is possible for this option.
• The System options option enables you to specify additional options in an OPTIONS statement. The options must be separated by spaces.
• The Collect diagnostic messages option specifies whether to generate code for diagnostic messaging for this transformation.
  Use the down arrow to select Yes or No. The default value for this option is No.

Select Checkpoint in the left panel to view and specify the following options:
• The Assign as restart-point option specifies whether this Aggregation transformation should be the first transformation that is executed when the job is restarted.
  Use the down arrow to select Yes or No.
The **Run this transformation always when restarting** option specifies whether this Aggregation transformation should always be run when the job is restarted. (The **Assign as restart-point** option obviates the necessity for this option.) Use the down arrow to select **Yes** or **No**.

- The **Code** tab contains the code that is generated for the transformation.
- The **Precode and Postcode** tab contains information about user-written code that might be inserted at the beginning or the end of the transformation.
- The **Parameters** tab contains information about prompts.
- The **Notes** tab contains areas where you can annotate the table.
- The **Extended Attributes** tab contains a custom property that is not part of the metadata for the transformation.

The following display shows the **Extended Attributes** tab of an aggregation table.

**Figure 8.26  Extended Attributes Tab of an Aggregation Transformation**

<table>
<thead>
<tr>
<th>#</th>
<th>Field Name</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>newAttribute</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For items in the preceding display, the following definitions apply:

- **Un** adds a row to the attribute table. A number and a default name are provided, but you must enter the value and description.

- **Up** if present, enables you to reorder rows by moving a selected row up in the table.

- **Down** if present, enables you to reorder rows by moving a selected row down in the table.

- **Delete** deletes a selected attribute from the list.

- **#** specifies the number of the extended attribute.

- **Field Name** specifies the attribute name to be defined.

- **Value** specifies the value for the attribute that is specified in the **Field Name** column.

- **Description** describes the attribute and value.
Delete an Aggregation Transformation from a Job

A job can consist of multiple transformations. An Aggregation transformation can consist of multiple aggregations, each generating an aggregation table. To delete an Aggregation transformation from a job, perform the following steps:

1. Locate the Aggregation transformation that you want to delete. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the box that represents the Aggregation transformation that you want to delete.

3. From the drop-down menu, select Delete.

Note: If you delete an Aggregation transformation, the target tables that were populated by those aggregations are not deleted. However, the tables are no longer updated.

Rename an Aggregation Transformation

1. Locate the Aggregation transformation that you want to rename. To do so, from the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Right-click the Aggregation transformation box.

3. From the drop-down menu, select Properties.

4. On the General tab, enter the new name of the Aggregation transformation.

5. Click OK to save your changes and return to the process flow diagram.

Note: Renaming an Aggregation transformation does not rename the aggregation tables that it generates.

Working with Aggregation Transformation Filters

About Aggregation Transformation Filters

A filter can be used to limit the amount of data that is read into an individual aggregation table. You can define a filter to be used in an Aggregation transformation, modify or edit the filter, and delete it from an Aggregation transformation. A filter that is specified for an Aggregation transformation can be applied to any of the aggregation tables that are being specified in the Aggregation transformation. However, the filter does not affect any of the data that is already in the tables that were created or updated before the application of the filter. If you define or modify a filter for an Aggregation transformation, or delete a filter from an Aggregation transformation, the existing aggregation tables are not automatically regenerated.

Note: Filters are used only when data is read into the aggregation table. If you modify a filter, the data that is already in the table remains unchanged.
After a filter has been added to an Aggregation transformation, it can be applied to the input of any aggregation table within that transformation. For both the Simple Aggregation Table wizard or the Summarized Aggregation Table wizard, you can select an input filter on the Select filter and column for data duplication page of that wizard. When you are using the Aggregations through Template wizard, if the aggregation that you select uses a filter, it is added to the specification automatically.

**Access the ITRM Options Tab on the Properties Dialog Box of an Aggregation Transformation**

To define, modify, or delete a filter for an Aggregation transformation, you must first access the ITRM Options tab on the Properties dialog box of that Aggregation transformation. To do so, perform the following steps:

1. From the IT Data Marts tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located.
2. Double-click the job to open it on the Diagram tab of the Job Editor window, and locate the appropriate Aggregation transformation.
3. Right-click the Aggregation transformation. From the drop-down list, select Properties.
4. Select the ITRM Options tab to open the grid of input filters. The List of Filters group box displays the name and expression of input filters that are defined for this Aggregation transformation.

**Define a Filter for an Aggregation Transformation**

To define an input filter for an Aggregation transformation, perform the following steps:

Access the ITRM Options tab on the Properties dialog box of the Aggregation transformation for which you want to define a filter. To do so, see the preceding topic.

1. Click New to display a new line in the grid on which you can enter a new filter. The default name of this filter is "Untitledn," where n is the nth filter that exists for this Aggregation transformation.
The following display of the **ITRM Options** tab shows that a new filter is being defined for the SMF Jobs Aggregation.

**Figure 8.27 List of Filters Group Box**

2. Enter the name of the filter. Consider giving the filter a name that is unique within this Aggregation transformation.

3. Enter the expression that specifies the filter. You can enter the expression directly in this field, from a formula, or by using the Expression Builder functionality. For information about how to use this functionality, see “About the Expression Builder” on page 206.

4. If you want to purge the source table upon successful creation of aggregation tables, click the corresponding check box.

5. When you are satisfied with the definition for the filter, click **OK** to save your work and return to the process flow diagram.

**Delete a Filter from an Aggregation Transformation**

To remove a filter from an Aggregation transformation, you must first remove the filter from all the aggregation tables that use it. (For information about how to do so, see “Delete a Filter from an Aggregation Table” on page 205.)

Access the **ITRM Options** tab on the Properties dialog box of the Aggregation transformation from which you want to delete a filter. To do so, see “Access the ITRM Options Tab on the Properties Dialog Box of an Aggregation Transformation” on page 203. Then perform the following steps:

1. Select the filter that you want to delete.
2. Click **Delete**. If the filter that you selected is used in another table, a warning message is displayed that lists the tables where the filter is used. In that case, you must delete the filter from those tables.

3. Click **OK** to save your changes and return to the process flow diagram.

*Note:* In order to apply the changes that you made, you must redeploy the jobs that use that filter. For information about deploying jobs, see “Redeploy All Jobs on the Server” on page 384.

### Delete a Filter from an Aggregation Table

An aggregation filter that is being used by an aggregation table cannot be deleted from an Aggregation transformation. If you attempt this action, a message box appears that identifies the aggregation tables that are using the filter. To delete the input filter from the Aggregation transformation, you must first remove it from all aggregations where it is being used.

To remove a filter from an aggregation table, perform the following steps:

1. From the **IT Data Marts** tree, navigate to the IT data mart that contains the job where the Aggregation transformation is located. Double-click the job to open it on the **Diagram** tab of the Job Editor window.

2. Right-click the aggregation table that uses the input filter. From the drop-down list, select **Edit**.

3. The first page of the wizard appears. Use the **Jump to Page** option to go directly to the page of the wizard where you can delete the filter. From the drop-down list, select **Apply Filter** and click **Next**.

4. In the **Select filter** field, the drop-down list shows the filters that can be applied. You can choose another filter to apply to the table, or else the **(None)** option, which removes the filter from this table.

   *Note:* Only one filter can be applied to an aggregation table.

5. Click through the remaining pages of the wizard until the summary page displays.

6. Click **Finish** to save your changes and return to the process flow diagram.

### Modify a Filter of an Aggregation Transformation

To modify or edit a filter that is associated with an Aggregation transformation, perform the following steps:

1. Access the **ITRM Options** tab on the Properties dialog box of the Aggregation transformation for which you want to modify a filter. To do so, see “Access the ITRM Options Tab on the Properties Dialog Box of an Aggregation Transformation” on page 203.

2. Select the filter that you want to modify. You can change the name and the expression of the filter. You can also change the specification about purging the input table after the aggregation tables have been created.

   • To change the name of the filter, select the **Name** field of the filter to highlight it. Then enter the new name of the filter.

   • To change the expression, select the **Expression** field to highlight it. Then enter the modified expression that specifies the filter. You can enter the expression
directly in this field or you can use the Expression Builder functionality. For information about how to work with the Expression Builder in SAS IT Resource Management, see “About the Expression Builder” on page 206.

• To change the specification about purging the input table after the aggregation tables are created, click the corresponding check box. (A checked box means that the source table is to be purged.)

3. When you have finished modifying the filters, click **OK** to save your changes and return to the process flow diagram.

**About the Expression Builder**

To invoke the Expression Builder, double-click the **Expression** field.

*Figure 8.28 Invoking the Expression Builder*

Then, double-click the icon that contains the ellipsis (...). The Expression Builder window appears and enables you to specify a filter.

*Note:* When invoked from the Add Filter dialog box, the Expression Builder window consists of two tabs: **Functions** and **Data Sources**.
Figure 8.29  Expression Builder Window with Functions Tab Selected
The Data Sources tab of the Expression Builder window lists the columns of the table that is the input to this Aggregation transformation.

Figure 8.30  Expression Builder Window with Data Sources Tab Selected

You can select any of these columns from the list of data sources to be an operand in the expression that you are building.

For information about the Expression Builder window, click the F1 key or Help from within that window.

Note: The syntax of the expression that specifies the filter must conform to the rules for an IF statement. The expression should result in a nonzero value for true and zero value for false. (Do not code the word IF; code the expression only.) Certain operations that are valid only in a WHERE clause fail if they are used in a filter. For information about the IF and WHERE statements, see the SAS Viya Statements: Reference.

When you are satisfied with the expression, click OK in the Expression Builder window to close that window and place the expression in the appropriate field of the filter.
Overview of Exception Analysis Processing

SAS IT Resource Management provides the ability to define, detect, evaluate, and report on conditions in the data that are statistically exceptional. Exception analysis systems notify users about potential conditions of concern in a proactive way.
SAS IT Resource Management exception analysis processing enables users to accomplish the following objectives:

- organize data sources for the detection of exceptional conditions
- describe the statistical behaviors that are indicative of IT anomalies
- prescribe recommended actions to correct the anomaly
- distribute information about the anomaly to responsible parties

Exception condition might include indicators of anomalies such as the following:

- free memory below a designated threshold more than 15 times in a row
- disk queues that are 2 standard deviations or more greater than those observed over the past 2 months
- instances where a machine's CPU is greater than 85% busy for more than 50% of the observations evaluated for a particular machine

The SAS IT Resource Management exception analysis process examines columns of source data. Typically, the source data is a staged table. However, it can be any table (including an aggregation table) that users need to examine for exceptional conditions.

*Note:* The source data cannot be an information map.

The exceptional conditions that you define for your site can be evaluated for groupings of data that you specify.

---

**How to Use the Exception Analysis Feature**

The exception analysis feature is specified within a job that contains an Exception transformation. The Exception transformation can be generated in two ways:

- automatically, as a transformation within a job that is created by the Adapter Setup wizard or the Add Domain Category wizard.

If the wizard is creating jobs for an adapter and domain category for which exception definitions have been created, then an exception job is also created. The exception job uses a staged table as input and generates a target exception table. Exception jobs are not created by the Adapter Setup wizard for aggregation tables.

You can review the specifications of the exception definition by navigating to `Folders ➔ Shared Data ➔ SAS IT Resource Management ➔ Exception Definitions`. Select the definition and review the descriptive information that is displayed at the bottom of the window.

- manually, as a transformation within a job that you create.

To do so, perform the following tasks:

1. Create a new job.
2. Add an Exception transformation to the job.
3. Determine what input source table you want to use and add it as a source table to the transformation. (The source table can be any SAS table.)

*Note:* Column names in the input table that have a double-underscore (`__`) prefix might conflict with temporary variables that are used in Exception transformation processing.
4. Designate what data should be kept for any detected exceptional conditions by adding target (output) tables.

5. Determine what exceptional conditions you want to detect.
   - You can select from a supplied set of predefined exception definitions that are located at Folders $\Rightarrow$ Shared Data $\Rightarrow$ SAS IT Resource Management $\Rightarrow$ Exception Definitions.
   - You can specify the exceptional conditions that you want to detect by using the New Exception Definition wizard. This wizard can be accessed from the Exception transformation.

6. Specify whether exception reports should be generated.
   Specify whether you want to trigger alerts.

7. Run the job that contains the Exception transformation.

8. Review the reports and alerts that might be triggered by the job. Take the appropriate actions.

For more information, see “About the Exception Transformation” on page 214.

---

### How Are Exceptions Evaluated?

#### Overview of the Exception Evaluation Process

Exceptions are identified by evaluating the data in the input table, which can be filtered, using the criteria specified in the exception definitions that are listed for the transformation. Exceptions that are identified are written to the target exception table. (You can also specify that more detailed information be written to the exception condition table). For information about how to specify an exception, see “Working with the Exception Transformation” on page 215.

#### Filtering Data for the Exception Evaluation Process

The data is first filtered according to any specifications in the Exception transformation’s Filters tab. The filter can be based on a user-specified expression such as a list of resources that you are interested in. The following expression is an example of this type of filter:

\[
\text{MACHINE IN ('one', 'two', 'three')}
\]

The filter can also specify other user requirements such as filtering by router type, or excluding time periods that are not of interest. The following expression is an example of this type of filter:

\[
\text{DAYOFWEEK}='Sat' \text{ AND DAYOFWEEK}='Sun'
\]

The Last Time Periods field can also be used to filter the incoming data.

If a filter is not defined, then all the input data is considered for evaluation.

#### Evaluating the Exception Definition

After the data is filtered, each observation is evaluated using the exception expression from each of the exception definitions in the transformation. For each incoming
observation (of the filtered data), the exception expression is determined to be either true or false for each exception definition.

At this point, observations for which the expression is true are only potential occurrences of an exception. This is because there are grouping and occurrences attributes of the exception definition that factor into whether an exception is found or not. These values affect whether an exception has been detected:

- Grouping is specified on the Specify Grouping page of the Exception Definition wizard.

  Group By columns define the grouping that organizes the data to evaluate. After the grouping data is evaluated, a set of potential exceptions is identified. If no grouping is specified, then the entire incoming data is evaluated as a single group.

  *Note:* In addition, if no Group By column is selected, “For All Data” is displayed on the overview report, rather than a specific by group values, if that report is generated.

- The occurrences attribute of the exception definition is used to evaluate any potential exceptions to determine whether actual exceptions exist. The occurrences value is specified on the top part of the Occurrences and Exception Type page of the Exception Definition wizard. The occurrences part of the page is outlined in red in the following display:

  Figure 9.1  Occurrences Part of the Occurrences and Exception Type Page of the Exception Definition Wizard

  ![Figure 9.1](image-url)

*Processing Exceptions*

An exception is flagged only if both the exception expression and the occurrences specification are satisfied.

If the criteria of an exception definition are met, one observation is written to the exception table, which is considered to be one exception. At the same time, for that group, all observations for which the expression is true are written to the exception
condition table. (If you have not specified an exception condition table, this information is written to an internal work table.) If no exception is found for a given group, then nothing is written for the group to either table, and nothing further is done for that group.

For example, suppose that the expression was true for 5 observations in a group for a particular exception definition. However, the Occurrences section of the exception definition specified a **Percentage of observations in the selected group** of 25%. If a group consisted of 25 observations, and the expression was true for 5 observations (which is 20% of the group), the criteria for an exception are not met. Therefore, no exception would be found. Because no exception was found, the following statements are applicable:

- No observation is written to the exception table.
- No observations are written to the exception condition table, if the creation of this table was specified.

However, using the same example, imagine if the expression was true for 7 observations. In this case, an exception would be found, because 28% is above 25%. Because an exception was found, the following statements are applicable:

- One observation is written to the exception table.
- Seven observations are written to the exception condition table, if it was specified.

### Handling Missing Values

**Missing Values in the Constant Threshold, Other, Range, and Statistic Bounds Types**

If an observation has missing values for any numeric columns that are specified in the expression, then the observation is skipped before the data is evaluated. (This does not apply to character columns with missing or blank values.)

For example, suppose the exception definition has these characteristics:

- Occurrences: 3 in a row
- Type: Constant
- Analysis column: AVENQUEMAX
- Expression: AVENQUEMAX > 1

If the incoming observations have the pattern of missing values that is shown in the following table, then an exception is found. The exception is found because the observation at 01Jan2013:00:30 is omitted before evaluation (due to a missing value for AVENQUEMAX). Thus, three observations in a row are detected where AVENQUEMAX > 1.

<table>
<thead>
<tr>
<th>Datetime</th>
<th>AVENQUEMAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>01Jan2013:00:00</td>
<td>1.234</td>
</tr>
<tr>
<td>01Jan2013:00:15</td>
<td>1.329</td>
</tr>
<tr>
<td>01Jan2013:00:30</td>
<td>.</td>
</tr>
<tr>
<td>Datetime</td>
<td>AVENQUEMAX</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>01Jan2013:00:45</td>
<td>1.002</td>
</tr>
</tbody>
</table>

*Note:* A value of ‘.’ for a numeric column is the standard SAS way of denoting a missing value.

**Missing Values in the Free-Form Type**
For free-form exception definitions, there is no automatic detection of missing values. Because you supply the complete form of the expression, you are also responsible for whatever treatment of missing values that is appropriate to the task.

---

**About the Exception Transformation**

The Exception transformation provides a user interface to find exceptional conditions or anomalies in the data. The Exception transformation is invoked from within a job.

*Note:* You can set up the Exception transformation in a new job or you can include the Exception transformation in an existing job.

After adding the Exception transformation to a job, right-click the transformation. This action provides access to its properties and to various other functions such as creating an exception definition or selecting a supplied exception definition.

The Exception transformation enables you to organize and describe how to examine the input source table to specify the conditions that are indicative of exceptional behaviors within the IT infrastructure. When exception jobs run and the criteria of exception definitions are satisfied, the Exception table is created. If specified, the exception condition table is also created. These tables can be used for processing at a later time.

In addition, an overview report is generated, along with individual reports for each exception that is discovered. These reports are optional, and if specified, they are published to the SAS Content Server and can be viewed in ITRM Report Center. (The Group By variables that are specified in the exception definition are used as BY variables for accessing reports in ITRM Report Center.)

*Note:* An exception job with one or more exception definitions always generates an overview report. However, if no exceptions are found, no individual reports are generated.
Working with the Exception Transformation

Set Up the Exception Transformation

To set up the Exception transformation manually, perform the following actions.

1. Navigate to the job in the IT Data Marts tree where you want to locate the Exception transformation. Double-click the job to open it on the Diagram tab of the Job Editor window.
   
   **TIP** You can create a new job for this purpose or use an existing job.

2. Navigate to the Transformations tree and expand SAS IT Resource Management. Drag and drop the Exception transformation onto the process flow diagram.

3. Locate your selected source table and then drag and drop it onto the process flow diagram. Use the cursor to connect the table to the left side of the exception image.
   
   **TIP** A staged table is typically the source table for Exception transformations. However, the source table can be any physical table or view that has been defined in metadata.

   The name of the source table can contain a maximum of 60 characters.

4. Designate what data should be kept by adding target tables. You must specify the exception table. You can also specify the creation of an exception condition table. For more information about the exception and exception conditions tables and their contents, see “Exception and Exception Condition Tables” on page 237. For more
information about specifying the target tables, see “How to Specify an Exception Table” on page 240.

5. Right-click the Exception transformation image to display the drop-down menu.

6. Select Properties. The following display appears:
Specify the Properties of the Exception Transformation

1. On the **General** tab, you can modify the following information about the table.

   **Name**
   identifies the name of the Exception transformation that you are specifying. The default value for this field is **Exception**.

   **Tip** Enter a name that describes and distinguishes this from other Exception transformations.

   **Description**
   describes the Exception transformation that you are specifying. It is useful to include, at a minimum, the following information:
   - the Input table: Adapter_TableName
   - Measures: Measure name
   - Purpose: Summary of the exception definition and its purpose

2. The **Filters** tab enables you to limit the amount of data that is read into an Exception transformation. (Filtering occurs before exceptions are evaluated.)

   You can specify the following information:
   - In the **Expression** field, enter the combination of functions or mathematical operations that define the filter. Click **Expression Builder** to facilitate entering the text of the expression.

   ![Figure 9.3 Filters Tab of the Exception Properties Dialog Box](image)

   - In the **Maximum number of individual exceptions to be processed** field, enter a numeric value to limit the number of exceptions that you want to process.

   If the exception triggers more exceptions than the **Maximum number of individual exceptions to be processed**, the Exception transformation issues a
warning and stops searching for other exceptions. For example, if the limit is set
to 100, the 1st through 100th exceptions that are found are recorded normally,
and processing continues. If another exception is detected, the following warning
is displayed:

WARNING: The maximum number of individual exceptions to be
processed, 100, was exceeded; stopping evaluation.

The input data is not evaluated for any additional exceptions.

• Check the **Apply “No Limit” on the number of exceptions to be processed**
  box to process all exceptions that are discovered.

  **Tip** For best results, leave this box unchecked. If it is checked and an
  exception definition results in many thousands of exceptions, the job might
  run for a long time and exceed disk space allocations.

• In the **Last time periods** field, enter the number of previous periods that you
  want to evaluate for exceptions. (This field is applicable only for simple or
  summary aggregation tables that specify an aging column. The aging column
  values define what is considered to be a time period.)

If the field is blank or zero, no time period sub-setting is performed.

*Note:* The last $N$ time periods are evaluated over all of the data. They are not
evaluated separately by group. (If a filter is specified, then the time periods
are calculated over all of the data that passes the filter criteria.) The time
periods are calculated by evaluating distinct values of the **TimePeriod**
column in the source aggregation table. Therefore, if you ask for the latest 5
time periods, the last 5 time periods are evaluated for the data as a whole. If
you specify **Group BY** columns, some groups might not have any data for
those specific 5 time periods. For example, this can occur in situations where
occasionally machines dynamically drop in and out of the data stream.

3. On the **Report Server** tab, you can specify the name of the SAS Content Server and
the path on that server to which exception reports are published. These choices are
required when reports are generated. (Generating reports is the default behavior.)

• The default value for this field is **SAS Content Server**. Use the drop-down
  arrow to display and select the other choices.

• The **Repository folder path** is the location in the SAS Content Server where
  exception reports are published.

  *Note:* Use the **Administration** workspace of ITRM Report Center to add or
delete a repository folder path. Do not edit the path. (If you need to change
the path, delete it and then add the correct path in the **Administration**
workspace of ITRM Report Center.)

4. The **Report Parameters** tab enables you to specify information about your reports.

  **Tip** If you do not want to generate reports, use the drop-down list to set the
  **Generate exception reports** option to **No**. Then you do not have to specify any
  additional fields on the **Report Parameters** tab.

You can specify the following information:

• **Style template** specifies the name of the style template that is used by all of the
  graph reports that the Exception transformation creates. The style template
determines graph colors and other attributes inside the graph portion of a report.
You can use the standard style template that SAS IT Resource Management
provides (named **ITRMDefault**) or create your own style template that includes

**Note:** The content, report titles, and footnotes of the individual reports that are generated by the Exception transformation honor the style template that you specify. This style sheet does not affect the overview report.

- **Location for style sheet** specifies the cascading style sheet (.css file) that is used when viewing a report. It controls colors and other attributes outside of the graph portion of a report.

Any of the following location types are valid values for this field:

- a full URL to the style sheet on a specified server (such as `http://<server>:8080/<folder name>/<file name of the cascading style sheet>`).
- a URL to a style sheet on all the clients where the web browser is initiated (such as `file://c:/programfiles/<folder name>/<file name of the cascading style sheet>`).
- a relative URL to the style sheet on the middle tier where the graphs are installed (such as `/<folder name>/<subfolder name>/<file name of the cascading style sheet>`). The option to use only the relative path provides portability of this value. For example, the name or location of the middle tier might change. If it does, the location value does not need to change if the folder names in the middle tier remain the same.

The default value (`/SASContentServer/repository/default/sasdev/ITRM/styles/ITRMDefault.css`) provides a path to the default style sheet for SAS IT Resource Management reports. You can create a style sheet that includes your own custom colors, logos, and visual design. For more information, see “About Templates and Style Sheets” in Chapter 8, “Working with Report Jobs and Performance Report Transformations,” in the *SAS IT Resource Management 3.8: Reporting Guide*.

- The **Override location for temporary physical files on server** field specifies temporary disk space for storing reports that are generated by a report job. After the reports have been published to the SAS Content Server, these files and any associated folders are deleted. The default value for this field is blank.

- **Generate exception reports** specifies whether to generate exception reports. The default value for this parameter is **Yes**.

The **Report Parameters** tab also enables you to reset the parameter values to their original default values. To do so, select **Reset** next to a specific field to reset the value for that parameter to the default value. Or, select **Reset to defaults** to reinstate the default value for all parameters on the tab.

5. On the **Exception Definitions** tab, you can select from the available exception definitions or create new exception definitions to be included in the transformation.

The **Exception Definitions** tab includes a list of currently selected exception definitions for this transformation.

**Note:** An exception definition describes what constitutes an exception. It includes the exception condition, the exception persistence, and the text that describes the exception. You can select a supplied definition or create a new definition. At least one exception definition must be defined for the Exception transformation to run.
This table includes the following parameters:

- **Exception Definition Name** specifies the name of the exception definition.
- **Exception Definition Folder** displays the folder where the exception definition is stored.

On the **Exception Definitions** tab, you can perform the following tasks.

- To create a new exception definition, follow the instructions here: “Defining an Exception Definition with the New Exception Definition Wizard” on page 226.

- To add an existing exception definition to this transformation, perform the following steps:
  
  - Click **Add**. The Select Exception Definitions dialog box appears.
  
  - In the **3.8 IT Exception Definitions** folder, navigate to the adapter and domain category that you are working with.
  
  - You can select one or more definitions from the **Supplied** or **User-Defined** folders. However, if you select multiple exception definitions, the **Selected IT exception definition** field and the **Description** box are blank.

  If you select a single exception definition, the **Selected IT exception definition** field and the contents of the **Description** box are displayed. These fields can help you determine whether you selected the appropriate exception definition.

  - The **Selected IT exception definition** field displays the name of the highlighted definition.
  
  - The **Description** box shows the contents of the **Description** field of the highlighted exception definition.

  **Note:** If you saved exception definitions in another folder (for example, **My Folder**), you can select them from that folder instead.

  - Click **OK** to add the selected definitions to the Exception transformation.

- To edit an existing exception definition, perform the following steps:
  
  - Select the exception definition that you want to modify.
  
  - Click **Edit**. The Edit Exception Definition wizard appears.
  
  - Use the **Next** button to navigate to the page of the wizard that you want to modify.
• Continue to navigate through the remaining pages of the wizard. When you are satisfied with your changes, click **Finish** to update the transformation with your modified definition.

*Note:* If the same exception definition is currently in use in another Exception transformation, you are warned about possible implications for altering this exception definition.

• To remove an exception definition, perform the following steps:
  - Select the exception definition that you want to remove from the Exception transformation.
  - Click **Remove**. The exception definition is removed from the transformation but is not deleted from metadata.

The **Exception Definitions** tab provides additional information about the exception definition that is selected in the Exception Definitions table. The lower part of the following display shows the contents of the Exception Definition Properties group box. These properties reflect the properties of the highlighted exception definition.

6. On the **Report Attributes** tab, you can specify values for fields that can be used to filter reports in ITRM Report Center. To specify the values, you can select an attribute from the drop-down list.

*Tip* If you do not want to generate reports, you do not have to specify any fields on the **Report Attributes** tab.
### Table 9.2  Report Attributes of the Exception Definition

<table>
<thead>
<tr>
<th>Property</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain category</td>
<td>Specifies the adapter and domain category for the Exception transformation. For example, the value <code>DTPerfSentry_ServerDisk</code> indicates that the Exception transformation corresponds to the Server Disk domain category of the DT Perf Sentry adapter. This value is a primary report filter that can be used when viewing reports in the <strong>Gallery</strong> workspace of ITRM Report Center. Use the down arrow ▼ to select a value for this field. This value is required.</td>
</tr>
<tr>
<td>Domain subcategory</td>
<td>(Optional) Specifies the domain subcategory that corresponds to the domain category for the Exception transformation. This value is a primary filter that can be used when viewing report in the <strong>Gallery</strong> workspace of ITRM Report Center. Use the down arrow ▼ to select a value for this field. Note: Although this property is optional, specifying this property can facilitate viewing the associated report in ITRM Report Center.</td>
</tr>
<tr>
<td>Job schedule frequency</td>
<td>(Optional) Specifies when the corresponding reports for the Exception transformation should be scheduled to run. This value is a primary filter that can be used when viewing reports in the <strong>Gallery</strong> workspace of ITRM Report Center. Use the down arrow ▼ to select a value for this field. Note: Although this property is optional, specifying this property is recommended because it facilitates viewing the associated report in ITRM Report Center. Note: This value is a primary report filter in metadata only. It does not affect the schedule for the corresponding report job. However, for best results, you should schedule the corresponding exception analysis job to run according to this filter. For example, if the schedule frequency is Weekly, then schedule the job to run weekly.</td>
</tr>
<tr>
<td>Keywords</td>
<td>(Optional) Specifies the keywords that the Exception transformation assigns to the reports that it creates. Keywords are primary filters that can be used when viewing reports in the <strong>Gallery</strong> workspace of ITRM Report Center. Use the right arrow ▶ to select keywords from the list of <strong>Keywords Available</strong> values. Note: Although this property is optional, specifying this property is recommended because it facilitates viewing the associated report in ITRM Report Center. For best results, include the keyword <code>Excp</code> in your selections.</td>
</tr>
<tr>
<td>Property</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Report author</td>
<td>Specifies the user ID of the person who created the Exception transformation. If the value is <strong>Supplied</strong>, then the exception definition was supplied by SAS IT Resource Management 3.8. Do not use double quotation marks in this field. This value is automatically specified. However, you can modify it. <strong>Note:</strong> Although this property is optional, specifying this property is recommended because it facilitates viewing the associated report in ITRM Report Center.</td>
</tr>
<tr>
<td>Expire reports after (Days)</td>
<td>Specifies the number of days that the corresponding reports are stored in the SAS Content Server before they expire. If a report expires and its exception job is run again, the expired report is deleted and replaced with the new report. This value is required. The default value of this property is 1.</td>
</tr>
</tbody>
</table>

When planning to filter and subset your reports, you might need to create domain categories, domain subcategories, job schedule frequencies, and keyword values that are unique to your business. To manage your own unique primary report filter values, click **Manage User-Defined Primary Report Filters** on the **Report Attributes** tab. The Manage User-Defined Primary Report Filters window appears. On this window, you can add or delete primary report filters that are user-defined. To do so, perform these steps:

a. From the list on the left of the pane, select the type of filter for which you want to add or delete a value. For example, you can select **Domain Category, Domain Subcategory, Job Schedule Frequency**, or **Keywords**.

**Figure 9.5**  Manage User-Defined Primary Report Filters Page for Domain Categories

b. To add a new filter, select a report attribute and then enter the new filter value in the **Filter value** field in the right pane of the window. This field accepts only letters, numbers, hyphens, and underscores.
Click **Add** to create the filter value.

*Note:* Misspellings, typing errors, and differences in capitalization standards can create inconsistencies in this field. An error in the value can make the associated reports difficult to find when using ITRM Report Center to filter your reports. Inconsistencies can also lead to multiple filter values that mean the same thing but are listed separately.

c. To delete a user-defined primary report filter, select the filter that you want to delete and click **Delete**.

d. Click **Close** to update the user-defined values in the list of available filters that are available on the **Report Attributes** tab of the Exception transformation.

e. After a user-defined value is added in the Manage User-Defined Primary Report Filters window, it can be selected in the previous window.

*Note:* You can use the user-defined primary report filter values later in ITRM Report Center when viewing and searching for reports. Because user-defined primary report filters are stored on the metadata server, they can be shared with other clients that might want to filter reports in a similar way.

7. The **Notifications** tab enables you to specify whether to publish alerts on the **Home** workspace of ITRM Report Center when an exception is discovered.

*Figure 9.6 Notification Tab of the Exception Transformation*

To publish alerts, perform the following steps:

- To publish alerts, check the **Publish alerts** box. By default, this box is not checked.

*Note:* Alerts are displayed in a user’s **Home** workspace of ITRM Report Center if the user subscribed to receive them.
• Specify the type of alerts that should be published. Select a value for the **Alert type** field from the drop-down list. A value in this field is required if the **Publish alerts** box is checked.

*Note:* To revise the list of alert types, see “Update the List of Available Alerts” in Chapter 10, “Administrative Tasks,” in the *SAS IT Resource Management 3.8: Reporting Guide.*

• Specify the alerts that have priority to be published. Select a value for the **Alert priority** from the drop-down list of priorities. A value in this field is required if the **Publish alerts** box is checked.

• Enter up to 60 characters in the **Alert title** field. A value in this field is required if the **Publish alerts** box is checked.

*Note:* If reports are generated, then the alert also contains a URL to the overall exception report that is generated at this time by this job execution.

8. The **Notes** tab enables you to add a note or to associate registered notes or documents with this Exception transformation. If you add an assigned document, a link to that document appears in the overview report.

9. The remaining tabs (**Options**, **Code**, **Precode and Postcode**, and **Extended Attributes**) are optional. For information about these tabs, click **Help**.

10. When you are satisfied with the Exception transformation, click **OK** to return to the process flow diagram. Be sure to save the job.

**CAUTION:** If you made any changes to any of the properties or exception definitions in the Exception transformation, redeploy the job that contains the transformation.

---

**Delete an Exception Transformation**

To delete an Exception transformation from a job, perform the following steps:

1. In the **IT Data Marts** tree in SAS IT Resource Management, navigate to the folder that contains the exception job. Then double-click the job that contains the Exception transformation that you want to delete.

2. Right-click the Exception transformation in the process flow diagram and select **Delete**. The Exception transformation is deleted from the job.

3. Click **OK** to save your changes.

*Note:* If the job was already deployed, be sure to redeploy it when you have finished making changes.

---

**Edit an Exception Transformation**

*Note:* In Edit mode, you cannot change the expression type of an exception definition.

To edit an existing Exception transformation, perform the following steps:

1. In the **IT Data Marts** tree of SAS IT Resource Management, navigate to the folder that contains the exception job. Then double-click the job that contains the Exception transformation that you want to edit. (Alternatively, you can right-click and select **Open**.)
2. Right-click the Exception transformation in the process flow diagram and select Properties. A Properties dialog box is displayed and enables you to modify the various parameters that are specified for the Exception transformation and the code that it generates.

For more information about the specific parameters that are available for configuration in the Exception transformation, see “Specify the Properties of the Exception Transformation” on page 217.

3. Click OK to save your changes.


---

**Defining an Exception Definition with the New Exception Definition Wizard**

To create an exception definition, perform the following steps:

1. On the Properties dialog box of the Exception transformation, click the Exception Definitions tab. Click New to invoke the New Exception Definition wizard.

   The first page of the New Exception Definition wizard appears.

   *Figure 9.7 General Information Page of the Exception Definition Wizard*

   ![General Information Page of the Exception Definition Wizard](image)

   2. On this page, you can specify identifying information about this exception definition.
• Enter the name of the exception definition in the Name field. This field can contain up to 60 characters. It must be unique within the metadata folder. A value is required in this field. The default value of this field is a concatenation of the term “Exception Definition” and a random number (for example, Exception Definition 40902).

• (Optional) Enter the identifying information in the Description field. This field can contain up to 200 characters. It is useful to include, at a minimum, the following information:
  • Input table: Adapter_TableName
  • Measures: Measure name
  • Purpose: Summary of the exception definition and its purpose

• The Location field specifies where the exception definition is stored. Click Browse to navigate in the /Shared Data/SAS IT Resource Management/3.8 IT Exception Definitions folder to the adapter and domain category that is associated with this exception definition. Then select the User-Defined folder and click OK.

  Note: This location is supplied for your convenience. However, you can store the new exception definition in a different folder location.

  Tip SAS IT Resource Management software stores the definitions that it supplies in the Supplied folder. Therefore, do not store your user-defined definitions in that folder. Future updates to the software might result in overwriting the contents of the Supplied folder.

3. On the Specify Grouping page, you can specify the columns by which groups are defined, and the column that should be used to order observations within each group.

• If you specify Group by columns, each grouping is evaluated separately to find exceptions. There is either one or no exception for each grouping. (A grouping is defined by a unique set of values for the group by columns.) For example, if you specify MACHINE, the data for each unique machine is treated as a separate grouping and evaluated separately for exceptions. In other words, for each unique machine, either there is an exception or there is no exception for that machine. If you do not specify any group by columns, then the entire input data is evaluated as a whole. (The grouping is the entire data set.) There would be either one or no total exceptions for this definition.

• If an order column is specified, then observations are ordered within each group prior to evaluation. Ordering observations impacts those exception definitions where you want to flag an exception if a certain number of occurrences are found in a row.

  Caution: If the Order Column is not specified, do not specify a date-related or time-related column for the Group By parameter.

  Tip In most cases, you should specify a grouping column.

Enter a value or accept the defaults for the following fields:

• Source table: shows the full name of the input source table.

• Available columns: shows the list of columns that can be selected for grouping the exceptions.

• Group by columns: shows the columns that define the groups by which the exception definition is evaluated. For example, if you want to evaluate each machine separately, select MACHINE as the grouping column. If you are
evaluating a summary table, the most likely choices for grouping come from the class or ID columns of the summary table.

• The **Order Column** box: shows the column to be used to order observations within each group prior to evaluation. If the **Order Column** is not specified, then the evaluation uses the order of the observations as they exist in the input data. If you are evaluating data from a summary table, the most likely choice is the aging column, if there is one.

In most cases, the **Order Column** that is selected in an exception definition is used for the horizontal axis of graph reports. However, if all of the following conditions are met, then the horizontal column of the graph uses the concatenated column, such as **DAYDATEHOUR**:

• The input to the transformation is a summarized aggregation table.
• The class list of the input table includes the HOUR column.
• The aging column of the input table is DAYDATE.
• The input table includes the DAYDATEHOUR column.
• In the exception definition, either of the following conditions is true:
  • The **Order Column** is HOUR and the **Group by columns** field does not include the aging column.
  • The **Order Column** is the aging column and the **Group by columns** field does not include HOUR.

*Note:* The label on the resulting exception report might show **Date_Hour**.

• **Format of the selected column** is displays the format of the column that is used for ordering the analysis column. (The format is displayed for informational purposes only.)

In the following display, the group by column is **DAYOFWEEK** and the order column is **DAYDATE**. This groups the data by each day of the week that is present in the input data. In addition, the data is sorted by the date for each observation in the data. In other words, the data is evaluated separately for each day of the week.
In addition, within each group (DayOfWeek), the data is evaluated in order of the date (DayDate).

**Figure 9.8 Specify Grouping Page of the New Exception Definition Wizard**

*Note:* When you select multiple Group By columns, the order of these columns affects the order of reports as seen in ITRM Report Center, such as in the **Resource** workspace. If you select those columns for exception definitions in the same order that you selected the Group By columns for your performance reports, then both the exception report results and the performance report results are presented in the same order when seen in ITRM Report Center. For example, you might have selected **DOMAIN** and then **MACHINE** as the Group By columns for your performance report. If you want them to appear in the same order in ITRM Report Center, do not select **MACHINE** and then **DOMAIN** as the Group By columns for your exception report.

**CAUTION:**

If you are selecting multiple Group By columns, select those columns in the same order that you selected the Group By columns for your performance reports. For example, you might have selected **DOMAIN** and then **MACHINE** as the Group By columns for your performance report. If so, you should not select **MACHINE** and then **DOMAIN** as the Group By columns for your exception report.

4. On the Occurrences and Exception Type page, you can specify the following information:

   - In the **Occurrences** group box, you can specify the observations that you want to be processed. Select one of the following options:

     * Any observations in the selected group: specifies that each observation in the selected group should be examined to determine whether it satisfies the condition specified in the exception definition.
If the expression that is displayed below in the **Condition** field is found to be true for any observation in the group, then an exception is recorded for this group.

- **Number of observations in the selected group**: specifies how many observations must satisfy the condition specified in the exception definition in order to trigger an exception.

If the expression that is displayed below in the **Condition** field is true for this many (or more) observations in the group, then an exception is recorded for this group.

- **Number of observations in a row**: specifies how many sequentially occurring observations must satisfy the condition of the exception definition in order to trigger an exception.

If the expression that is displayed below in the **Condition** field is true for this many (or more) observations in a row, then an exception is recorded for this group. (Observations are determined to be in a row based on the order that is specified by the **Order Column** on the Specify Grouping page, if any. If the **Order Column** is not specified, then the observations are processed in the order in which they exist in the input table.)

- **Percentage of observations in the selected group**: specifies the percentage of observations that must satisfy the condition of the exception definition in order to trigger an exception.

If the expression is found to be true for this percentage of observations (or more) in the group, then an exception is recorded for this group.

**Note**: When evaluating observations for the number or percentage of occurrences, observations with missing values for columns in the expression are omitted prior to evaluation. Therefore, they do not factor into the calculation of numbers or percentages or the evaluation of observations that are in a row.

- In the **Type** field of the **Expression Type** group box, use the down arrow to select the expression that defines this exception. The following choices are available:

  - **Constant threshold**: compares the value of the specified column to the specified constant value. For example, the expression might be `CPUBUSY > 99`.

    **Note**: The value of the constant must be a numeric value if the specified column is numeric, even if the formatted value of the column appears to be non-numeric. For example, if the specified column is a time value, such as CPUTIME, which has a TIME. format, the formatted values in the column might appear as "00:01:00". However, the constant value needs to be specified as an unformatted numeric such as 60 (seconds). Some other numeric columns might have formatted values such as "up", "down", "yes", "no", but the constant value needs to be the unformatted numeric equivalent such as 0 or 1.

  - **Other column**: compares the value of one specified column to the value of another specified column.

  - **Range**: compares the value of the specified column to a range. The condition is met if the value is within or outside of the upper or lower bound of the range.
• **Statistic bounds**: compares the value of the specified column to a range that is defined by the specified mean, plus or minus the specified standard deviation (times a multiplication factor).

  *Note*: The **Statistic bounds** type is available only when the source table is a summary aggregation table.

• **Free form**: enables the user to specify any valid SAS DATA step code that results in a Boolean (true/false) result.

• The **Condition** field displays the form of the expression that corresponds to the type of this exception definition. This field is for informational purposes only and does not accept user input.

In the following display, the exception definition triggers an exception if three observations in a row satisfy the exception condition. The exception type is Constant threshold, which is defined on the next page of the wizard.

**Figure 9.9 Occurrences and Exception Type Page of the New Exception Definition Wizard**

5. On the **Exception Expression** page, you can define the expression for the expression type that you chose on the previous page. The **Exception Expression** field at the bottom of the page displays the mathematical expression of the exception type. For information about how to specify the fields, see the Help for that page.

The values that are specified in an exception expression should be unformatted. The expression is evaluated without regard to formats or informats that might be associated with the column. However, in the expression for a free-form-type exception, you can use formatted values. In that situation, the syntax must use those formatted values explicitly. Here are some examples:

• In the expression for a constant threshold exception, you might select the column CPUTIME with a TIME. format. To evaluate if CPUTIME was more than one
minute, define this expression as \texttt{CPUTIME > 60} rather than as \texttt{CPUTIME > '00:01:00'}. 

\textit{Note:} If the exception was of the free-form type, you could also use SAS date, datetime, or time constant syntax, such as \texttt{CPUTIME > '00:01:00'd}. This syntax is independent of any specific format that CPUTIME might have.

- In the expression for a free-form type of exception, your source table might have a column USER with a \$USRGRP. user format. The following code shows how to include an explicit use of that format (or any other available format or informat):

\begin{verbatim}
... [code omitted] PUT(USER,$USRGRP.)='Technical Support' ...[code omitted]
\end{verbatim}

\textit{Note:} When defining the expression, you are prompted to select an analysis column from a drop-down list of column names. If an exception report is generated based on this expression, the analysis column name is not displayed. Instead, the label that corresponds to the analysis column name is shown on the report.

- \textbf{Constant threshold} is the default value for \textbf{Expression Type}. For the \textbf{Constant threshold} type of expression, specify the following fields:
  - Analysis column
  - Operator
  - Constant

\textit{Note:} This value is used to draw the reference line on the resulting graphs.

The fields that are needed to define the expression of the exception vary for each type of expression.

The following display shows the fields needed for the \textbf{Constant threshold} type of expression.

\textit{Figure 9.10 Constant Threshold Expression Page}
• For the **Other** column type of expression, specify the following fields:
  - Analysis column
  - Operator
  - Comparison column

*Note:* Graphs for exceptions of this type of expression are multi-line plots.

• For the **Range** type of expression, specify the following fields:
  - Analysis column
  - Lower limit
  - Upper limit
  - Check the **Include bounds** box if you want to include the upper and lower limits in the comparison.

The resulting expression is an OR of the two sub-expressions that specify the upper and lower ranges.

*Note:* The values in the **Upper limit** and the **Lower limit** are used as reference lines on the resulting graphs.

• For the **Statistic bounds** type of expression, specify the following fields:
  - Analysis column
  - Statistic column (Mean)
  - Statistic column (Standard Deviation)
  - Band multiplication

*Note:* The list of eligible standard deviation columns is restricted to those columns that are related to the selected mean. If there are none, the **Statistic bounds** type cannot be fully defined.

• Check the **Include bounds** box if you want to include the upper and lower limits in the comparison.

*Note:* The **Statistic bounds** type is available only when the source table is a summary table.

The following display shows the fields needed for the **Statistic bounds** type of expression.
Figure 9.11  Statistic Bounds Type of Expression

The resulting expression is an OR of the two sub-expressions that specify the upper and lower statistic bounds.

Note: For an example of how this expression type can be used, see “Example 2: Detecting Sudden Increases in Demand with the Statistic Bounds Expression Type” on page 252.

- The following display shows the fields that are needed to specify the Free form type of expression.
You can specify the expression by invoking the Expression Builder function or by entering it manually.

- To invoke Expression Builder, click the **Expression** button (circled in red). For information about how to use this functionality, see “About the Expression Builder” on page 206.

- If you enter the expression manually, you are responsible for the syntax of the free-form expression. The text that you specify here should be valid SAS syntax for the right-hand part of a SAS assignment statement in the DATA step. It should result in a Boolean (true/false) value.

When the job that contains the free-form expression is run or deployed, the syntax of the expression is checked. If the syntax of the expression is not valid, an error message is displayed and the job is not run.

**Note:** For any columns that are used in the expression, be sure to treat missing values appropriately.

6. There are two sections on the Recommendations page: **Recommendations** and **Documents**. In the **Recommendations** box, you can enter text that pertains to the exception. For example, you can specify the actions that the exception report recipient should take as a result of this exception.

**TIP** There are no restrictions on the text in the **Recommendations** box.

In the **Documents** box, you can specify the names and paths of documents that are assigned to this recommendation. Document references can be either file system names (such as MyDocument), uniform resource identifiers (URIs), or uniform resource locators (URLs). These fields are not validated, so be sure to enter valid values.

You can perform these actions:
• Click New to add a document to this recommendation. The New Document dialog box appears. Specify the following information about the document. You can enter the name of the document or accept the default. You can also enter a description of the document.

• You can specify a name in the Name field or accept the default name.

• (Optional) In the Description field, enter information about the document. Do not use double quotation marks in this field.

• In the Location field, you can specify the folder where the document is stored. If the document is not in the default location, you can use the Browse button to navigate to where the document is stored. Click Browse Local to search the folders on your local machine. Click Browse Remote to search for folders that are not on your machine.

• In the File field, specify the filename of the document.

• Click Remove to delete a highlighted document from this recommendation.

• Click Attach to select additional documents to include in this recommendation. The Select Documents dialog box appears. You can select documents from the folders in the Folders tab or from the Inventory tab.

Note: Click Finish on this page to complete the specification of the exception definition. The recommendation and any documents are visible in the exception reports for this exception definition.

7. On the Report Attributes tab, you can specify the following fields:

• Domain category

  Note: This field is required.

• Domain subcategory

• Job schedule frequency

• Keywords

• Report author

  Note: Do not use double quotation marks in the Report author field.

• Expire reports after (Days)

  Note: This field is required.

When planning to filter and subset your reports, you might need to create domain categories, domain subcategories, job schedule frequencies, and keyword values that are unique to your business. The ITRM Report Definition task enables you to create and manage your own unique primary report filter values that you can assign to report definitions. You can use these filter values later in ITRM Report Center when viewing and searching for reports. You can also share these user-defined primary report filters with other clients that might want to filter reports in a similar way.

8. Click Next to view the Summary page. It displays the specifications that is used to create the new exception definition. If they are satisfactory, click Finish to create the new exception definition and add it to the Exception transformation.
Exception and Exception Condition Tables

About the Exception and Exception Condition Tables

The exception and exception condition tables are target tables that are written by the Exception transformation. You are required to have an exception table as output. The exception condition table is optional.

The exception and exception condition tables are created (or replaced) with every successful execution of the Exception transformation.

Note: The exception and exception condition tables are treated as any other physical tables in an IT data mart, with respect to functions such as Delete, and so on.

CAUTION: Do not modify, delete, or add columns to the exception table. Do not modify or delete columns from the exception condition tables. The Exception transformation requires many of these columns for accurate exception processing. Adding new columns to the exception condition table is not advised except when you are adding Obs or Order columns. For more information, see “Including the Obs and Order Columns in the Exception Condition Table” on page 240.

Properties of the Exception and Exception Condition Tables

The metadata about an exception or exception condition table is available from the Properties dialog box of the table.

To view the properties of the table, complete the following steps:

1. Navigate to the folder in the IT Data Marts tree that contains the exception job and the table that you want to view.
2. Open the job that includes the table.
3. Right-click the table in the process flow diagram and select Properties.

The following list includes all of the table properties. It also indicates whether a property is available only from the table in the Tree view or in the process flow diagram:

- The General tab displays information that identifies the table name, description, location, and associated responsibilities.

- The Columns tab displays the metadata for each column in the table.
  - For more information about the properties that are available from the Columns tab of an exception table, see “Contents of the Exception Table” on page 238.
  - For more information about the properties that are available from the Columns tab of an exception condition table, see “Contents of the Exception Condition Table” on page 239.

- The Indexes tab displays any indexes that have been created for this table. For each column, the name, description, length, and type are stored.

- The Keys tab displays any keys that have been created for this table. However, the values displayed on this tab are ignored by SAS IT Resource Management.
• The **Parameters** tab displays any prompts or groups that have been created for this table. This tab is available from the **Tree** view only.

• The **Physical Storage** tab displays information about the physical name of the table and the library and DBMS where it is located.

• The **Options** tab displays table options such as compressing observations in a SAS data set, providing additional security options, and overwriting data sets.

• The **Notes** tab displays any notes or documents that are associated with this table.

• The **Extended Attributes** tab displays information about any custom property that is not part of the standard metadata for this table. This tab includes any external names for a table, if available.

• The **Authorization** tab defines access to the current object. For more information, see the Help for this tab.

For more information about the contents of these tabs, click **Help** in the dialog box.

### Contents of the Exception Table

The exception table contains a record of every exception that is found during the execution of the Exception transformation. One observation is written to the exception table for each exception found. If an exception is not found, no observation is written.

The table contains these fields.

**Table 9.3  Contents of the Exception Table**

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
<th>Type</th>
<th>Length</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datetime</td>
<td>Exception Datetime</td>
<td>Numeric</td>
<td>8</td>
<td>DATETIME21.2</td>
</tr>
<tr>
<td>DefinitionName</td>
<td>Definition Name</td>
<td>Character</td>
<td>60</td>
<td>(None)</td>
</tr>
<tr>
<td>DefinitionPath</td>
<td>Definition Path</td>
<td>Character</td>
<td>255</td>
<td>(None)</td>
</tr>
<tr>
<td>Expression</td>
<td>Expression</td>
<td>Character</td>
<td>1024</td>
<td>(None)</td>
</tr>
<tr>
<td>Group</td>
<td>Group</td>
<td>Character</td>
<td>1024</td>
<td>(None)</td>
</tr>
<tr>
<td>GroupWhere</td>
<td>Group in WHERE clause form</td>
<td>Character</td>
<td>1024</td>
<td>(None)</td>
</tr>
<tr>
<td>OccurrenceType</td>
<td>Occurrence Type</td>
<td>Character</td>
<td>32</td>
<td>(None)</td>
</tr>
<tr>
<td>OccurrenceLimit</td>
<td>Occurrence Limit</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
<tr>
<td>OccurrenceValue</td>
<td>Occurrence Value</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
<tr>
<td>SourceName</td>
<td>Source Name</td>
<td>Character</td>
<td>60</td>
<td>(None)</td>
</tr>
<tr>
<td>SourcePath</td>
<td>Source Path</td>
<td>Character</td>
<td>255</td>
<td>(None)</td>
</tr>
<tr>
<td>TotalObs</td>
<td>Total Observations</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
</tbody>
</table>
**Contents of the Exception Condition Table**

If requested, the exception condition table consists of each observation from the input table that satisfies both the filter criteria and the exception condition criteria. The table contains these fields.

**Table 9.4  Contents of the Exception Condition Table**

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
<th>Type</th>
<th>Length</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConditionVariables</td>
<td>Condition Variables</td>
<td>Character</td>
<td>1024</td>
<td>(None)</td>
</tr>
<tr>
<td>Datetime</td>
<td>Exception Datetime</td>
<td>Numeric</td>
<td>8</td>
<td>DATETIME21.2</td>
</tr>
<tr>
<td>DefinitionName</td>
<td>Definition Name</td>
<td>Character</td>
<td>60</td>
<td>(None)</td>
</tr>
<tr>
<td>DefinitionPath</td>
<td>Definition Path</td>
<td>Character</td>
<td>255</td>
<td>(None)</td>
</tr>
<tr>
<td>Expression</td>
<td>Expression</td>
<td>Character</td>
<td>1024</td>
<td>(None)</td>
</tr>
<tr>
<td>Group</td>
<td>Group</td>
<td>Character</td>
<td>1024</td>
<td>(None)</td>
</tr>
<tr>
<td>Group</td>
<td>Where</td>
<td>Group in WHERE clause form</td>
<td>Character</td>
<td>1024</td>
</tr>
<tr>
<td>Obs</td>
<td>Original row of the input table in which this</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
<tr>
<td></td>
<td>condition was found</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OccurrenceLimit</td>
<td>Occurrence Limit</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
<tr>
<td>OccurrenceType</td>
<td>Occurrence Type</td>
<td>Character</td>
<td>32</td>
<td>(None)</td>
</tr>
<tr>
<td>OccurrenceValue</td>
<td>Occurrence Value</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
<tr>
<td>Order</td>
<td>The value of the OrderBy column in the original</td>
<td>Numeric</td>
<td>8</td>
<td>(None)</td>
</tr>
<tr>
<td></td>
<td>input table for the row in which this condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>was found</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Note: If the original OrderBy column is not</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>numeric, the value for Order is a missing value.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SourceName</td>
<td>Source Name</td>
<td>Character</td>
<td>60</td>
<td>(None)</td>
</tr>
<tr>
<td>SourcePath</td>
<td>Source Path</td>
<td>Character</td>
<td>255</td>
<td>(None)</td>
</tr>
</tbody>
</table>
Note: The Group column contains the column label, not the column name. This substitution improves the matching of the exception reports with performance reports in ITRM Report Center.

**Including the Obs and Order Columns in the Exception Condition Table**

Starting with SAS IT Resource Management 3.6, the Obs and Order columns are both automatically supplied when the user chooses the **Add New Exception Tables** action in the Properties dialog box of the Exception transformation. If a user has existing exception tables from previous versions of SAS IT Resource Management, these columns are not automatically added. However, the columns can be added manually by using the Properties dialog box of the Exception Condition table. Alternatively, you can remove the output exception tables and use the **Add New Exception Tables** action to create new ones.

**How to Specify an Exception Table**

To specify an exception table, perform the following steps:

1. In the exception analysis job, right-click the Exception transformation to display the Properties dialog box. From the list of properties, select **Add New Exception Tables**. The New Exception Tables wizard appears.

*Figure 9.13  First Page of the New Exception Tables Wizard*

You can view, but not change, the name of the IT data mart. You can change the location from the default location shown, but you should specify a folder within the same IT data mart folder.
2. On the Select exception tables page, check the box that corresponds to the table that you want to create. The exception table is required. However, the creation of the exception condition table is optional.

Figure 9.14  Select Exception Tables Page of the New Exception Tables Wizard

3. If you are creating exception tables for this transformation for the first time, the Specify SAS library page of the wizard appears.

Figure 9.15  Specify the SAS Library Page of the Wizard
a. Specify the **Name** and **Description** for the SAS library. The wizard uses the naming convention `Exception <unique number>` to name SAS libraries for the exception feature. You can accept the default name or enter a new name for the library. However, library names must be unique within the application server.

b. Confirm that the **Server** field shows the server that is associated with the selected IT data mart where this library will be stored. This field does not enable modifications.

c. Specify the **Libref** that is associated with the library. The wizard uses the naming convention `EXP + <the same number generated for the library>` to name the libref. You can accept the default name or enter a new libref name.

**Note:** The following naming rules apply to the libref:

- The libref can consist of no more than eight characters.
- The libref must begin with a letter (A through Z) or an underscore (_).
- The remaining characters of the libref must be letters (A through Z), numerals (0 through 9), or an underscore (_). The libref cannot contain spaces.

d. Specify the **Path Specification** for the location of the library and thus where the tables for this library are stored. The default value is based on the combination of the default path that is specified for the IT data mart and the operating system of the server. The characters `exp<unique number>` are also appended to the path, where the unique number is the same as that generated for the preceding library.

You can accept the default path, enter a new path, or click **Browse** to select a path.

**Browse** is disabled when the selected application server is running on a machine using the z/OS operating system. To enter a z/OS path manually, use either a prefix for a traditional z/OS file system path (**MY.DATAMART**) or a root directory in the zFS hierarchical file system (**/u/mynamename/datamart**).

**Note:** On UNIX and z/OS using zFS locations, you can use paths that contain symbolic links. Using symbolic links is useful if you want to retain flexibility for changing the real physical location of libraries. See the UNIX ‘ln’ command for additional details.

4. The final page of the wizard displays your specifications for the tables to be created by the Exception transformation.
Click **Finish** to create the tables.

**Note:** The completed New Exception Tables wizard creates one SAS library that stores all of the target tables from the Exception transformation.

The following display shows the completed Exception transformation with its two target tables, circled in red.

**Figure 9.16 Exception Transformation**
How to Delete an Exception Table or an Exception Condition Table

To delete a target table from an Exception transformation, perform the following steps:

1. Open the job that contains the Exception transformation.
2. Right-click the table that you want to delete.
3. Save the job.

Note: The Exception transformation must have an Exception table as a target table. If you delete it, the transformation is in an error state. Click the red error flag to view this message: “Create the Exception Table by using the 'New Exception Tables' action.” That action is available by right-clicking the Exception transformation.

Examples of the Exception Analysis Process

Example 1: Evaluating Server Usage with the Constant Threshold Expression Type

Problem Statement and Methodology
The capacity planner of a large enterprise wants to determine whether the MIS Business Intelligence servers (misbi4a, misbi5a, and misbi6a) in her company are underused. These servers are dedicated to the MIS group. The capacity planner wants to use facts to convince the MIS group to allow these BI servers to be shared by other teams in the organization. (These organizations require access to the Business Intelligence software that is hosted on these servers.) The following example describes how this is accomplished.

This example uses a filter to specify MIS business intelligence servers. To avoid seeing the same exceptions every day, the exception specification uses a filter to look for exceptions for the last day only. The input source is a DAYHOUR table called DayHourSystem. The exception definition is set up to flag an exception if it discovers six consecutive hours where the CpuBusyPctWMean is less than 20%. The group that is specified in the Exception transformation for this example is MACHINE.

Setting Up the Exception Transformation
For this example, the Exception transformation (CPU Utilization For MIS Business Intelligence Servers) is executed from the job called System Daily Exceptions. Both the exception table and the exception condition table are specified for this transformation. Their contents can be used for additional processing.
The name of the Exception transformation is specified on the **General** tab. In this example, the name is **CPU Utilization For ITRM Servers**.

The **Filters** tab causes the transformation to process only observations that pertain to the date of the last date of data and the three machines (misbi4a, misbi5a, and misbi6a).
Figure 9.18  Filters Tab of the Exception Transformation

The filters that are specified on the **Report Attributes** tab are shown in the following display.

Figure 9.19  Report Attributes Tab of the Exception Transformation

The **Domain subcategory** is not specified.
Note: The exception definition for this example is described in the following topic. This example maintains the default values for the remaining tabs of the Exception transformation.

**Setting Up the Exception Definition**

The **Group by** value for this example is **MACHINE**. The **Order Column** is **DAYDATE**.

**Figure 9.20  Grouping Specification**

As shown in the following display, the **Exception Type** is **Constant threshold**. The **Number of observations in a row** is set to **6**.

Note: The source data is hourly data. Therefore, each observation represents an hour.
Figure 9.21  Occurrences and Expression Type Specification
In the following display, the **Expression** for this Constant threshold exception is `CPUBUSYMEAN < 20`. (`CPUBUSYWMEAN` is calculated as a percentage.)

**Figure 9.22  Constant Threshold Expression Specification**

---

**Running the Exception Job**

When the job that contains the Exception transformation is run and if an exception is detected, two types of reports are generated:

- an overview report.

  *Note:* An exception job with one or more exception definitions always generates an overview report. However, if no exceptions are found, no individual reports are generated.

- an individual report for each Group By value that met the exception condition. The individual report shows the details that pertain to the exception that was flagged.

For this example, both the exception table and the exception condition table are written out from the transformation.

**Viewing the Exception Reports**

The Exception transformation creates an overview report. If exceptions are found, the transformation also generates individual reports. The following display shows the unexpanded overview report.
To see the expanded version of the overview report, click the name of the exception definition. (In the preceding display, this name is circled.) The expanded overview report lists the Group By values (for the MACHINEs) that matched the condition that was specified by the exception definition. In this example, the following MACHINES had CPU Utilization below 20% for 6 observations (hours) in a row: misbi4a, misbi5a, and misbi6a.

To see the individual reports for the MACHINES that experienced low CPU utilization, click the corresponding MACHINE. In the preceding display, the misbi4a MACHINE is circled. That action displays the individual report for misbi4a.

Note: The remainder of this example pertains to the misbi4a machine.
To see the observations that matched the expression that was specified in the exception definition, click **Link to Observations That Match the Exception Definition Expression Report**. (The link is circled in the preceding display.) The expression that was specified in the exception definition is \( \text{CPUBUSYMEAN} < 20 \).

### Analysis and Recommendations

As shown in the individual report for misbi4a, the server is consistently underused. Except for two significant periods of moderate usage, the server is not experiencing much activity.
The recommendation that is circled in this display suggests that this server be considered for consolidation with another server.

**Example 2: Detecting Sudden Increases in Demand with the Statistic Bounds Expression Type**

**Problem Statement and Methodology**

The capacity planner and the performance analyst would both like to be warned of sudden spikes in resource consumption. Volatility of demand is a common occurrence to some extent. However, sudden rises in resource demand might also be due to changes in customer behavior or business needs that were not anticipated. It might be necessary to make adjustments on a short-term basis, and the capacity plan might need to be modified as well.

**Adding Moving Average Statistics to the Aggregation**

In this example, the performance analyst does not want to set a fixed threshold, because a slow and steady growth in demand is expected. However, the analyst still wants to be notified if the growth in demand is more sudden. To accomplish this for CPU consumption, the analyst first defines a moving average of the period and a moving standard deviation for CPU time in the aggregation summary table. (These are based on the weighted mean of CPUBUSY.) These statistics are used to construct a dynamic (rather than static) threshold for warning of spikes in demand.

*Note:* For moving averages, the period is specified when you define it on the New Moving Statistics Column page of the Summarized Aggregation Table wizard as shown in the following display.
**Setting Up the Exception Transformation**

In a new job with an Exception transformation, using this aggregation summary table as input, the analyst defines an exception definition that can detect sudden spikes in CPU consumption. The exception definition uses statistic bounds to compare the current CPU consumption as a weighted mean (CPUBUSYWMEAN) with a dynamic threshold consisting of the moving average of the same underlying column (CPUBUSYWMEAN_MA) plus or minus two standard deviations for the moving average (CPUBUSYWMEAN_MSD).

**Setting Up the Exception Definition**

In the Exception transformation itself, the analyst specifies that reports be generated and that an alert be sent if an exception is found.
Running the Exception Job

If an exception is detected when the job that contains the Exception transformation is run, two types of reports are generated:

- an overview report.

  Note: An exception job with one or more exception definitions always generates an overview report. However, if no exceptions are found, no individual reports are generated.

- an individual report for each Group By value that met the exception condition. The individual report shows the details that pertain to the exception that was flagged.

For this example, both the exception table and the exception condition table are written out from the transformation.

Viewing the Exception Report

The following individual report is generated for this example:
Analysis and Recommendations

The analyst tested the new Exception transformation and definition by executing it against existing data because she had already encountered recent episodes of spikes in demand.

An exception was generated for the misbi5a machine, among others, during the period for which the analyst already had data. As illustrated by the plot, CPU consumption exhibited slow but steady minor growth until the week of June 16. The statistic bounds formed by the moving average and moving standard deviation adjust for this growth automatically. However, during the week of June 16, CPU consumption exploded upward and exceeded the dynamic threshold. The exception was triggered by this sudden spike in demand.

**Note:** As the spike in demand recedes, the statistic bounds threshold automatically readjusts again as usage returns to normal.

Satisfied that this exception definition would provide her with alerts and accompanying reports for the next spike in demand, the analyst put this job into the normal daily schedule. The next time that this type of sudden increase in demand occurs, the analyst will be notified on a daily basis alerted of any future occurrence.
Chapter 10

Adapter Setup Wizard

About the Adapter Setup Wizard

What Is the Adapter Setup Wizard?

The Adapter Setup wizard enables you to define and create staging, aggregation, information map, and reporting jobs that process the raw data for an IT resource. These jobs include predefined configurations that are based on industry intelligence that represents a best estimate about the types of aggregations and reports that most sites need for analysis.

Note: The Adapter Setup wizard produces staging, Aggregation, Information Map, Exception, and Performance Report transformations that are good choices for many users. However, you might have site-specific requirements. Therefore, you should examine the results of the Adapter Setup wizard. You might need to add or delete
elements of the jobs, transformations, or tables in order to accommodate the needs of your site or organization.

After the wizard creates the appropriate jobs, you can schedule and run each job as needed. The jobs process the raw data in a manner that is specified by or based on a selected adapter and domain category.

For more information about using the Adapter Setup wizard, see “Accessing and Navigating the Adapter Setup Wizard” on page 259.

Advantages of the Adapter Setup Wizard

The Adapter Setup wizard defines and programmatically creates jobs and the metadata for staged tables, aggregations, information maps, exception, and performance reporting jobs for a given adapter. In addition, the wizard also applies intelligence to these objects. Here are some of the benefits that the Adapter Setup wizard provides:

• programmatic creation of staging, aggregation, and information map jobs that include transformations and output tables that are used for staging and aggregating data with the recommended summarizations, statistics, percentiles, percent changes, moving averages, and rankings for performance reporting

• programmatic creation of jobs that include Performance Report transformations that use predetermined information maps and report definitions to build relevant reports based on a given adapter and domain category

• programmatic creation of exception jobs for those staged tables of an adapter and domain category for which exception definitions are supplied

• options to specify the scope and size of jobs that are created for a given adapter as determined by output level (staging job only, minimal, typical, and full) or other criteria (domain category, time period, key metrics, and so on)

• translation of metrics in the raw data source to standard units of measure

• generation of a default set of computed columns that are appropriate for the adapter data source

• the ability to choose appropriate statistics for aggregations and weighting them appropriately

• a default list of metrics that will be ranked

• an appropriate set of aggregations based on the staged data for the adapter data source

• a default set of filters that might be useful for limiting the output size of aggregations

• categorization of data in summarized aggregations by appropriate specification of class variables

• creation of an information map for each aggregation table

• report-ready data

With the Adapter Setup wizard, you can create comprehensive jobs that meet your reporting needs.

Naming Conventions That the Adapter Setup Wizard Uses

The Adapter Setup wizard uses specific naming conventions when naming and saving the various folders, jobs, transformations, and tables that it creates. These standards simplify the management and maintenance of the various objects that are interrelated.
For best results, if you edit the IT data mart folders, subfolders, jobs, transformations, or tables that the Adapter Setup wizard creates, then use the same naming conventions that the Adapter Setup wizard uses for consistency and efficiency.

This chapter provides several examples of the naming conventions that the Adapter Setup wizard uses. For a comprehensive list of the naming conventions and location standards that SAS IT Resource Management uses, see “About Naming Standards for SAS IT Resource Management Objects” on page 573.

Using the Adapter Setup Wizard

Accessing and Navigating the Adapter Setup Wizard

To access the Adapter Setup wizard, open SAS IT Resource Management and select **New** ⇒ **IT Resource Management** ⇒ **Adapter Setup**. To navigate through the pages of the wizard, use the following wizard buttons:

- **Help**
  - displays a Help topic for the current window.

- **Cancel**
  - abandons changes that were made after the last save and closes the current window.

- **Back**
  - displays the previous window in the wizard.

- **Next**
  - displays the next page of the wizard.

- **Finish**
  - saves changes that were made after the last save and closes the current window.

Steps to Complete the Adapter Setup Wizard

The Adapter Setup wizard guides you through several steps that help define the ETL jobs, staged tables, summarized aggregation tables, information maps, and Performance Report transformations for the selected adapter. The steps vary based on the requirements of the adapter that you select.

Here are all of the possible steps or pages that the Adapter Setup wizard can present for a given adapter:

- Specify an adapter for your input data source.
- Specify the configuration level that controls the scope and amount of output jobs.
- Specify the IT data mart.
- Specify staging parameters such as the location of the raw data and how to handle duplicate data.
- Select domain categories for the selected adapter.
- Select the time periods for which you want to create aggregation jobs and report jobs.
- Specify the location of any user-written formulas.
- Specify the location of the SAS Content Server for report packages.
• Specify the job deployment information.
• View a summary of the specifications that you have chosen and the ETL objects that
  the Adapter Setup wizard creates when the resulting jobs are executed.

Creating Jobs Using the Adapter Setup Wizard

The Adapter Setup wizard enables you to define and create the ETL jobs that are
required to process your IT resource data. You do not need to run the Adapter Setup
wizard frequently for a given adapter. For best results, run the Adapter Setup wizard
initially for a given adapter. Do not run it again for the same adapter unless you have
changes in how you would like to process input data. Running the Adapter Setup wizard
additional times does not update the jobs, transformations, or tables from the previous
runs. Instead, it creates new jobs, transformations, and tables.

To specify all of the necessary parameters that the Adapter Setup wizard requires to
create the jobs for an adapter, perform the following steps:

1. From the menu bar of the SAS IT Resource Management client, select New ⇒ IT
   Resource Management ⇒ Adapter Setup to open the Adapter Setup wizard.
2. Specify the adapter for which you want to create jobs.
Figure 10.1  Specifying the Adapter

- Adapters
  - Amazon CloudWatch
  - ASG TMON2CIC
  - ASG TMONDB2
  - ASG TMONDB2 V5
  - BMC Mainview IMS
  - BMC Perf Mgr
  - CA TMS
  - CSV
  - DT Perf Sentry
  - DT Perf Sentry with MXG
  - Ganglia
  - HP Perf Agent
  - HP Reporter
  - IBM AS400
  - IBM DCOLLECT
  - IBM EREP
  - IBM IMS
  - IBM SMF
  - IBM TPF
  - IBM VMMON
  - MS SCOM
  - RRDtool
  - SAP ERP
  - SAR
  - SAS Environment Manager
  - SNMP
  - VMware Data Acquisition
  - VMware vCenter
  - Web Log
a. Click the adapter that you want to use from the list of the adapters provided. You can move the cursor over an adapter to view a tooltip that provides the full name of the adapter, any former names of the adapter, and information about the types of data that the adapter provides. The remaining pages and parameters that are presented in the Adapter Setup wizard are based on the specific adapter that you select on this page.

*Note:* The AS/400 and IMS adapters are not available for selection on this page. The staging code that is required for these data sources is not automated by the Adapter Setup wizard. However, SAS IT Resource Management supplies staging transformations for these adapters. You can use these staging transformations to create staging jobs manually for these data sources. For more information about how to create a staging job manually using a staging transformation, see “Add a Staging Transformation to a Staging Job” on page 115.

For more information about the specific adapters that SAS IT Resource Management supports, see “Supported Adapters” on page 66.

b. Click **Next**.

3. Specify the configuration level that represents the scope of output jobs that you want the Adapter Setup wizard to create.

*Note:* If you are using an adapter that does not include aggregations that are categorized with configuration levels, then the level is automatically set to create a staging job only and this page is not displayed.

**Figure 10.2** Specifying the Level of Output

![Specify the level of output](image)

Configuration levels enable you to specify the general scope or amount of aggregation tables and jobs that you want the Adapter Setup wizard to create. These levels provide various presentations of granularity in the data based on the aggregations and metrics that are available for an adapter. The jobs that are created for each level include the metrics that are used in the reports for that level. These
jobs might also include other metrics that have been predetermined to be useful for reporting on the given level.

Configuration levels are unique for each adapter. However, in some cases, the levels can be identical for a given adapter. For more information about the metrics and aggregations that are supported for each adapter, see the SAS IT Resource Management metrics documentation. To locate the SAS IT Resource Management documentation, use the Products Index A-Z at http://support.sas.com/documentation/index.html.

To specify the level of output, complete the following steps:

a. Select one of the following configuration levels:

   **Staging Job Only**
   creates only a staging job for the adapter. If you select this option, no aggregation jobs, information map jobs, reporting jobs, or exception jobs are created.

   **Minimal**
   creates a staging job and additional jobs that include metrics, aggregations, report definitions, and exception definitions for a small number of reports. This level is for reporting on a small scale. You might use this level to create jobs that are related to low-priority, non-critical machines.

   **Typical**
   creates the staging job and a set of jobs that include recommended metrics, aggregations, report definitions, and exception definitions that satisfy a typical set of reports for an adapter. (This configuration level includes the output that is part of the **Minimal** setting.) This configuration level is the default option.

   **Full**
   creates a staging job and a comprehensive set of jobs that include most metrics, aggregations, report definitions, and exception definitions that SAS IT Resource Management supports. This level includes all of the jobs that are part of the **Typical** level. In addition, it includes many of the other metrics that are recommended for an adapter. You might use this level when you want the full benefits of the domain intelligence that is available with the SAS IT Resource Management solution. In addition, this configuration level provides additional information from the full set of metrics that are available from the adapter data sources.

   *Note:* Increasing the configuration level results in more complex transformations and jobs. If you select **Full** when you need only the **Typical** level, then the extra complexity causes the Adapter Setup wizard to be slower to complete than is necessary for your needs. Also, the nightly ETL jobs will take longer to process.

b. Click **Next**.

4. Specify the IT data mart where you want to save the ETL jobs that the Adapter Setup wizard will create, or create a new IT data mart.
Figure 10.3 Specifying the IT Data Mart

a. Select an IT data mart from the list of available IT data marts. If you do not want to use one of the data marts in the list, then click **New IT Data Mart**. This action launches a wizard that guides you through the process of creating and defining a new IT data mart. When you are finished, the wizard returns you to the Adapter Setup wizard.

b. Click **Next**.

5. Specify staging and duplicate-data checking parameters for the selected adapter. Staging parameters vary by adapter as they specify the configurations that are required to extract, transform, and load specific raw data into staged tables.

The parameters that are marked with an asterisk (*) require a value. All other parameters do not require a value.

You can also click **Reset** for a given staging parameter to use the default value if there is one available for the parameter. If the default value is already selected, then the **Reset** option is not available. You can also click **Reset to defaults** to set all the staging parameters to the default values.

**Note:** **Reset to defaults** does not reset a parameter that is dependent on another parameter if the parent parameter does not change.

For more information about the staging and duplicate-data checking parameters that are available for each adapter, see “Staging Parameters” on page 478.

a. Specify the staging parameters in order to govern how you want the staging code to execute for the adapter. The following image is an example of the staging parameters for the DT Perf Sentry adapter:
b. Specify the duplicate-data checking parameters in order to govern how you want the duplicate-data checking to execute for the adapter. The following image is an example of the duplicate-data checking parameters for the DT Perf Sentry adapter.
c. Click **Next**.

**Note:** If you selected the adapter VMware vCenter, then the Adapter Setup wizard presents two pages of staging parameters: one for VMware Data Acquisition jobs and one for VMware vCenter jobs. For more information about accessing raw data for the VMware vCenter adapter, see Appendix 15, “Working with the VMware Adapter,” on page 731.

6. Specify one or more domain categories that you want the Adapter Setup wizard to use when creating the resulting jobs.

**Note:** For some adapters, the Adapter Setup wizard might not create aggregation and information map jobs. For those adapters, the wizard creates only a staging job and skips this page.

---

### Figure 10.5 Specifying Duplicate Checking Parameters for the Adapter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
</tr>
<tr>
<td>INT value for %RMDUPCHK macro</td>
<td>Represents the maximum interval that is permitted between dateline stamps on two consecutive rowdata records. Enter the interval here.</td>
</tr>
<tr>
<td>KEEP value for %RMDUPCHK macro</td>
<td>Represents the maximum number of weeks for which you want to retain control data. Enter the value here.</td>
</tr>
<tr>
<td>REPORT value for %RMDUPCHK macro</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The preceding example shows the domain categories that are available for the DT Perf Sentry adapter. All of the domain categories that are related to Server data have been selected. Note that the description in the box on the right corresponds with the domain category that is highlighted in the Select domain categories box.

The Adapter Setup wizard helps you manage system performance by enabling you to select only the domain categories that are essential to the performance management and capacity planning processes for your enterprise. The Adapter Setup wizard creates a predefined set of jobs based on the domain categories that you select. The time that the Adapter Setup wizard takes to create the jobs varies based on the number of staged tables, aggregation jobs, and report jobs that are generated for the domain categories that you select.

**Note:** If you are using an adapter that does not include domain categories, then this page is not displayed.

For more information about domain categories, see “Domain Categories” on page 287.

1. Click one or more domain categories to enable or disable the domain category for staging and aggregation. At least one domain category must be selected before you can continue to the next page of the wizard.

2. Click Next.

7. Select the time periods that you want to use for the aggregation and reporting jobs. You can also specify that you want to create aggregation tables that include shift data or that you want to generate aggregation tables that contain key metrics. This page of the wizard displays the number of aggregation tables that will be created based on your selections.
On the lower part of this page, you can specify the cut off time that marks the end of the completed day. The default time is 18:00. If you want to change that time, check the **Override default cut off time** and use the spinners to specify the cut off time that you want to use.

**Note:** For some adapters, the Adapter Setup wizard might not create aggregation and information map jobs. For those adapters, the wizard creates only a staging job and skips this page.

**Figure 10.7 Selecting Time Periods and Metrics**

The preceding example shows that all time periods and key metrics have been selected and that 14 aggregations will be created. Note that the description in the box on the right corresponds with the time period that is highlighted in the **Select time periods** box. The cut off time that signifies a completed day is changed from the default value of 18:00 to 15:00.

The time periods are another way that the Adapter Setup wizard helps you manage system performance, aggregations, and jobs. The wizard enables you to select only the time periods that are essential to the performance management and capacity planning processes for your enterprise. The Adapter Setup wizard creates only the aggregation and report jobs that reflect the time periods and key metrics that you select. In turn, you do not have to sort through extra jobs and reports that focus on time intervals that you do not need.

**Note:** You must select at least one time period or the option **Generate key metrics** to continue. (That is, you can select any combination of these four choices: **Day**, **Week**, **Month**, or **Generate key metrics**, but you must select at least one.)

For more information about the specific aggregations that the Adapter Setup wizard creates based on time period and shift, see “Aggregations by Time Period” on page 280.

a. Select the time periods for which you want to create aggregation and report jobs.
Day
creates aggregation jobs and the daily, weekly, and monthly report jobs that generate reports about the daily data.

Week
creates aggregation jobs and the weekly report job that generate reports about the weekly data.

Month
creates aggregation jobs and the monthly report job that generate reports about the monthly data.

b. Select Shift if you want to the generate aggregations, information maps, and reports that are based on shift data, in addition to daily, weekly, or monthly data.

Note: In some cases, Shift might be selected by default because of the adapter that you selected earlier in the wizard.

c. Select Generate key metrics if you want to generate aggregation tables, information maps, and reports that include only the key metrics that focus on the most critical data for a performance area or domain category.

Note: If the domain categories that you selected do not include key metrics, then this option is not available.

d. If you want to change the cut off time that signifies the end of a day, check the Override default cut off time. Then use the spinners to select the cut off time that you want to use.

e. Click Next.

8. Specify the location of any user-written formulas to use in addition to the formulas that SAS IT Resource Management supplies.

Figure 10.8 Specifying User-Written Formulas

The staged tables and aggregation tables that the Adapter Setup wizard creates include computed columns that reference various formulas. When the tables with computed columns are instantiated, SAS IT Resource Management looks for the corresponding formulas in the list of supplied formulas.

You might have customized or user-written formulas that you prefer to use. If so, then use this page of the wizard to specify the location of the user-written formulas that you want to use. The Adapter Setup wizard then looks in the folder that you specified for any formulas that have the same name as those in the tables that it creates. If a formula with the same name is in the folder, then the wizard uses that formula. If the formula is not found in your specified location, then the wizard
searches for the formula in this location: **Shared Data/SAS IT Resource Management/IT Formulas**. If the formula is still not found, then the wizard searches for it in this location: **Products/SAS IT Resource Management/IT Formula**.

a. Click **Browse** to navigate to and select the folder that includes any user-written formulas that you want to use instead of the formulas that SAS IT Resource Management supplies. This field is optional and does not allow manual entries. If you do not have user-written formulas that you want to use and do not specify a folder in this field, then the Adapter Setup wizard defaults to the supplied formulas.

b. Click **Next**.

9. Specify the location of the SAS Content Server where the report definitions are retrieved and where the reports that are generated from the resulting jobs are stored. This page does not appear if you selected the configuration level **Staging Job Only** on the second page of the wizard.

**Figure 10.9 Specifying SAS Content Server**

The report definitions that the Adapter Setup wizard uses to create the report jobs are stored on the SAS Metadata Server. The reports that are generated from the report jobs are stored on the SAS Content Server.

If you are using domain categories that result in reporting jobs, specify the following parameters for the SAS Content Server:

**SAS Content Server**

specifies the name of the server that is used as the SAS Content Server for storing report definitions and report job outputs.

*Note:* Only servers that can be valid SAS Content Servers are included in the drop-down list for this parameter.
**Repository folder path**

specifies the path within the SAS Content Server where the report definitions and reports are stored. The default location is `/SASContentServer/repository/default/sasdav/ITRM`.

*Note:* Use the **Administration** workspace of ITRM Report Center to add or delete a repository folder path. Do not edit the path. (If you need to change the path, delete it. Then create a new path in the **Administration** workspace of ITRM Report Center.)

*Note:* If no report jobs will be generated, this page does not appear.

Click **Next**.

10. Specify whether you want the Adapter Setup wizard to automatically deploy the jobs that it creates. If no report jobs will be generated, this page does not appear.

*Note:* This page does not appear if you selected more than two domain categories. (This restriction does apply, however, if you selected the **Staging Only** configuration level.)

**Figure 10.10 Specifying Job Deployment**

![Figure 10.10 Specifying Job Deployment](image)

Specify the following fields to deploy jobs automatically:

**Deploy jobs automatically**

specifies that you want the Adapter Setup wizard to deploy all the jobs that it creates. Otherwise, the Adapter Setup wizard only creates the jobs. You must deploy them manually.

**Deployment directory**

specifies the location where the jobs are deployed if you select the option to deploy the jobs automatically.

*Note:* If you are working with z/OS, then the location for deployment can be a directory in the zFS file system or a partitioned data set (PDS) directory. If you are working with traditional z/OS, you are prompted to specify the file
system device, values for the primary and secondary space, and the number of volumes.

Click Next.

11. View a summary of the metadata that you specified for the adapter with the Adapter Setup wizard.

Figure 10.11 Viewing Specifications

The summary consolidates all of the specifications that you provided on the previous pages of the wizard.

a. Review the summary and ensure that it reflects the specifications and results that you expect. If you want to change a value that you specified on a previous page, click Back to navigate to the appropriate page and change the parameter value as needed.

The last item on the Summary page provides the location where a log file for the current Adapter Setup wizard instance is stored. This text file is automatically stored on your machine after each execution of the Adapter Setup wizard. The log includes all of the information that is detailed on the Summary page of the Adapter Setup wizard. It also includes the dates and times at which the Adapter Setup wizard was run. For more information about the log file, see “Log File Created by the Adapter Setup Wizard” on page 286.
b. Click **Finish** when complete. The wizard creates the jobs and saves them in an `<adapter><number>` folder within the IT data mart that you selected. The time that the Adapter Setup wizard takes to create the resulting jobs varies based on the adapter and the parameters that you specify. A progress bar shows the status when the wizard creates the appropriate jobs. If the jobs cannot be created, an error message is displayed.

**Note:** The first time you edit a job that the Adapter Setup wizard created, the job is marked as needing to be saved. (An asterisk is next to the name in the title bar of the Job Editor window). This is because the Job Editor is storing the initial editor settings for how the job is displayed in the window. The job was saved when the Adapter Setup wizard executed.

You might not want the Adapter Setup wizard to automatically deploy the jobs that it creates. In that case, you must deploy the resulting jobs if you want to run them in batch mode. You can right-click a job to open a menu that provides various options such as deployment and scheduling tasks. For information about deploying and scheduling the jobs that the Adapter Setup wizard creates, see “Deploy and Run Jobs That the Adapter Setup Wizard and Add Domain Category Wizard Create” on page 288.

### What Does the Adapter Setup Wizard Create?

#### What are the Types of Jobs That the Adapter Setup Wizard Creates?

Based on your specifications, the Adapter Setup wizard creates a set of ETL jobs and all the metadata that is necessary for those jobs to execute. These jobs and the associated metadata are stored in the `<adapter><number>` folder and other subfolders of the IT data mart that you are working with.

**Note:** The default name of each job contains the name that matches the subfolder where the job is located in addition to the domain category that you specify with the Adapter Setup wizard.

The Adapter Setup wizard creates the following types of jobs:

- one staging job that contains only the part of the ETL flow that relates to the staging transformation and the target staged tables.
  
  **Note:** The Adapter Setup wizard creates two staging jobs for the VMware vCenter adapter: VMware Data Acquisition and VMware vCenter.

- zero or more aggregation jobs that each contain one Aggregation transformation with target summary tables. The number of aggregation jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you specified. For more information about the aggregations that the Adapter Setup wizard creates and how you can use these aggregations to analyze and report on your IT data, see “Aggregation Jobs and Objects Created by the Adapter Setup Wizard” on page 279.

- zero or more information map jobs that each contain one Information Map transformation per aggregation table. The number of information map jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you specified.
For more information about the information map jobs that the Adapter Setup wizard creates and how you can use them to report on your IT data, see “Information Map Jobs and Objects Created by the Adapter Setup Wizard” on page 282.

- zero or more reporting jobs that each contain one or more Performance Report transformations per information map. The number of reporting jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you made when specifying the adapter.

- zero or more exception jobs for staged tables that each contain one or more Exception transformations. The number of exception jobs that are created depends on the number of staged tables for the adapter for which exception definitions are supplied.

You might not select the option to have the Adapter Setup wizard automatically deploy the jobs that it creates. In that case, you must deploy the resulting jobs if you want to run them in batch mode. You can right-click a job to open a menu that provides various options such as deployment and scheduling tasks. For information about deploying and scheduling the jobs that the Adapter Setup wizard creates, see “Deploy and Run Jobs That the Adapter Setup Wizard and Add Domain Category Wizard Create” on page 288.

Here is an example of the subfolders and jobs that the Adapter Setup wizard created for a second instance of the SAR adapter. The domain categories of Disk and System were selected. Two exception jobs were generated.

*Figure 10.12 Subfolders and Jobs Created by the Adapter Setup Wizard*
The domain categories for some adapters include a very large amount of data and associated tables. In these cases, the domain categories are divided into domain subcategories. A separate aggregation table, information map job, aggregation job, reporting job, and exception job is created for each domain subcategory based on the time periods and other reporting selections that you made when specifying the adapter. For example, the IBM SMF adapter includes a domain category called DB2 Global. The DB2 Global domain category is divided into four domain subcategories (AttachConName, ConType, JobAttach, Plan, and Subsystem).

Here is an example of the objects that the Adapter Setup wizard created for a second instance of the IBM SMF adapter. The DB2 Global domain category and the Day time period were selected. (No exception jobs were generated because the DB2 Global domain does not have any exception definitions.)

Figure 10.13 Subfolders and Jobs Created for Domain Subcategories

Where Does the Adapter Setup Wizard Store the Objects That It Generates?

The Adapter Setup wizard stores the objects that it generates in predetermined locations within the IT data mart that you select. These objects can be stored in any location to which you have Write access. However, the Adapter Setup wizard uses the following
folder organization to simplify the management and maintenance of the various objects that are interrelated.

*Note:* If you choose to create or edit IT data mart folders, subfolders, jobs, transformations, or tables, use the same naming conventions and folder structure that the Adapter Setup wizard uses. This practice ensures consistency and efficiency.

The wizard creates an `<adapter><number>` folder in the IT data mart that you are working with. Within this folder, the wizard creates the following two subfolders for the objects that it creates:

- The **Staging** subfolder, which contains the staging job, staged tables, and the library for those tables.

  Within the **Staging** subfolder, the wizard creates the **Exception** subfolder if exception definitions were set up for this adapter and domain category.

  The following display shows the metadata that is created in the **Staging** subfolder for a second instance of the SAR adapter within the IT data mart. The **Staging** subfolder contains the SAR 2 System Exceptions job, the Exception_System target exception table, and the Exception 2902 library that contains the exception table. The **Staging** subfolder also contains the SAR Staging job, the SARDEV staged table, and the library (SAR Staging 2763) for that table.

*Figure 10.14 Default Location of Objects Created by the Adapter Setup Wizard for Staging the Raw Data*

- The **Domain Categories** subfolder contains additional subfolders that are named by domain category. Each of these subfolders for domain categories contain the libraries, aggregation tables, and jobs (aggregation, information map, and reporting) that are associated with the respective domain category.

  For example, the following display shows the metadata that is created in the **Domain Categories** subfolder for the following scenario:

  - SAR adapter is selected, and it is the second time the wizard is run for this adapter in the IT data mart.
  - Two domain categories (Disk and System) are selected.
  - One time period (Day) is selected.

In this example, the **Domain Categories** subfolder contains two subfolders of domain objects: Disk and System. Each domain subfolder contains three aggregated
tables, the library associated with those tables, the aggregation job, the information map job, and the reporting job.

Figure 10.15 Default Location of Objects Created by the Adapter Setup Wizard for Aggregating, Creating Information Maps, and Reporting on the Staged Data

Staging Jobs, Exception Jobs, and Objects Created by the Adapter Setup Wizard

About Staging Jobs, Exception Jobs, and Objects Created by the Adapter Setup Wizard

For most adapters, the Adapter Setup wizard creates one staging library and one staging job for each execution of the wizard. The staging library is named <adapter> Staging <unique number>. The staging job is named <adapter> Staging and it contains the following objects for a given adapter:

- one staging transformation
- one or more target staged tables

A staging job creates the code that populates the associated staged tables. The staged tables are created by the Adapter Setup wizard based on template tables that are supplied as part of SAS IT Resource Management. The content of these tables is predetermined. They include the data that is most relevant and appropriate for analysis and reporting based on the domain category and time periods that you selected in the wizard. A staged table in the staging job is given the same name as the template table on which it is modeled. For more information about the specific staged tables that each domain category supports, see “Overview of the SAS IT Resource Management Data Model” on page 548.
If an exception definition was set up for this adapter and domain category, an Exception subfolder is created under the Staging subfolder. The wizard creates one exception library and one or more exception jobs for each execution of the wizard. The exception library is named `<adapter> Exception <unique number>`. The exception job is named `<adapter> <domain category> Exceptions` and it contains the following objects for a given adapter:

- one Exception transformation
- one target exception table

*Note:* An exception condition table can be added to the Exception transformation. For more information, see “How to Specify an Exception Table” on page 240.

*Note:* For the VMware vCenter adapter, the Adapter Setup wizard creates two staging jobs (VMware Data Acquisition and VMware vCenter) with one staging transformation and one staging library for each.

### How to Determine Whether the Adapter Setup Wizard Will Create Exception Jobs for Your Selections

SAS IT Resource Management supplies predefined exception definitions for the staged tables of several adapter and domain category combinations. These exception definitions include information such as the name of the exception definition, the expression of the exception, and other attributes. The Adapter Setup wizard uses these prepackaged exception definitions in the exception jobs that it creates for the adapter and domain categories that you select.

If you select an adapter domain category for which SAS IT Resource Management supplies exception definitions, then the Adapter Setup wizard creates the appropriate exception jobs. To determine whether the Adapter Setup wizard is going to create exception jobs for the adapter and domain category that you selected, view the Summary page of the wizard before you select **Finish**. (For information about jobs that the wizard creates, see Appendix 4, “Jobs That the Adapter Setup and the Add Domain Category Wizards Create,” on page 525.)
The Summary page lists the exception jobs that the Adapter Setup wizard will create and the exception definitions that the exception jobs use. As shown in the following display, one exception job is created. It will run two exception definitions.

**Figure 10.16** Example of a Summary Page Listing Exception Jobs

---

**Aggregation Jobs and Objects Created by the Adapter Setup Wizard**

**Overview**

The Adapter Setup wizard creates zero or more aggregation jobs for a supported adapter. Each of these aggregation jobs contain one staged table as the source table, one Aggregation transformation, and one or more target summary aggregation tables. The aggregation tables are named using the convention `<time period>` (such as `Day`, `WeekShift`, `MonthShiftHour`, `KeyMetrics`, `Detail`, and so on) `<domain subcategory>` (such as `cache`, `memory`, `server`, and so on). For example, an aggregation table name might be `MonthShiftHourDisk`.

There are three types of aggregations that the Adapter Setup wizard might include in an aggregation job.

- **regular aggregations by time period**
  - transformations that specify one or more ways to classify, summarize, and age an input table based on a specified time period. For more information about aggregations that are created by time period, see “Aggregations by Time Period” on page 280.

- **key metrics aggregations**
  - aggregations that include only key metrics and any relevant classification and ID columns that are associated with these key metrics to provide vital data for the longer term forecast and capacity planning reporting about key metrics aggregations, see “Key Metrics Aggregations” on page 281.
detail aggregations
simple aggregation tables that contain detail data as it was read by the staging transformation. For more information about the detail aggregations that the Adapter Setup wizard creates, see “Detail Aggregated Tables” on page 281.

The number and type of aggregations that are provided for a supported adapter varies based on the type of data that the adapter collects and the specifications that you select in the Adapter Setup wizard.

For more information about working with aggregations in SAS IT Resource Management, see “Working with Aggregation Transformations” on page 198. For more information about the aggregation metrics that are provided by SAS IT Resource Management adapters, see the documentation at http://support.sas.com/documentation/onlinedoc/itsv/metrics.html.

**Aggregations by Time Period**
The Adapter Setup wizard creates a set of aggregations based on the domain categories and time periods (Day, Week, Month, Shift) that you select. These aggregations, stored in separate folders for each domain category that you selected, classify, summarize, and age an input table based on the selected time periods. For example, the WeekDisk aggregation includes weekly data about server disk performance. In turn, the weekly reporting job uses the information from this aggregation table and its corresponding information map to generate a report that shows the weekly performance data for the server disk.

The following table shows the aggregations that the Adapter Setup wizard creates based on selected time periods.

**Table 10.1 Aggregations Created by Time Period Selection**

<table>
<thead>
<tr>
<th>Selected Time Period</th>
<th>Generated Aggregations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>Detail</td>
</tr>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td></td>
<td>DayHour</td>
</tr>
<tr>
<td>Day + Shift</td>
<td>Detail</td>
</tr>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td></td>
<td>DayShift</td>
</tr>
<tr>
<td></td>
<td>DayHour</td>
</tr>
<tr>
<td></td>
<td>DayShiftHour</td>
</tr>
<tr>
<td>Week</td>
<td>Week</td>
</tr>
<tr>
<td></td>
<td>WeekHour</td>
</tr>
<tr>
<td>Week + Shift</td>
<td>Week</td>
</tr>
<tr>
<td></td>
<td>WeekShift</td>
</tr>
<tr>
<td></td>
<td>WeekHour</td>
</tr>
<tr>
<td></td>
<td>WeekShiftHour</td>
</tr>
<tr>
<td>Month</td>
<td>Month</td>
</tr>
<tr>
<td></td>
<td>MonthHour</td>
</tr>
</tbody>
</table>
Selected Time Period | Generated Aggregations
--- | ---
Month + Shift | Month
 | MonthShift
 | MonthHour
 | MonthShiftHour

**Key Metrics Aggregations**
The Adapter Setup wizard creates key metrics aggregations if you select the **Key metrics** option in the wizard. These aggregations are named with the prefix “KeyMetrics” and are stored with the other aggregation tables for a given domain category.

Key metrics aggregations are tables that have only a few columns that are deemed highly important for the domain category. These aggregations serve as the source for capacity planning and forecasting. These aggregations include only key metrics and any relevant classification and ID columns that are associated with these key metrics to provide vital supporting data for the selected metrics.

Key metrics are a subset of the available metrics that are provided by adapters for a given performance area such as resource utilization. You can use key metrics aggregation tables to quickly view the most critical data for a performance area.

The following image shows a key metrics aggregation, circled in red, in a process flow diagram.

*Figure 10.17  Key Metrics Aggregation in a Process Flow Diagram*

For more information about key metrics, see “What Are Key Metrics?” on page 562.

**Detail Aggregated Tables**
For some adapters, the Adapter Setup wizard creates simple aggregation tables that consist of the raw data from the staged table that is appended to the simple aggregated table. These aggregated tables are named with the prefix “Detail” and are stored with the other aggregation tables for a given domain category.

Detail aggregated tables provide a granularity that enables you to view and report on the raw data as it is retrieved from the source. These simple aggregated tables can support join columns, computed columns, and aging, but they do not include statistics or other intelligence from SAS IT Resource Management.
The following image shows a detail aggregation, circled in red, in a process flow diagram.

**Figure 10.18  Detail Aggregation in a Process Flow Diagram**

![Process Flow Diagram](image)

**Information Map Jobs and Objects Created by the Adapter Setup Wizard**

The Adapter Setup wizard creates one information map job (named `<domain category> Information Map`) for each domain category that you select. These information map jobs include an Information Map transformation for each aggregation table that the wizard creates for the domain category. Each Information Map transformation is named the same as its corresponding aggregation table `<level>` (such as `Day, WeekShift, MonthShiftHour`, and so on) `<domain subcategory>` (such as `cache, memory, server`, and so on).

*Note:* When the Adapter Setup wizard creates Information Map transformations, it populates the **Information map path** field on the **Information Map Parameters** tab and checks the **Use default path of the job** box. (When this box is checked, the **Information map path** is grayed out, and cannot be changed.) The Information Map transformation stores the information maps in the current folder where the information map job resides. This enables you to move or rename elements of the folder structure easily without having to modify each of the Information Map transformations that are affected. If you want to change the location where the information maps are stored, uncheck the **Use default path of the job** box and enter the changed path. You can click **Browse** to navigate to the location where you want to store your information maps.

When the information map jobs run, the Information Map transformations create information maps for the corresponding aggregation tables. Those information maps are stored in the same `<domain category>` folder as the information map job, aggregation tables, and aggregation job. In the case of objects created by the Adapter Setup wizard, an Information Map transformation assigns the same name to the information map that it creates. As a result, the aggregation table, Information Map transformation, and resulting information map have the same name. This helps identify and associate each object easily.

*Note:* You might make changes to the tables that are read into those Information Map transformations that alter the structure of the table (for example, by adding or deleting columns). If so, you must rerun the corresponding information map jobs so that the information maps are regenerated.
The Adapter Setup wizard provides filters for the Information Map transformations that it creates. The wizard automatically provides one filter for each ranked column and one or more filters for the ranked columns of dates. These filters are specified in the Information Map transformations and propagated to the information maps that are created when the job is run. For more information about working with Information Map transformations, information maps, and information map filters, see “About Information Maps” on page 308.

Reporting Jobs and Objects Created by the Adapter Setup Wizard

About Reporting Jobs Created by the Adapter Setup Wizard

The Adapter Setup wizard programmatically creates reporting jobs for the domain categories and time periods that you might select. These reporting jobs are named using the convention <domain subcategory> <time period> (such as Daily, Weekly, and Monthly) Reporting. These jobs are stored in the same domain category folder as the aggregation and information map jobs.

Reporting jobs include Performance Report transformations that use report definitions, information maps, and aggregation tables to generate readable reports on the IT resource data. When a reporting job executes, it creates the necessary report packages and reports based on the information maps that are in the same domain category folder. The reports are then saved as tabular or graphic files (such as HTML or PNG files) in the SAS Content Server that you selected in the Adapter Setup wizard. For more information about the reporting jobs that the Adapter Setup wizard creates for specific domain categories and time periods, see “How to Determine Whether the Adapter Setup Wizard Will Create Reporting Jobs for Your Selections” on page 283.

Note: The metadata server and SAS Content Server must be running when reporting jobs execute or the jobs will fail to generate output.

After a reporting job is deployed, scheduled, and executed, the resulting report output is available for viewing with ITRM Report Center. The ITRM Report Center enables you to access, filter, and manage your report content from a web browser. For more information about reporting jobs and using ITRM Report Center, see the SAS IT Resource Management 3.8: Reporting Guide.

How to Determine Whether the Adapter Setup Wizard Will Create Reporting Jobs for Your Selections

SAS IT Resource Management supplies predefined report definitions for several domain categories and time periods. These report definitions include information such as the table and level, the names of the variables, the report style, and other attributes that are used to build graphical reports from your IT resource data. The Adapter Setup wizard uses these prepackaged report definitions in the reporting jobs that it creates for the domain categories and time periods that you select.

If you select a domain category and time period for which SAS IT Resource Management supplies report definitions, then the Adapter Setup wizard creates the appropriate reporting jobs. To determine whether the Adapter Setup wizard is going to create reporting jobs for the domain category and time periods that you selected, view the Summary page of the wizard before you select Finish. (For information about jobs that the wizard creates, see Appendix 4, “Jobs That the Adapter Setup and the Add Domain Category Wizards Create,” on page 525.)
The Summary page lists the report jobs that the Adapter Setup wizard will create and the report definitions that the report jobs use, as shown in the following image:

**Figure 10.19 Example of a Summary Page Listing Report Jobs**

*Note:* The Summary page also includes a note if no reporting jobs will be created.

You can also determine whether the Adapter Setup wizard is going to create reporting jobs based on your selections by viewing the list of supplied report definitions for a given domain category and time period. If SAS IT Resource Management supplies report definitions for a given adapter, domain category, and time period, then the Adapter Setup wizard creates a reporting job for those selections. If there are no supplied report definitions for a given adapter, domain category, and time period, then the Adapter Setup wizard does not create reporting jobs for those selections.

To view the supplied report definitions, perform the following steps:

1. In the Folders tree, select **Shared Data** ➔ **SAS IT Resource Management** ➔ **3.8 IT Report Definitions**.
2. Select an `<adapter>` folder.
3. Select a `<domain category>` folder.
4. Select **Supplied**.
5. Select a `<time period>` folder.
You can also create your own report definitions, Performance Report transformations, and reporting jobs to supplement the reporting jobs that the Adapter Setup wizard creates. You can also add reporting jobs to the domain categories and time periods for which the Adapter Setup wizard does not create reporting jobs. Report definitions that you create can be stored in the User-Defined folder within the domain category folder. If you decide to create your own reporting objects and jobs, use the same naming conventions and folder structure that the Adapter Setup wizard uses for consistency and efficiency. Consider using the reporting objects that are supplied by SAS IT Resource Management as templates for those objects that you create. For more information about creating your own report definitions, Performance Report transformations, and reporting jobs, see the SAS IT Resource Management 3.8: Reporting Guide.

CAUTION:
For best results, maintain copies of any supplied report definitions and any supplied report definitions that you might have modified so that your collection of reports is preserved. The Adapter Setup wizard looks in the Supplied folder for the report definitions to use in the reporting jobs that it creates. If you modify or remove these supplied report definitions, then you will lose or overwrite the intelligence that SAS IT Resource Management has incorporated into these definitions to ensure proper creation of the reports. Likewise, subsequent updates to SAS IT Resource Management software will overwrite any modifications that you have made to those report definitions that were supplied by the solution.

**Libraries Created by the Adapter Setup Wizard**

The Adapter Setup wizard creates libraries that are required to hold the various tables that are used by the jobs that the wizard creates. The wizard creates the necessary
libraries based on the adapter and domain categories that you select. For example, only a few adapters such as IBM SMF and ASG TMON2CIC require a spin library for spin data. The Adapter Setup wizard creates a spin library only for those adapters that require one.

Staged library and libref names must be unique within the application server. The Adapter Setup wizard creates the following libraries and stores them in the same folder as their corresponding jobs and tables in the IT data mart:

library for staged tables
holds the staged tables that the Adapter Setup wizard creates. The Adapter Setup wizard creates one staged library for each staging job that it creates with every execution of the wizard. This library is named <adapter> Staging <unique number>. The corresponding libref name is STG <the same unique number as the library>.

libraries for aggregation tables
hold the aggregation tables that the Adapter Setup wizard creates. The Adapter Setup wizard creates an aggregation library for each aggregation transformation that it creates. These libraries are named <domain subcategory> <unique number>. The corresponding libref name is AGG <the same unique number as the library>.

spin library
holds the spin metadata for adapters that use spin data. These libraries are named <adapter name> Spin <unique number>. The corresponding libref name is SPIN.

exception library
holds the exception tables that the Adapter Setup wizard creates. The Adapter Setup wizard creates an exception table. If specified, it also creates an exception condition table. These libraries are named Exception <unique number>.

**Log File Created by the Adapter Setup Wizard**

The Adapter Setup wizard creates a log file after each execution of the wizard and stores the text file on your machine. The last item on the Summary page of the Adapter Setup wizard provides the location where the log file is stored. On the client, these log files are located in a directory that is determined based on the APPDATA environment variable. On Windows 7, this location is typically C:\Users\userid\AppData\Roaming\SAS\SASITResourceManagement\3.8.

The name of the log file is based on the adapter that you selected and the date and time that the Adapter Setup wizard was executed (ASWlogYYMMDDHHMMSS-<adapter name> <number>). For example, the Adapter Setup wizard might create the following log file if executed for the fourth instance of the DT Perf Sentry adapter on May 23, 2014, at 2:30:44 p.m.: ASWlog1405231433044-DT Perf Sentry 1.txt.

The Adapter Setup wizard log includes all of the information that is detailed on the Summary page of the Adapter Setup wizard. It also includes the processing time for each
process and the total processing time for the wizard to execute. The following image shows a sample log file from an execution of the Adapter Setup wizard.

Figure 10.21  Sample Log File from the Adapter Setup Wizard

Domain Categories

About Domain Categories

Domain categories are categories of staged template tables and aggregation tables that are organized logically to represent subsets of the IT resource measurements that are available from an adapter. This organization helps you create reports from one or more related template tables and aggregation tables of IT performance measurements.

**Note:** The domain categories that the Adapter Setup wizard displays are not necessarily all of the available domain categories for an adapter. You can view all of the domain categories for an adapter by opening the Folders tree view and expanding Products ⇒ SAS IT Resource Management ⇒ Adapters ⇒ <adapter name> ⇒ IT Template Tables. The staged template tables are grouped by domain category. All of the domain categories for an adapter are in this list.

**Tip** The Add Domain Category wizard can be invoked if you want to add domain categories to an existing staging transformation. For more information, see “About the Add Domain Category Wizard” on page 291.

The domain categories that are associated with an adapter vary based on the requirements and capabilities of each adapter. If SAS IT Resource Management provides aggregation and information map jobs for a given adapter, then the Adapter Setup wizard enables you to select the domain categories that you want to use. If an adapter does not have aggregation and information map jobs available from the Adapter Setup wizard,
then the wizard creates only a staging job. It does not enable you to select a domain category.

This capability helps you manage system performance by enabling you to select the specific domain categories that are essential to the performance management and capacity planning processes for your enterprise. The time that the Adapter Setup wizard takes to create the resulting jobs varies based on the number of staged tables, aggregation jobs and tables, information map jobs, and reporting jobs that are generated for the domain categories that you select.

Note: The Adapter Setup and Add Domain Category wizards create ETL jobs based on the domain categories that you select. However, for some adapters such as those based on event-type data, domain categories are divided further into domain subcategories. In these cases, the jobs that are created are based on the domain subcategories instead. This prevents jobs from being too large. When working with the ETL jobs that the Adapter Setup and Add Domain Category wizards create, you might notice that the jobs are categorized into these subcategories.

For more information about the types of jobs that the Adapter Setup and Add Domain Category wizards create for each adapter and domain category, see Appendix 4, “Jobs That the Adapter Setup and the Add Domain Category Wizards Create,” on page 525.

---

**Deploy and Run Jobs That the Adapter Setup Wizard and Add Domain Category Wizard Create**

The Adapter Setup wizard and Add Domain Category wizard provide convenient ways to create the jobs that stage, summarize, and report on the IT resource data that an adapter loads. However, these wizards do not run the jobs that they create. You must run the resulting jobs as needed.

Deploying a job enables you to execute the job outside of the SAS IT Resource Management client. This practice might be necessary when scheduling a job to run at a specified time or when a job might need to be made available as a stored process. SAS IT Resource Management enables you to deploy as well as run jobs. For more information about deploying, scheduling, and running jobs, see “Jobs That Process IT Data” on page 365.

The Adapter Setup wizard and Add Domain Category wizard create jobs that are separated into individual component jobs. Therefore, you have the flexibility to modify, deploy, and run them separately if you have updates to only one aspect of the data extraction, transformation, loading, and reporting process.

The jobs that the Adapter Setup and Add Domain Category wizard create depend on one another to process the raw data for reporting. For example, the aggregation jobs include aggregations that rely on the staged tables that are generated when the staging job is run. As a result, each job should be run only after the jobs that it depends on have been run.

The following list shows the types of jobs that these wizard create and the dependencies of each. Each job type in the list is dependent on the job type that precedes it.

1. staging job
2. aggregation job
3. information map job
4. reporting job
5. exception job
Note: An exception job is dependent on the successful execution of the job that generates its source table.
Chapter 11
Add Domain Category Wizard

About the Add Domain Category Wizard

What Is the Add Domain Category Wizard? ........................................... 291
Advantages of the Add Domain Category Wizard ................................. 292
Naming Conventions That the Add Domain Category Wizard Uses ........... 292

Using the Add Domain Category Wizard ............................................. 293
Accessing and Navigating the Add Domain Category Wizard ................. 293
Steps to Complete the Add Domain Category Wizard ......................... 294
Creating Jobs By Using the Add Domain Category Wizard .................... 294

What Does the Add Domain Category Wizard Create? .......................... 302
What are the Types of Jobs That the Add Domain Category Wizard Creates? 302
What Objects Does the Add Domain Category Wizard Generate? .............. 303
Log File Created by the Add Domain Category Wizard .......................... 305

About the Add Domain Category Wizard

What Is the Add Domain Category Wizard?

The Add Domain Category wizard enables you to add domain categories to an existing staging transformation that has been generated by the Adapter Setup wizard. For each new domain category, the wizard creates aggregation jobs, information map jobs, reporting jobs, and exception jobs that process the raw data for an IT resource. These jobs are based on industry intelligence that represents a best estimate about the types of aggregations and reports that most sites need for analysis. If exception definitions are set up for the adapter and domain category combination, an exception job is also created. For more information about domain categories, see “Domain Categories” on page 287.

TIP The Add Domain Category wizard creates jobs and metadata (for tables, libraries, folders, and so on), in the same way that the Adapter Setup wizard does. Therefore, knowledge of how the Adapter Setup wizard works is necessary in order to understand the Add Domain Category wizard. This chapter explains how the Add Domain Category wizard works. For more information about processing details that are not discussed in this chapter, see “About the Adapter Setup Wizard” on page 257.

After the wizard creates the appropriate jobs, you can deploy, schedule, and run each as needed.

For more information about using the Add Domain Category wizard, see “Accessing and Navigating the Add Domain Category Wizard” on page 293.
Note: You might want to process one or more sets of raw data into the staged tables that were added with the Add Domain Category wizard. In addition, you want to include that backloaded data in the appropriate aggregation tables and, ultimately, the reports. For information about how to do this, see “How to Backload Raw Data” on page 643.

Advantages of the Add Domain Category Wizard

The Add Domain Category wizard enables you to add more domain categories to an existing adapter instance under the following circumstances:

- The Adapter Setup wizard created the staging transformation to which you want to add another domain category.
- The domain category that you are adding was not previously specified for this adapter.

If you already added all available domains using the Adapter Setup wizard or the Add Domain Category wizard, then the Add Domain Category wizard does not allow you to add anything else.

Note: The Add Domain Category wizard cannot be used for staging transformations that were created by means other than the Adapter Setup wizard. It cannot be used for the RRD or CSV adapters because each of these adapters has only one domain category. In addition, it cannot be used for the following adapters that enable only staging transformations:

- ASG TMON2CIC
- ASG TMONDB2
- ASG TMONDB2 V5
- BMC Mainview IMS
- CA TMS
- DT Perf Sentry with MXG
- IBM DCOLLECT
- IBM EREP
- IBM TPF
- IBM VMMON

Naming Conventions That the Add Domain Category Wizard Uses

The Add Domain Category wizard uses the same naming conventions that the Adapter Setup wizard uses when naming and saving the folders, jobs, transformations, and tables that it creates. These standards simplify the management and maintenance of the various objects that are interrelated. For best results, if you edit the IT data mart folders, subfolders, jobs, transformations, or tables that the wizard creates, then use the same naming conventions that the Adapter Setup wizard uses for consistency and efficiency.

For a comprehensive list of the naming conventions and location standards that SAS IT Resource Management uses, see “About Naming Standards for SAS IT Resource Management Objects” on page 573.
Using the Add Domain Category Wizard

Accessing and Navigating the Add Domain Category Wizard

The Add Domain Category wizard is launched from a staging transformation from within the staging job that was created by the Adapter Setup wizard.

To access the Add Domain Category wizard, perform the following steps:

1. From the IT Data Marts tree, navigate to the job that contains the staging transformation to which you want to add domain categories. Double-click the job to open it in the process flow diagram.

2. Right-click the staging transformation. From the drop-down list, select Add Domain Category.

![Properties of Staging Transformation with Add Domain Category Circled](image)

The Add Domain Category wizard appears.

To navigate through the pages of the wizard, use the following wizard buttons:

- **Help** displays a Help topic for the current page.
- **Cancel** abandons changes that were made after the last save and closes the current page.
Steps to Complete the Add Domain Category Wizard

The Add Domain Category wizard guides you through several steps that help define the ETL jobs, staged tables, aggregation tables, information maps, and performance report transformations for the selected adapter.

Here are the steps or pages that the Add Domain Category wizard can present for a given adapter:

• Specify the configuration level that controls the number of aggregation tables and jobs to be produced.
• Select domain categories that you want to add to the adapter.
• Select the time periods for which you want to create aggregation and report jobs.
• Specify the location of any user-written formulas.
• Specify the SAS Content Server for report packages.
• Specify the job deployment information.
  
  Note: Automatic deployment of jobs is not available if you have selected more than two additional domain categories.

• View a summary of the specifications that you have chosen and the ETL objects that the Add Domain Category wizard creates when the resulting jobs are executed.

Note: Unlike the Adapter Setup wizard, the Add Domain Category wizard does not prompt you to select an adapter, an IT data mart, or staging parameters, such as the location of the raw data. These selections are implicitly specified in the staging transformation that you are working with.

Creating Jobs By Using the Add Domain Category Wizard

To specify all of the necessary parameters that the Add Domain Category wizard requires to create the tables and jobs for an adapter, perform the following steps:

1. The first page of the Add Domain Category wizard enables you to specify the configuration level that represents the scope of output jobs that you want the wizard to create.
Configuration levels enable you to specify the general scope or amount of aggregation tables and jobs that you want the Add Domain Category wizard to create. These levels provide various presentations of granularity in the data based on the aggregations and metrics that are available for an adapter. The jobs that are created for each level include the metrics that are used in the reports for that level. These jobs might also include other metrics that have been predetermined to be useful for reporting on the given level.

Configuration levels are unique for each adapter. However, in some cases, the levels can be identical for a given adapter. For more information about the metrics and aggregations that are supported for each adapter, see the SAS IT Resource Management metrics documentation. To locate the SAS IT Resource Management documentation, use the Products Index A-Z at http://support.sas.com/documentation/index.html.

To specify the level of output, complete the following steps:

a. Select one of the following configuration levels:

**Minimal**
modifies the staging transformation, adds staged tables, and creates additional jobs that include metrics, aggregations, report definitions, and exception definitions for a small number of reports. This level is for reporting on a small scale. You might use this level to create jobs that are related to low-priority, non-critical machines.

**Typical**
modifies the staging transformation, adds staged tables, and creates the staging job and a set of jobs that include recommended metrics, aggregations, report definitions, and exception definitions that satisfy a typical set of reports for an adapter. (This configuration level includes the output that is part of the **Minimal** setting.)

This configuration level is the default option.
**Full**  
modifies the staging transformation, adds staged tables, and creates a staging job and a comprehensive set of jobs that include most metrics, aggregations, report definitions, and exception definitions that SAS IT Resource Management supports. This level includes all of the jobs that are part of the **Typical** level. In addition, it includes many of the other metrics that are recommended for an adapter. You might use this level when you want the full benefits of the domain intelligence that is available with the SAS IT Resource Management solution. This configuration level also provides additional information from the full set of metrics that are available from the adapter data sources.

**Note:** Increasing the configuration level results in more complex transformations and jobs. Selecting **Full** when you need only the **Typical** level adds to the complexity of the processing. This extra complexity causes the Add Domain Category wizard to be slower to complete. Also, the nightly ETL jobs takes longer to process.

b. On the next page, you can specify one or more domain categories that you want the Add Domain Category wizard to use when creating the resulting jobs. Click one or more domain categories to enable the domain category for staging and aggregation. At least one domain category must be selected before you can continue to the next page of the wizard.

**Figure 11.3 Selecting the Domain Categories for the Adapter**

This page displays a list of the domain categories that are available for the selected adapter. This list excludes the domain categories that were previously selected when the Adapter Setup wizard was run or during a previous invocation of the Add Domain Category wizard for this adapter.

If no categories are available to add, this message is displayed: “There are no domain categories to add. All domain categories already exist.” Click **OK** to close the wizard.
**Note:** The description in the box on the right corresponds to the domain category that is highlighted in the **Select domain categories** box.

For more information about domain categories, see “Domain Categories” on page 287.

2. Select the time periods that you want to use for the aggregation and reporting jobs. You can also specify that you want to create aggregation tables that include shift data or key metrics. On the lower part of this page, you can specify the cut off time that marks the end of the completed day. This page of the wizard also displays the number of aggregation tables that will be created based on your selections.

*Figure 11.4  Selecting Time Periods*

For more information about the specific aggregations that will be created based on the time period and shift, see “Aggregations by Time Period” on page 280.

To respond to the prompts on this page, perform the following steps:

a. Select the time periods for which you want to create aggregation and report jobs:

   **Day**
   creates aggregation jobs and the daily, weekly, and monthly report jobs that generate reports about the daily data.

   **Week**
   creates aggregation jobs and the weekly report job that generate reports about the weekly data.

   **Month**
   creates aggregation jobs and the monthly report job that generate reports about the monthly data.

b. Select **Shift** if you want to generate aggregations, information maps, and reports that are based on shift data, in addition to daily, weekly, or monthly data.

   **Note:** In some cases, **Shift** might be selected by default because of the adapter that you selected earlier in the wizard.
c. **Key metrics** are metrics that focus on the most critical data for a performance area or domain category. Select **Key metrics** if you want to generate aggregation tables, information maps, and reports that include only the key metrics.

   *Note:* If the domain categories that you selected do not include key metrics, then this option is not available.

d. If you want to change the cut off time that signifies the end of a day, check the Override default cut off time. Then use the spinners to select the cut off time that you want to use.

   *Note:* You must select at least one time period or the **Key metrics** option to continue. (That is, you can select any combination of these four choices: **Day**, **Week**, **Month**, or **Key metrics**, but you must select at least one.)

3. Specify the location of any user-written formulas to use in addition to the formulas that SAS IT Resource Management supplies.

   **Figure 11.5 Specifying User-Written Formulas**

The staged tables and aggregation tables that the Add Domain Category wizard creates include computed columns that reference various formulas. When the tables with computed columns are instantiated, SAS IT Resource Management looks for the corresponding formulas in the list of supplied formulas.

You might have customized or user-written formulas that you prefer to use. If so, then use this page of the wizard to specify the location of the user-written formulas that you want to use. The Add Domain Category wizard then looks in the folder that you specified for any formulas that have the same name as those in the tables that it creates. If a formula with the same name is in the folder, then the wizard uses that formula. If the formula is not found in your specified location, then the wizard searches for the formula in this location: `Shared Data/SAS IT Resource Management/IT Formulas`. If the formula is still not found, then the wizard searches for it in this location: `Products/SAS IT Resource Management/IT Formula`. 

Click **Browse** to navigate to and select the folder that includes any user-written formulas that you want to use instead of the formulas that SAS IT Resource Management supplies. This field is optional and does not allow manual entries. If you are not working with user-written formulas and do not specify a folder in this field, then the Add Domain Category wizard defaults to the supplied formulas.

4. Specify the location of the SAS Content Server where the report definitions are retrieved and where the reports that are generated from the resulting jobs are stored.

**Figure 11.6  Specifying SAS Content Server**

The report definitions that the Add Domain Category wizard uses to create the report jobs are stored on the SAS Metadata Server. The reports that are generated from the report jobs are stored on the SAS Content Server.

If you are using domain categories that result in reporting jobs, specify the following parameters for the SAS Content Server:

**SAS Content Server**

specifies the name of the server that is used as the SAS Content Server for storing report definitions and report job output.

*Note:* Only servers that can be valid SAS Content Servers are included in the drop-down list for this parameter.

**Repository folder path**

specifies the path within the SAS Content Server where the report definitions and reports are stored. The default location is `/SASContentServer/repository/default/sasdav/ITRM`.

*Note:* Use the Administration workspace of ITRM Report Center to add or delete a repository folder path. Repository folder paths that are created by using SAS Management Console are not displayed. (In SAS IT Resource Management 3.3, customers could use SAS Management Console to add a repository folder path. In SAS IT Resource Management 3.4 and later, customers should use only the Administration workspace of ITRM Report Center to add or delete this path.) Do not edit the path.
5. Specify the following parameters to indicate whether you want the Add Domain Category wizard to deploy the jobs that it creates.

**Figure 11.7  Job Deployment Options**

**Deploy jobs automatically**

specifies if you want the Add Domain Category wizard to deploy all of the jobs that it creates. Otherwise, the wizard only creates the jobs and you must deploy them manually.

*Note:* Automatic deployment of jobs is not available if you are adding more than two additional domains.

**Deployment directory**

specifies the location where the jobs are deployed if you deploy the jobs automatically.

*Note:* If you are working with z/OS, then the location for deployment can be a directory in the zFS file system or a partitioned data set (PDS) directory.

You might not want to have the Add Domain Category wizard automatically deploy the jobs that it creates. If so, then you must deploy the resulting jobs if you want to run them in batch mode. You can right-click a job to open a menu that provides various options, such as deployment and scheduling tasks. For information about running the jobs that the Add Domain Category wizard creates, see “Running Jobs” on page 375. For more information about deploying a job, see “Deploy a Job for Scheduling” on page 377 or see the SAS Data Integration Studio Help.

6. View a summary of the metadata that you specified for the adapter with the Add Domain Category wizard.
The summary consolidates all of the specifications that you provided on the previous pages of the wizard.

a. Review the summary and ensure that it reflects the specifications and results that you expect. If you want to change a value that you specified on a previous page, click Back to navigate to the appropriate page and change the parameter value as needed.

The last item on the Summary page provides the location where a log file for the current Add Domain Category wizard instance is stored. This text file is automatically stored on your machine after each execution of the wizard. The log includes all of the information that is detailed on the Summary page of the Add Domain Category wizard. It also includes the dates and times at which the Add Domain Category wizard was run. For more information about the log file, see “Log File Created by the Add Domain Category Wizard” on page 305.

b. Click Finish when complete. The wizard creates the jobs and saves them in an &lt;adapter&gt;&lt;number&gt; folder within the IT data mart that you selected. The amount of time that the Add Domain Category wizard takes to create the resulting jobs varies based on the adapter and the parameters that you specify. A
progress bar shows the status when the wizard creates the appropriate jobs. If the jobs cannot be created, an error message is displayed.

**CAUTION:**

Be sure to redeploy the staging job that contains the staging transformation that was modified by the Add Domain Category wizard. Run the information map job only once after the aggregation job, and then run it again only if and when modifications are made to the aggregation job.

You might not want to have the Add Domain Category wizard automatically deploy the jobs that it creates. If so, then you must deploy the resulting jobs if you want to run them in batch mode. You can right-click a job to open a menu that provides various options, such as deployment and scheduling tasks. For information about running the jobs that the Add Domain Category wizard creates, see “Running Jobs” on page 375. For more information about deploying a job, see “Deploy a Job for Scheduling” on page 377 or the SAS Data Integration Studio Help.

---

**What Does the Add Domain Category Wizard Create?**

**What are the Types of Jobs That the Add Domain Category Wizard Creates?**

Based on your specifications, the Add Domain Category wizard creates a set of ETL jobs and all the metadata that is necessary for those jobs to execute. These jobs and the associated metadata are stored in the `<adapter><number>` folder and other subfolders of the IT data mart that you are working with.

*Note:* The default name of each job contains the name that matches the subfolder where the job is located in addition to the domain category that you specify with the Add Domain Category wizard.

The Add Domain Category wizard performs the following actions:

- modifies the existing staging transformation by adding a staged table to the staging transformation on which the wizard is invoked.

- creates zero or more aggregation jobs that each contain one Aggregation transformation with target summary tables. The number of aggregation jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you specified. For more information about the aggregations that the Add Domain Category wizard creates and how you can use these aggregations to analyze and report on your IT data, see “Aggregation Jobs and Objects Created by the Adapter Setup Wizard” on page 279.

- creates zero or more information map jobs that each contain one Information Map transformation per aggregation table. The number of information map jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you specified. For more information about the information map jobs that the Add Domain Category wizard creates and how you can use them to report on your IT data, see “Information Map Jobs and Objects Created by the Adapter Setup Wizard” on page 282.
• creates zero or more reporting jobs that each contain one or more Performance Report transformations per information map. The number of reporting jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you made when specifying the adapter.

• zero or more exception jobs that each contain an Exception transformation. The number of exception jobs that are created varies based on the domain categories selected for the adapter and whether exception definitions are supplied for the corresponding staged tables.

What Objects Does the Add Domain Category Wizard Generate?

The Add Domain Category wizard uses many of the same processes that are used by the Adapter Setup wizard. The objects that are created by the Add Domain Category wizard are stored using the same folder structure that the Adapter Setup wizard uses when it stores the objects that it creates. You must have Write access to these locations. For best results, if you create or edit IT data mart folders, subfolders, jobs, transformations, or tables, then use the same naming conventions and folder structure that the Adapter Setup wizard uses for consistency and efficiency.

The Add Domain Category wizard creates the following objects:

• a new staged table that the wizard stores in the existing Staging folder of the IT data mart that you are working with.

The following display shows the metadata that is created in the Staging subfolder for an instance of the IBM SMF adapter after the domain category for the RMF Device was added to the staging transformation. (The staging transformation was originally set up for the RMF System domain.)

• The Staging subfolder contains the IBM SMF Staging job, the RMFSYSTM and TYPE74 staged tables, and the library (IBM SMF Staging 6516) for those tables.

• An Exception subfolder was generated. It contains the Exception job (IBM SMF 1 RMF Device Exceptions), the Exception 1087 library, and the Exceptions_RMF Device exception table. These objects are generated because the \Folders\Shared Data\SAS IT Resource Management\3.8 IT Exception Definitions folder contains exception definitions for the RMF Device domain of the IBM SMF adapter.
As shown in the previous display, the **Domain Categories** subfolder contains an additional subfolder for the newly added RMF Device domain category. This subfolder contains the following objects that are associated with the respective domain category.

- the Disk 3252 library
- the DayDisk, DayHourDisk, and DetailDisk aggregation tables
- the IBM SMF 1 Disk Aggregation, IBM SMF 1 Disk Daily reporting, and IBM SMF 1 Disk Information Map jobs
• the Exception folder, the Exception 1087 library, Exceptions_RMF Device Exceptions table, and IBM SMF 1 RMF Device Exceptions job

Note: The Exception folder is located under the Staging folder.

Note: The information maps for this domain are generated when the associated information map job is run successfully.

Log File Created by the Add Domain Category Wizard

The Add Domain Category wizard creates a log file after each execution of the wizard and stores the text file on your machine. The last item on the Summary page of the Add Domain Category wizard provides the location where the log file is stored. On the client, these log files are located in a directory that is determined based on the APPDATA environment variable.

On Windows 7, this location is typically C:\Users\userid\AppData\Roaming\SAS\SASITResourceManagement\3.8.

The name of the log file is based on the adapter that you selected and the date and time that the Adapter Setup wizard was executed (ASWlogYYMMDDHHMMSS-<adapter name> <number>). For example, the Add Domain Category wizard might create the following log file if executed for the DT Perf Sentry adapter on May 27, 2014, at 1:19 p.m.: ADCWlog140527131954137-IBM SMF 2.txt. (It would be located here: C:\Users\userid\AppData\Roaming\SAS\SASITResourceManagement\3.8\ADCWlog140527131954137-IBM SMF 2.txt.)
Figure 11.10  Sample Log File from the Add Domain Category Wizard

```
Add domain category wizard processing started at: Tue May 27 13:24:06 EDT 2016

Summary:
-------------------
IT data mart: IT Data Mart 52633
Default root path: C:\users\www
Application server: SASITRM
Operating system: Windows
Host: 198000.cpm
Port: 8561
User: itrmuser
Level of output: Typical
Domain category: IBM SMF 2
Time period: Day
Shift: No
Generate key metrics: No
Override default cut off time: No
Formulas location: /Shared Data/SAS IT Resource Management/IT Formulas
SAS Content Server: SAS Content Server
Repository folder path: /SASContentServer/repository/default/sas dav/ITRM
Deploy jobs automatically: Yes
Deployment directory: C:\users\www\SMF2\IBM SMF 2 Staging
Staging job: IBM SMF 2 Staging
Staged table: TYPEZ
Aggregation Job: IBM SMF 2 Disk Aggregation
Aggregation data location: C:\users\www\SMF2\Disk
Aggregation tables:
1) DayHourDisk
2) DailyDisk
3) DayHourDisk
Information map job: IBM SMF 2 Disk Information Map

ind: Creating information map job(s)...(datetime:Tue May 27 13:24:51 EDT 2016)
start: Creating 1 reporting job(s)...(datetime:Tue May 27 13:24:51 EDT 2016)
report definitions are searched within /SAS Content Server
ind: Creating reporting job(s)...(datetime:Tue May 27 13:24:58 EDT 2016)
start: Creating 1 exception job(s)...(datetime:Tue May 27 13:24:58 EDT 2016)
exception definitions are searched within /SAS Content Server/IBM SMF 2 exception definitions
ind: Creating exception job(s)...(datetime:Tue May 27 13:25:06 EDT 2016)
```
Chapter 12
Information Maps

About Information Maps ........................................... 308
  What Is an Information Map? ................................... 308
  Benefits of Using Information Maps .......................... 308
  How Are Information Maps Created? ......................... 309
  Where Are Information Maps Stored? ......................... 309

About Information Map Transformations ...................... 310
  What Are Information Map Transformations? ................. 310
  What Are the Properties of an Information Map Transformation? 310
  How to Access the Properties of an Information Map Transformation 312

User-Specified Information Map Transformations .......... 312
  Overview of Specifying an Information Map Transformation 312
  Create an Information Map Transformation ................ 312
  Modify an Information Map Transformation ................. 316
  Delete an Information Map Transformation from a Job .... 318
  Delete an Information Map ..................................... 319
  Update an Information Map from a Template ............... 319

Information Map Objects That Are Generated by the
Adapter Setup Wizard and the Add Domain Category Wizard 320
  What Information Map Objects Do the Adapter Setup and the
    Add Domain Category Wizards Generate? ................... 320
  How the Adapter Setup Wizard Names Information Map Objects 321
  Where the Adapter Setup or Add Domain Category Wizard
    Stores Information Map Objects .......................... 321
  What Information Map Filters Does the Adapter Setup or
    Add Domain Category Wizard Create? ....................... 322
  How the Adapter Setup or Add Domain Category Wizard
    Names Information Map Filters ........................... 322

Working with Information Map Filters ......................... 323
  Benefits of Using Information Map Filters ................ 323
  How to Access the Filters for an Information Map .......... 323
  About the Information Map Parameters Tab ................ 324
  Add a Filter to an Information Map ......................... 325
  Modify a Filter on an Information Map ...................... 326
  Delete a Filter from an Information Map .................... 327

Using SAS Information Map Studio ............................ 328
  Overview of SAS Information Map Studio ................... 328
  Benefits of Using SAS Information Map Studio ............ 328
  How to Access SAS Information Map Studio ................. 328
About Information Maps

What Is an Information Map?

An information map is a collection of data items and filters that describes and presents a view of physical data tables in a form that is relevant and meaningful to a business user. (An information map does not contain any data—it is a map to the physical data.) You can use information maps with query and reporting applications such as SAS Enterprise Guide and SAS Web Report Studio to build business reports for your enterprise data.

Note: SAS IT Resource Management does not enable you to manipulate information maps directly. You must use Information Map transformations to specify the information maps that are created when the transformation's job is run. As a result, the information map properties that you can view from SAS IT Resource Management are limited and not available for direct modification. These properties include metadata about the information map such as its name, location, when it was created, who created it, when it was last modified, and who modified it. They are for information purposes only and cannot be modified. If you want to edit the parameters for an information map using SAS IT Resource Management, you must modify the Information Map transformation that creates the information map and run the corresponding job. In addition, the SAS IT Resource Management solution includes SAS Information Map Studio, which you can use to modify copies of supplied information maps.

Benefits of Using Information Maps

Information maps provide the following benefits:

- Descriptive labels can be created and used rather than variable names in reports. For example, an information map might assign a column label such as “PagingFileType” to the raw data field that is named “PAGTYPE.”

- Filters are available that can be added to any information map to make it easier to report on subsets of data. For example, you can select a filter named “Last Week” rather than constructing a WHERE clause like “WeekDateDescRank=2”. (Filters can be used for multiple reports.)

- IT intelligence can be shared with other SAS applications, which can use information maps as sources for reporting. SAS Web Report Studio requires an information map as a source for its reporting processes. SAS Enterprise Guide supports information
maps for reporting. SAS Foundation supports information maps by means of the information maps LIBNAME engine.

**How Are Information Maps Created?**

There are two ways to create an information map:

- **Execute a job that contains an Information Map transformation.** You can create a job that contains an Information Map transformation in two ways:
  
  - For many supported adapters, the Adapter Setup wizard and the Add Domain Category wizard create jobs that contain Information Map transformations that, when run, create information maps for those adapters. For information about how to work with the Adapter Setup wizard, see “About the Adapter Setup Wizard” on page 257. For more information about how to work with the Add Domain Category wizard, see “About the Add Domain Category Wizard” on page 291.

  **Note:** Some changes that are made to the tables that are read into Information Map transformations might alter the structure of the table (for example, by adding or deleting columns). If so, then the user must rerun the corresponding information map jobs so that the information maps are regenerated.

  - SAS IT Resource Management enables you to create information maps for adapters by executing Information Map transformations. Information Map transformations are specified within a job. When the job runs, the Information Map transformations create information maps that are based on specified parameters. For information about how to create an Information Map transformation, see “Create an Information Map Transformation” on page 312.

- **Use SAS Information Map Studio to create, modify, and test information maps for SAS IT Resource Management.** For more information, see the SAS Information Map Studio Help and “Using SAS Information Map Studio” on page 328.

  **Note:** If you use SAS Information Map Studio to modify an information map that was created by an Information Map transformation, the changes are not carried over to the Information Map transformation. As a result, modifications that are made to an existing information map by using SAS Information Map Studio might be overwritten and lost when the corresponding job is rerun. To avoid this situation, modify a copied version of the automatically generated information map. Then save that modified version under a different name so that it is not overwritten by the extract, transform, and load (ETL) processes.

  **Note:** Information maps must be re-created whenever the structure of the tables underlying the maps is modified.

**Where Are Information Maps Stored?**

The Adapter Setup and Add Domain Category wizards create folders within the selected IT data mart for each specified adapter. Within the adapter folder, **Domain Category** folders are set up for each separate domain that you specified. The information maps that pertain to a particular domain and the job that creates those maps are stored within that domain folder. The information map is created and stored when the job that contains the Information Map transformation is executed.

**Note:** When created by the Adapter Setup and Add Domain Category wizards, an information map is given the same name and is stored in the same location as the associated aggregation table. The icons that are next to the object can be used to distinguish the aggregation table from the information map. In the list of objects that
can appear in the **IT Data Marts** tree, information maps are identified by this icon: 📊. Aggregation tables can be identified by this icon: 📊. When generated from a user-specified Information Map transformation, information maps are saved in any location that you specify when you set up the Information Map transformation. The information map is created and stored when the job that contains the Information Map transformation is executed.

When generated from the SAS Information Map Studio application, information maps are stored in any location that you specify when you save the new information map.

---

**About Information Map Transformations**

**What Are Information Map Transformations?**

Information Map transformations are parts of a job that create information maps for source tables, which are typically aggregation tables. These transformations use PROC INFOMAPS to create information maps that describe source table items for reporting processes. Each Information Map transformation corresponds to a single source table within a job.

- When the Adapter Setup and Add Domain Category wizards run, they automatically specify the columns that are to become data items. The wizards also create data items that are based on expressions, if needed.

- When you work with the Information Map transformation manually, you must select the columns that you want to include in the transformation. No columns are included automatically.

When data item specifications are added to the Information Map transformation, the name for each data item that is based on a column in the source table is derived from the label of the source column. However, these names can be changed by the user after the data item is created.

**What Are the Properties of an Information Map Transformation?**

The Properties dialog box of an Information Map transformation provides tabs where you can specify the parameters for the information map that it creates.
As shown in the preceding display, the Properties dialog box for an Information Map transformation contains the following tabs:

- The **General** tab contains information that identifies the Information Map transformation.

- The **Information Map Parameters** tab contains the name, description, path, and filter information for the information map that this transformation will create.  
  
  *Note:* If the path is blank, the information map is created in the path where the job is located.

- The **Data Items** tab contains information about the data items that are specified for this transformation. This information can include the following items:
  
  - source column name
  - the data item name that is assigned to it in the information map
  - the description of the data item
  - the expression, if specified
  
  Data items are displayed alphabetically within sections for these item types:
  
  - Category data items
  - Category expressions (if any)
  - Measure data items
  - Measure expressions (if any)
  - Filters
  
  *Note:* A data item can be based on a source column or an expression, but not both.

- The **Options** tab contains information about additional options that can be specified for this transformation.

- The **Code** tab contains the code that is generated for this transformation.

- The **Precode and Postcode** tab contains the user-written code that can be inserted at the beginning or end of the current job or transformation. The user-written code can be stored in metadata or in a file.
The **Notes** tab contains any notes or documents that are associated with this Information Map transformation.

The **Extended Attributes** tab contains any property that is specific to SAS IT Resource Management and is not part of the standard metadata for an Information Map transformation.

**How to Access the Properties of an Information Map Transformation**

To access the properties of an Information Map transformation that are created by the Adapter Setup wizard, perform the following steps:

1. From the **IT Data Marts** tree, navigate to the IT data mart that contains the job where the Information Map transformation is located.

2. Double-click the job to open it on the **Diagram** tab of the **Job Editor** window, and locate the Information Map transformation whose properties you want to access.

3. Right-click the Information Map transformation. From the list that appears, select **Properties**. The Properties dialog box appears.

*Note:* You have the option to store the job that contains your Information Map transformation in another location. If so, the preceding instructions are not applicable.

**User-Specified Information Map Transformations**

**Overview of Specifying an Information Map Transformation**

Using the Adapter Setup wizard (or the Add Domain Category wizard) is the most convenient way to create Information Map transformations and information maps for supported adapters. However, you can also specify Information Map transformations manually.

An Information Map transformation requires that you specify the following information:

- the name of the Information Map transformation
- the name of the information map that it creates
- the location where the information map is to be stored

*Note:* If you do not specify the location, and it is left blank, the information map is created in the same folder as the job.

- the filter specification (if filtering is needed)
- the data items that are to be included in the information map

**Create an Information Map Transformation**

To create an Information Map transformation, perform the following steps:

1. Navigate to the job that is to contain the new Information Map transformation. Double-click the job to open it on the **Diagram** tab of the Job Editor window.
Note: If you want to create an Information Map transformation in a new job that does not already exist, you must first create the job using the New Job wizard. For information about how to do so, see “Jobs That Process IT Data” on page 365.

2. From the **Transformations** tree of SAS IT Resource Management, locate and expand the **SAS IT Resource Management** folder. Scroll downward to the Information Map transformation. Then drag and drop the Information Map transformation object onto the open job on the **Diagram** tab of the Job Editor window.

3. Navigate to the IT data source for this Information Map transformation. (This source table is typically an aggregation table. However, it can be any SAS table.) Drag and drop the IT data source onto the process flow diagram and connect it to the Information Map transformation object.

4. To specify the required information for the new Information Map transformation, right-click the Information Map transformation in the process flow diagram and select **Properties**. The Properties dialog box appears.

5. Click the **General** tab to enter the name and description for the Information Map transformation. The name and description that you specify here are for the Information Map transformation, not for the information map that the transformation creates.

   The name of the Information Map transformation can contain no more than 60 characters.

   **Note:** For best results, use the same naming convention that the Adapter Setup wizard uses for Information Map transformations. For information about the naming conventions that are used by the Adapter Setup wizard, see “About Naming Standards for SAS IT Resource Management Objects” on page 573.

6. Click the **Information Map Parameters** tab to display the following screen.

   **Figure 12.2 Information Map Parameters**

   On that screen, perform the following tasks:
• Specify the name of the information map that is to be created and the location where the information map is to be saved.

  Note: For best results, use the same naming convention that the Adapter Setup wizard uses for information maps. For information about the naming conventions that are used by the Adapter Setup wizard, see “How the Adapter Setup Wizard Names Information Map Objects” on page 321.

• Specify the path to the information map. For best results, use the same information map path that the Adapter Setup wizard uses for information maps. To do so, check the Use default path of the job. The default path appears in the Information map path field. (It is grayed and cannot be changed.) For more information, see “Where the Adapter Setup or Add Domain Category Wizard Stores Information Map Objects” on page 321.

  However, you can change where the information map is stored. To do so, uncheck the Use default path of the job box and enter a path in the Information map path field. Alternatively, you can click Browse to select a path to the information map from the Select a Location dialog box that displays the metadata directory structure.

7. Specify the filters for the information map. Use the Information Map Filters section of the Information Map Parameters tab if you want to specify filters for the information map. This section displays a grid that contains the name, expression, and description of filters that are defined for the information map that this transformation creates. (When you are creating a new Information Map transformation, the grid is empty.) For information about how to add a filter to an Information Map transformation, see “Add a Filter to an Information Map” on page 325.

8. Specify data items that you want to include in your information map. To do so, click the Data Items tab to specify the data items that you want to include in the information map that will be created by this Information Map transformation. Data items that are class columns will be available in SAS Web Report Studio for selection as filters.

  Note: In order to use or reuse the reports that are supplied by SAS IT Resource Management, specify the data items according to the standards that are in effect for the solution. For information about the standards used by SAS IT Resource Management, see “About Naming Standards for SAS IT Resource Management Objects” on page 573.

The grid that appears on this tab contains columns for Column Name, Data Item Name, Description, Expression, and Format for each data item. When a map is being created, the grid is empty.

• Click Import to display the list of Available columns. The columns that are listed here are columns that exist in the Information Map transformation's source table. Highlight the columns that you want to include as categories in the information map and use the right arrow to transfer them to the Selected category columns. Highlight the columns (numeric only) that you want to include as measures in the information map and use the right arrow to transfer them to the Selected measure columns.

In the following display, two data items are selected as category columns, and three data items are selected as measure columns.
Then click OK to display the selected category and measure columns on the Data Items grid where you can modify the name of the data item or its description.

- Click New to open the New Data Item window where you can add a new data item to the grid. Enter the **Data Item Name**, **Description**, **Classification** (Category or Measure), **Type** (Character or Numeric), **Format**, and **Expression** fields for the new data item.

   **Note:** The **Expression** field of a data item can contain 1024 characters. Do not enter double quotation marks in the **Expression** field.

   In the following display, a new data item called NewMeasure is defined and ready to be added to the Data Items grid.
Figure 12.4 New Data Item Window

Click OK to display the new data item on the Data Items grid where it can be modified if needed.

Note: In the case of data items that are added from the New Data Item window, the Column Name of the added item is blank.

- To remove a data item from the information map, highlight the data item and click Delete.

9. The remaining tabs (Options, Code, Precode and Postcode, Notes, and Extended Attributes) are optional. For information about these tabs, see the Help for SAS IT Resource Management.

10. Click OK to save the parameters for the Information Map transformation.

11. To save the modified job, from the menu bar select File ➔ Save.

Modify an Information Map Transformation

Editing an Information Map transformation can cause errors in reporting if the information map is used for reports. For example, do not remove or rename any data items or filters that are used in a report. If you do so, the report will fail. However, you can add anything or rename anything that is not used in a report.

To modify an Information Map transformation, perform the following steps:

1. Navigate to the job that contains the Information Map transformation that you want to modify. Double-click the job to open it on the Diagram tab of the Job Editor window.

2. Within the process flow diagram, right-click the box that represents the Information Map transformation that you want to modify.
3. From the menu list, select **Properties** to open the Information Map Properties dialog box. From this dialog box, you can access the **General**, **Information Map Parameters**, and **Data Items** tabs that serve as the primary locations for the information map parameters and metadata. These tabs enable you to view and modify the following items:

- the name of the transformation
- the name of the generated information map
- the location of the information map
- the filters for the information map
- the data items that make up the information map

4. On the **General** tab, you can modify the name and description of the Information Map transformation by changing the text in the **Name** field and the **Description** field.

   *Note:* The name and description that you specify here are for the Information Map transformation, not for the information map that the transformation creates. For best results, use the same naming convention that the Adapter Setup wizard uses for Information Map transformations. For information about the naming conventions that are used by the Adapter Setup wizard, see “How the Adapter Setup Wizard Names Information Map Objects” on page 321.

5. On the **Information Map Parameters** tab, you can make the following changes:

- Change the name of the information map that the transformation creates by changing the text in the **Information Map Name** field. Changing the name of an information map that was already created does not delete the map that was created with the old name.

   *Note:* For best results, use the same naming convention that the Adapter Setup wizard uses for information maps. Furthermore, to facilitate the association of the table with the information map, the name of the information map should be the same as the name of the source table. For information about the naming conventions that are used by the Adapter Setup wizard, see “How the Adapter Setup Wizard Names Information Map Objects” on page 321.

- Change the location where the transformation saves the information map that it creates. Information maps can be stored wherever you specify. To change the location, uncheck the **Use default path of the job**. Then you can manually enter the new path in the **Information map path** field. You can also click **Browse** to navigate to the new location in the metadata structure.

   If **Use default path of the job** is checked, you cannot change the **Information map path** field.

   *Note:* For best results, use the same storage path that the Adapter Setup wizard uses for information maps. To do so, make sure the **Use default path of the job** box is checked. The information map is saved in the same folder as the information map job. For more information, see “Where the Adapter Setup or Add Domain Category Wizard Stores Information Map Objects” on page 321.

- Change the filters for the information map that appear on the filter grid.

   - For information about adding filters to information maps, see “Add a Filter to an Information Map” on page 325.
   - For information about modifying filters on information maps, see “Modify a Filter on an Information Map” on page 326.
6. On the **Data Items** tab, you can make the following changes:

   - Select additional category or measure data items from the source table to add to the information map by clicking **Import**. Highlight the columns in the **Available columns** of the source table that you want to add. Then use the arrow to transfer them to the **Selected category columns** or **Selected measure columns** panels. Click **OK** to include these data items in the information map.

   - Define an additional data item for the information map by clicking **New**, which opens the **New Data Item** window. Then enter the **Data Item Name**, **Description**, **Classification** (Category or Measure), **Type** (Character or Numeric), **Format**, and **Expression** fields for the new data item.

     **Note:** The **Expression** field of a data item can contain 1024 characters. Do not enter double quotation marks in the **Expression** field.

     Click **OK** to add the new data item to the information map.

   - Delete a data item from the information map by highlighting it and clicking **Delete**.

7. Click **OK** to save the parameters for the Information Map transformation and the information map that it will generate. You can see the new information map that the modified transformation creates after the corresponding job has run. To see the results of the job in the tree view, right-click in the hierarchy view and select **Refresh**.

   **Note:** SAS Information Map Studio can also be used to modify the information maps that are generated by Information Map transformations in SAS IT Resource Management. However, the information maps that are generated by Information Map transformations in an information map job are regenerated each time that job is run. Therefore, any modifications that are made to an information map using SAS Information Map Studio might be overwritten and lost when the ETL job is rerun. To avoid this situation, modify a copied version of the automatically generated information map. Then save that modified version under a different name so that it is not overwritten by the ETL processes.

### Delete an Information Map Transformation from a Job

If you delete an Information Map transformation from a job, the information map itself is not deleted and your reports should continue to run correctly. However, if you later change a table, you must regenerate the associated information map in order to reflect the table changes in the report. Do this to avoid errors in the report. Do not delete an Information Map transformation unless you are certain that this action will not affect your reporting needs.

If you choose to delete an Information Map transformation from a job, perform the following steps:

1. Navigate to the job that contains the Information Map transformation that you want to delete. Double-click the job to open it on the **Diagram** tab of the Job Editor window.

2. Right-click the Information Map transformation in the process flow diagram.

3. From the menu list, select **Delete**.

4. To save the modified job, from the menu bar select **File ➪ Save**.
Delete an Information Map

Deleting an information map can create errors in reporting if your reports use the information map that you delete. Do not delete an information map unless you are certain that this action does not affect your reporting needs.

If you choose to delete an information map, perform the following steps:

1. Navigate to the location that contains the information map that you want to delete. (The default location for information maps is the folder that contains the information map job that creates the information map. However, you might have chosen to store your information map in another location.)
2. Right-click the information map. From the menu list, select Delete.
3. In the confirmation dialog box, click Yes to delete the information map. Otherwise, click No.

Update an Information Map from a Template

The following steps enable you to update the Information Map transformation for a table so that the information map’s filters and data items conform to the supplied template. (If an information map template exists for the source table, you can use that template to automatically update the filters and data items of an information map. Thus, you do not need to manually specify these items from the Information Map Parameters and Data Items tabs of the Properties dialog box.)

Note: You can add the Information Map transformation to an Information Map job. Alternatively, you can place the Information Map transformation in a new or in another existing job.

1. Open an Information Map job or create a new job.
2. In the IT Data Marts tree, locate the aggregation table that was created from a template table. Drag and drop the table onto the Diagram tab of the Job Editor window. (If the table was already present in this job, you can skip this step.)
3. From the Transformations tree, locate and expand the SAS IT Resource Management folder. Scroll downward to the Information Map transformation. Then drag and drop the Information Map transformation object onto the open job on the Diagram tab of the Job Editor window.
4. Connect the aggregation table to the left side of the Information Map transformation.
5. Right-click the box that represents the Information Map transformation and select Update map definition from template.

Note: If an aggregation table that was created from a template is not connected to the Information Map transformation, an error message appears. Similarly, if an information map template does not exist for the current source table, an error message appears.
6. If an information map template is available for the current source table, the following message appears: This action will replace all the filters & data items. Do you want to continue?

7. To update the information map, click Yes.

8. When the job that contains the Information Map transformation is run, the information map is created with the updated map attributes, including filters and data items.

   *Note:* To see the results of the job in the tree view, right-click in the tree view and select Refresh.

   *Note:* The information map transformation might have a source table that is not an aggregation table. Similarly, it might have a source aggregation table that was not constructed from a supplied template. In these cases, no information map template is available. Likewise, an aggregation table that was constructed from an aggregation template, but which has been modified by the user to have a different name, might not be recognized as having an information map template.

---

**Information Map Objects That Are Generated by the Adapter Setup Wizard and the Add Domain Category Wizard**

**What Information Map Objects Do the Adapter Setup and the Add Domain Category Wizards Generate?**

The Adapter Setup and Add Domain Category wizards create jobs that contain Information Map transformations for many of the adapters that SAS IT Resource Management supports. Using these wizards is the most convenient way to create Information Map transformations and information maps for selected adapters.

When the Adapter Setup and Add Domain Category wizards run, they create objects that pertain to the staging and aggregating of data. In the case of most supported adapters, these wizards create the objects that pertain to the generation of information maps, such as the following:

- an information map job.
- Information Map transformations that are contained in the information map job. For most supported adapters, an Information Map transformation is created for each aggregation table.
- information maps that are generated when their corresponding Information Map transformations are run.

   *Note:* To see the results of the job in the hierarchy view, right-click in the hierarchy view and select Refresh.

When generated by the Adapter Setup wizard or Add Domain Category wizard, information map objects are defined and created according to predetermined conventions for naming, storage, and filter creation. These conventions enable you to effectively manage and locate the information map objects that the wizards create.
For more information about the Adapter Setup wizard, see “About the Adapter Setup Wizard” on page 257. For more information about the Add Domain Category wizard, see “About the Add Domain Category Wizard” on page 291.

**How the Adapter Setup Wizard Names Information Map Objects**

For consistency and efficient identification, name your Information Map transformations and information maps using the same conventions as the Adapter Setup wizard.

For most supported adapters, the Adapter Setup and Add Domain Category wizards automatically create jobs that contain Information Map transformations. The source tables for these transformations are aggregation tables, which are also created by those wizards. The transformations are given the same names as their associated source aggregation tables—for example, `<level>` (such as week, day, month, and so on) + `<measurement category>` (such as cache, memory, server, network, and so on). The following name is an example of this naming convention: `DaySystem`.

The Information Map transformations also create information maps with the same name as the source aggregation tables. As a result, the aggregation tables, Information Map transformations, and resulting information maps for an information map job created by the Adapter Setup or Add Domain Category wizard all have the same name. This naming technique helps you identify and associate each object easily.

*Note:* The name of the information map cannot contain any of the following characters: *?"'\[\] $ & > ( ) { } ;’ ~ ^ @ # ! In addition, the name cannot contain a newline or tab character.

**Where the Adapter Setup or Add Domain Category Wizard Stores Information Map Objects**

By default, the Adapter Setup and Add Domain Category wizards store information maps in the same location as the job that contains the corresponding Information Map transformation. However, you can change where the information map is stored by revising the Information map path field. That field is located on the Information Map Parameters tab of the Properties dialog box of the Information Map transformation.

For example, when the Network Information Map job was run, the resulting information maps were created and stored in the default location. That is, they were stored in a subfolder named for the measurement category in the Network subfolder of the Domain Categories folder of the IT data mart. The following display shows the tree structure of these objects. The Network folder contains the aggregation tables, the information maps, the library, and the aggregation and information map jobs that were created by the Adapter Setup wizard.
What Information Map Filters Does the Adapter Setup or Add Domain Category Wizard Create?

When the Adapter Setup or Add Domain Category wizard creates Information Map transformations, it also creates filters. The wizard automatically provides two categories of filters for columns in the aggregation tables that they are associated with.

- It provides one filter for each ranked statistic column.
- It provides one or more filters for each ranked date class column.

These filters are specified in the Information Map transformations and propagated to the information maps that are created when the job is run. The filters are then available in the information maps for analysis and reporting when you use SAS Enterprise Guide and SAS Web Report Studio.

For more information about working with information map filters, see “Working with Information Map Filters” on page 323.

How the Adapter Setup or Add Domain Category Wizard Names Information Map Filters

The Adapter Setup and Add Domain Category wizards use specific conventions for naming and describing the information map filters that it provides. These conventions use best practices for naming and describing filters in a way that is concise, meaningful, and effective for use with other SAS solutions. For best results, use the following conventions that these wizards use when naming and describing the information map filters that you create:

- Provide each filter with a unique name within an information map. No two filters in an information map can have the same name. However, filters with the same name can be in multiple information maps.
- The information map library engine that is used by SAS Enterprise Guide to access information maps truncates filter names that are longer than 32 characters but ensures that they are unique.
- Include the ranked column name and the corresponding filter value in the description for the filter. The Adapter Setup and Add Domain Category wizards include the ranked column name and the corresponding filter value in the description for the filters that it provides. For example, if the CacheReadHitPctMinAscRank column is filtered in ascending order from one to ten (including one and ten), then the description for that filter is “CacheReadHitPctMinAscRank 1–10”. For
best results, use this convention to describe the information map filters that you create so that your information map filters are consistently identifiable.

---

**Working with Information Map Filters**

**Benefits of Using Information Map Filters**

Information maps support filters that enable you to subset data for efficient reporting. These filters make reporting easier by filtering out data that is not necessary for a given report and focusing on the data of interest. For example, you might create and use a filter named “Last Week” that specifies a WHERE clause for `WeekDateDescRank=2` in order to report on last week’s data. Or, you might create a filter named “Email Servers” to filter the data with a WHERE clause `Domain='Email'` in order to report on a subset of the data that relates to an email server.

As mentioned in the preceding topic, the Adapter Setup wizard automatically provides several filters for the Information Map transformations that it creates. If you create your own filter for an information map, ensure that the column with which you want to create the filter has been defined in the source table.

*Note:* A report can use one or more filters and these filters can be selected at reporting time. Unlike aggregation filters, these filters do not filter out any data until they are used in a report.

**How to Access the Filters for an Information Map**

The filters for an information map can be accessed on the **Information Map Parameters** tab of the Properties dialog box of the Information Map transformation. To access the filters, perform the steps that are shown in “How to Access the Properties of an Information Map Transformation” on page 312. Then select the **Information Map Parameters** tab.

*Figure 12.6 Information Map Parameters*
About the Information Map Parameters Tab

As shown in the preceding display, the following information appears on the Information Map Parameters tab.

Information map name
specifies the name of the information map that the transformation creates. The name can contain no more than 60 characters. The name of information maps cannot contain any of the following characters: * ? " ' | \ / \[ \] $ & > < ( ) { } : ; ` ~ % ^ @ # !
In addition, information map names cannot contain a newline, or tab character. A value is required in this field.

Information map description
specifies information about the information map. A value is optional in this field.

Use default path of the job
specifies whether you can enter a path in the Information map path.

• If this box is checked, the Information map path points to the same folder as the job that contains the Information Map transformation. The path is grayed out in the Information map path field. This box is checked by default.

• If this box is not checked, a path can be entered in the Information map path field.

Information map path
specifies where the transformation stores the information map that it generates. If the Use default path of the job is checked, you cannot modify the path. (The path is grayed out.) If that box is not checked, you can enter a new path.

Click Browse to select a path to the information map from the Select a Location dialog box that displays the metadata directory structure.

Information Map Filters
lists the filters for the information map in the form of a grid. Filters in an information map are criteria (rules) that subset data. You can click any of the fields of a filter (Filter Name, Filter Expression, and Filter Description) to change them. You can also add and delete filters for the information map.

#
The numbers under this symbol specify the ordinal position of the filter for the information map.

Filter Name
specifies the name of the filter. The name must be unique and can contain up to 60 characters.

Filter Expression
specifies the filter criteria (rules). The valid form for an expression of an information map filter is <<name of the table.name of the column>> valid operator and value for a numeric column or a string column.

CAUTION:
Filter expressions for information maps are case-sensitive. Filter expressions must not contain any double quotation marks. A discrepancy in case might cause errors or unexpected results when using the information map filter with other SAS solutions. Filter expressions that contain double quotation marks might cause the Information Map transformation to fail when executed.

Here are three examples of valid expressions for information map filters:
• <<DaySystem.DayDateDescRank>> = 1
• <<DaySystem.DayDateDescRank>> between 1 and 7
• <<DaySystem.Machine>> contains 'MACHINENAME'

Note: For more information about filter expressions, see the documentation for PROC INFOMAP in the SAS Viya Utility Procedures Guide. This documentation can be found at http://support.sas.com/documentation/onlinedoc/base/index.html.

Description displays a description of the filter. The description can contain up to 200 characters. However, short descriptions require less system memory and are often processed more efficiently by various SAS solutions.

Note: The Adapter Setup and Add Domain Category wizards include the ranked column name and the corresponding filter value in the description for the filters that they provide. For example, if the CacheReadHitPctMinAscRank column is filtered in ascending order from one to ten (including one and ten), then the description for that filter is “CacheReadHitPctMinAscRank 1–10.” For best results, use this same convention to describe the information map filters that you create.

Add a Filter to an Information Map

To add a filter to an information map, perform the following steps:

1. Navigate to the location that contains the information map where you want to add a filter.

2. In the appropriate Domain Categories folder of the adapter that you are working with, locate the job that contains the transformation for the information map.

3. Double-click the job to open it on the Diagram tab of the Job Editor window.

4. Right-click the box that represents the Information Map transformation. From the menu list, select Properties to open the Properties dialog box.

5. Select the Information Map Parameters tab to view a grid of filters. This grid displays the name, expression, and description of filters that are already defined for the information map that this transformation creates.

Note: For more information about filter expressions, see the documentation for PROC INFOMAP in the SAS Viya Utility Procedures Guide. This documentation can be found at http://support.sas.com/documentation/onlinedoc/base/index.html.

Add a Filter to an Information Map

To add a filter to an information map, perform the following steps:

1. Navigate to the location that contains the information map where you want to add a filter.

2. In the appropriate Domain Categories folder of the adapter that you are working with, locate the job that contains the transformation for the information map.

3. Double-click the job to open it on the Diagram tab of the Job Editor window.

4. Right-click the box that represents the Information Map transformation. From the menu list, select Properties to open the Properties dialog box.

5. Select the Information Map Parameters tab to view a grid of filters. This grid displays the name, expression, and description of filters that are already defined for the information map that this transformation creates.

Add a Filter to an Information Map

To add a filter to an information map, perform the following steps:

1. Navigate to the location that contains the information map where you want to add a filter.

2. In the appropriate Domain Categories folder of the adapter that you are working with, locate the job that contains the transformation for the information map.

3. Double-click the job to open it on the Diagram tab of the Job Editor window.

4. Right-click the box that represents the Information Map transformation. From the menu list, select Properties to open the Properties dialog box.

5. Select the Information Map Parameters tab to view a grid of filters. This grid displays the name, expression, and description of filters that are already defined for the information map that this transformation creates.

Add a Filter to an Information Map

To add a filter to an information map, perform the following steps:

1. Navigate to the location that contains the information map where you want to add a filter.

2. In the appropriate Domain Categories folder of the adapter that you are working with, locate the job that contains the transformation for the information map.

3. Double-click the job to open it on the Diagram tab of the Job Editor window.

4. Right-click the box that represents the Information Map transformation. From the menu list, select Properties to open the Properties dialog box.

5. Select the Information Map Parameters tab to view a grid of filters. This grid displays the name, expression, and description of filters that are already defined for the information map that this transformation creates.
6. At the bottom of the page, click **New**. This action displays a new line in the grid on which you can enter a new filter. The default name of this filter is “Untitledn,” where \(n\) is the \(n\)th filter that exists for this information map.

7. In the **Filter Name** column, enter the name of the filter. This name must be unique within the information map.

   *Note:* The **Filter Name** field can contain up to 60 characters. However, the information map library engine that is used by SAS Enterprise Guide to access information maps truncates filter names that are longer than 32 characters. To avoid the potential for truncation when using this information map with other SAS solutions, specify a filter name that does not exceed 32 characters in length.

8. In the **Filter Expression** column, enter the expression that specifies the filter criteria. The valid form for an expression of an information map filter is \(<\text{name of the table.name of the column}>\) \( valid \text{ operator and value for a numeric column or a string column. \} \) Here are three examples of valid expressions for information map filters:

   - \(<\text{DaySystem.DayDateDescRank}> = 1\)
   - \(<\text{DaySystem.DayDateDescRank}> \text{ between } 1 \text{ and } 7\)
   - \(<\text{DaySystem.Machine}> \text{ contains } \text{'MACHINENAME'}\)

   If you enter an invalid expression, the following message will appear in the log when the job is run: **Error: Failed to insert filter <name-of-filter>**.

   **CAUTION:**

   *Filter expressions for information maps are case-sensitive. Filter expressions must not contain any double quotation marks.* A discrepancy in case might cause errors or unexpected results when using the information map filter with other SAS solutions. Filter expressions that contain double quotation marks might cause the Information Map transformation to fail when executed.

   *Note:* SAS Enterprise Guide honors both measures and categories for information map filters. In SAS Enterprise Guide, you can open the information map that is generated from this transformation and you can select the filters that you have created.

9. In the **Description** column, enter a brief description of the filter. The description can contain up to 200 characters. However, short descriptions require less system memory and are often processed more efficiently by various SAS solutions. For best results, minimize the number of characters in the description while maintaining meaning and clarity.

   *Note:* The Adapter Setup wizard includes the ranked column name and the corresponding filter value in the description for the filters that it provides. For example, if the \(\text{CacheReadHitPctMinAscRank}\) column is filtered in ascending order from one to ten (including one and ten), then the description for that filter is “\(\text{CacheReadHitPctMinAscRank 1-10.}\)” For best results, use this same convention to describe the information map filters that you create.

10. Click **OK** to save. The new filters that you create are available in the information map only after the corresponding job runs.

### Modify a Filter on an Information Map

To modify a filter on an information map, perform the following steps:
1. Navigate to the location that contains the information map where you want to modify a filter.
2. In the appropriate **Domain Categories** folder of the adapter that you are working with, locate the job that contains the transformation for the information map.
3. Double-click the job to open it on the **Diagram** tab of the Job Editor window.
4. Right-click the box that represents the Information Map transformation.
5. From the menu list, select **Properties** to open the Properties dialog box.
6. Select the **Information Map Parameters** tab to view a grid of filters. The grid displays the name, expression, and description of filters that are defined for the information map that this transformation creates.
7. In the **Information Map Filters** panel of the tab, highlight the field of the filter that you want to change and enter the revised value. In addition, you can click **New** to add a filter to the grid or **Delete** to delete a highlighted filter from the grid.
8. Click **OK** to save the Information Map transformation with its revised filter. The filter is revised only after the corresponding job runs.

**Delete a Filter from an Information Map**

Deleting an information map filter can create unexpected results in reporting if your reports use the filter that was deleted. For example, if a report used an information map filter that was deleted, then the next time the report is run, it can experience errors or produce unexpected results. Do not delete an information map filter unless you are certain that this action does not negatively affect your reporting needs.

To delete a filter from an information map, perform the following steps:

1. Navigate to the location that contains the information map where you want to delete a filter.
2. In the appropriate **Domain Categories** folder of the adapter that you are working with, locate the job that contains the transformation for the information map.
3. Double-click the job to open it on the **Diagram** tab of the Job Editor window.
4. Right-click the box that represents the Information Map transformation.
5. From the menu list, select **Properties** to open the Properties dialog box.
6. Select the **Information Map Parameters** tab to view a grid of filters. The grid displays the name, expression, and description of filters that are defined for the information map that this transformation creates.
7. Right-click the filter that you want to delete.
8. From the menu list, select **Delete**.
9. Click **OK** to save. The filter is deleted in the information map only after the corresponding job runs.

*Note:* Filter changes are not applied immediately. They are applied the next time the job runs.
Using SAS Information Map Studio

Overview of SAS Information Map Studio

SAS Information Map Studio enables you to create and manage information maps outside of SAS IT Resource Management and SAS Data Integration Studio. When you are working with information maps for SAS IT Resource Management, you might choose to use SAS Information Map Studio to perform the following tasks:

- Create and maintain additional information maps other than those that are created by Information Map transformations in SAS IT Resource Management.
  
  Note: Information maps can be saved in any location that you specify. You might also choose to use the same guidelines that the Adapter Setup and Add Domain Category wizards use to manage information maps. This practice ensures that all of your information maps are consistent for your IT resource data.

- View information maps that were created by Information Map transformations in SAS IT Resource Management.

- Test information maps that were created by Information Map transformations in SAS IT Resource Management.

Benefits of Using SAS Information Map Studio

SAS Information Map Studio provides advanced capabilities for creating and managing information maps. These capabilities can provide some advanced benefits when working with information maps for your IT resource data. Here are some of the advanced features that are available in SAS Information Map Studio that might be helpful when managing your information maps:

- joining multiple tables within an IT data mart, across multiple IT data marts, and with other tables outside of the IT data mart.
  
  For information about the rules that govern joins, see “Specify Join Columns” on page 176.

- defining prefilters in information maps.

- using only a subset of available columns to make reporting easier by providing fewer choices of appropriate columns to report on.

- creating folders within an information map to organize data items and filters.

How to Access SAS Information Map Studio

To access SAS Information Map Studio and connect to the metadata server that contains your data, perform the following steps:

1. Open SAS Information Map Studio. To do so, from your Start menu, select Programs ➤ SAS ➤ SAS Information Map Studio.

2. If you are not connected to a metadata server, perform these steps:
   a. On the menu bar of SAS Information Map Studio, right-click File.
b. From the drop-down list, select **Connection Profile** where you can specify metadata server that contains the tables that you want to work with.

c. When the Connection Profile dialog box appears, you can create a connection profile with the Connection Profile wizard. Alternatively, you can open an existing one by selecting the profile from the drop-down list.

d. If you want to use this connection profile as your default profile, click the corresponding option.

e. Click **OK** to connect to the metadata server.

**Access an Information Map in SAS Information Map Studio**

You can use SAS Information Map Studio to create, modify, view properties, and test information maps.

**CAUTION:**

If the information map was created by a SAS IT Resource Management Information Map transformation, save it with a different name. Changes that are made to an information map using SAS Information Map Studio do not persist in the SAS IT Resource Management Information Map transformation that created the information map. As a result, the changes that are made using SAS Information Map Studio might be overwritten the next time the information map job runs.

To avoid this situation, you can take one of the following actions:

- Change the name of the information map that you modified and save that modified version under a different name so that it is not overwritten by the ETL processes.
- Change the information map path in the Information Map transformation or when using SAS Information Map Studio to point to the modified information map.

**Note:** If you change the map name or map path for your production maps, you might need to update and redeploy report jobs.

To access an information map from SAS Information Map Studio, perform the following steps:

1. Connect to the metadata server. Then use the **Folders** tree in the Resources panel to navigate to the location of the information map that you want to work with.

2. Highlight the information map that you want to open and click **Open**. Alternatively, you can double-click the information map to open it.

3. The Properties panel displays the properties and the values of the object that is highlighted in the Information Map Contents panel. Click **Details** to display more information about the highlighted object.

   - To view the properties of the information map, highlight the information map name in the Information Map Contents panel.

   - To view the properties of a column, highlight the column name in the Information Map Contents panel.

For more information about SAS Information Map Studio, see the SAS Information Map Studio Help and *SAS Information Map Studio: Getting Started with SAS Information Maps*.
Create an Information Map with SAS Information Map Studio

To create an information map, select File ➔ New from the menu bar. In the Resources panel, navigate to the IT data mart that contains the table for which you want to create an information map. Double-click the table to display its items in the Information Map Contents panel.

• To add a new folder, data item, or filter to the map, in the Information Map Contents panel right-click the map and select an option from the drop-down list.

  Note: Do not enter blank spaces in the Name field of a data item. To do so causes errors when the report is processed in ITRM Report Center.

• To delete an item from the map, double-click the map to display its items in the Information Map Contents panel and select Delete from the drop-down list.

• To rename an item on the map, double-click the map to display its items in the Information Map Contents panel and select Rename from the drop-down list.

Save the information map by selecting File ➔ Save from the menu bar.

Note: To be consistent with the naming conventions of the Adapter Setup wizard, save the information map under the same name as the table on which it is based. For information about the naming conventions that are used by the Adapter Setup wizard, see “How the Adapter Setup Wizard Names Information Map Objects” on page 321.

Modify, Rename, or Delete Items in an Information Map with SAS Information Map Studio

To modify an existing information map, navigate to the map and double-click it. The items in the existing map appear in the Information Map Contents panel.

• To add a new folder, data item, or filter to the map, in the Information Map Contents panel, right-click the map and select an option from the drop-down list.

  Note: Do not enter blank spaces in the Name field of a data item. To do so causes errors when the report is processed in ITRM Report Center.

• To delete an item from the map, right-click the item and select Delete from the drop-down list.

• To rename an item on the map, right-click the item and select Rename from the drop-down list.

• When you are finished making changes, click OK.

Save the information map by selecting File ➔ Save from the menu bar.

Test an Information Map with SAS Information Map Studio

To test a map, select Tools ➔ Run a Test Query. Then, select one or more items from the Available items panel and add them to the Selected items box.
Figure 12.7 Test the Information Map Window

Set the Output options to specify how you want to view the results and click Run Test. The results appear in a separate window.

Troubleshooting Information Maps Problems

Information Map Does Not Appear in the IT Data Mart Folder

Problem: After successful execution of an Information Map transformation, the resulting information map does not appear in the IT Data Mart folder.

Solution: To view the results of a successful execution of an Information Map transformation, you must explicitly refresh the current tree or work area. To do so, right-click somewhere in the tree. From the drop-down menu, click Refresh.

Lengthy Processing Time

Problem: Information maps take quite a bit of time to process.

Solution: To save processing time, you might want to delete any Information Map transformations for information maps that will not be used. You might also save processing time by deleting filters that are not useful.

Error Opening or Accessing Data from Information Maps


Solution: To determine whether you have Read access restrictions that prevent you from accessing the data, perform the following steps:
Open SAS Information Map Studio. Navigate to the information map that experienced the error.

From the Resources panel, select items from the information map that you want to verify and add them to the Selected Resources panel. Verify that the columns of the selected table appear correctly in the Information Map Contents panel.

Select Tools ⇒ Run a Test Query.

Click Run Test.

If you see any errors or warnings during the preceding steps, verify that you have Read privileges and Read metadata privileges. Otherwise, contact your data administrator.

Errors Running Information Map Transformations

Problem: An error occurs when running the Information Map job and information maps are not created.

Solution: Information Map transformations use PROC INFOMAPS, which requires specific authorization settings. Review the following list of authorization requirements and recommended configurations to ensure that your settings are configured correctly:

- Your user logon ID and password must be stored in metadata, using the SAS Management Console.

  *Note:* At run time, PROC INFOMAPS authenticates the user to the metadata server using the one-time password technique documented for SAS 9.2 and later. This means that the user submitting the code (whether interactively or in batch) should have defined a User object in the metadata. The user should also have defined a Login object defined for each authentication domain, with the correct user ID and password for each. In SAS Management Console, the User Manager can be used to create and modify Users. For each User object, the logins can be created or modified on the Accounts tab of the User dialog box. For more information, see “Security Overview” in SAS Intelligence Platform: Overview.

- You must have access to the physical files and directories. (PROC INFOMAPS does not validate the table at run time.)

- You must have Read authorization to the physical tables.

- You cannot have multiple SAS libraries with the same metadata name.

- Your default ACT on SAS Foundation must be set according to the configurations that are detailed in the installation guide for your operating environment.

  *Note:* You can submit jobs if you are logged on as an administrative user. However, this is not recommended.

Information Job Fails

If you change the name of the source aggregation table or the name of a column in that table, you must manually change the associated filter expressions for the information map. You can then redeploy and rerun the job.
Chapter 13
User-Written Staging Code

User-Written Staging Transformations ............................................. 333
Overview ......................................................................................... 333

Guidelines for Processing Data with User-Written Staging Transformations . . . 334
About Processing Data with User-Written Staging Transformations ........ 334
Staging Data with User-Written Staging Transformations ................. 335
Aggregating Data Created by User-Written Staging Transformations .... 346
Creating Information Maps for User-Written Adapters .................... 348
Reporting on Data Created with User-Written Staging Transformations .. 351

Working with User-Written Staging Transformations .................... 351
Create a User-Written Staging Transformation ............................ 351
Delete a User-Written Staging Transformation from a Job .............. 357
Modify a User-Written Staging Transformation ........................... 358
Rename a User-Written Staging Transformation ............................ 358

Using the Additional Generated Code ............................................. 359
Macro Variables ........................................................................... 359
Macros ......................................................................................... 359
Tabinfo and Varinfo ....................................................................... 361

What Are the Properties of the User-Written Staging Transformation? .... 362
General Tab .................................................................................. 362
Staging Parameters Tab .................................................................. 362
Code Tab ....................................................................................... 362
Precode and Postcode Tab ............................................................. 362
Notes Tab ...................................................................................... 362
Extended Attributes Tab ............................................................... 362

User-Written Staging Transformations

Overview

The SAS IT Resource Management User-Written Staging transformation provides a place for you to enter your staging code for a data source. The process consists of the following steps:

1. dropping the User-Written Staging transformation onto a job on the Diagram tab of the Job Editor window
2. (optional) attaching a source table
3. writing the SAS program to load raw data into SAS tables
4. attaching target tables
5. specifying the options and parameters for the transformation, including the location of the staging code
6. generating the code and running the job

When the code is generated, macros and macro variables that might be useful in the user-written code are also generated. After reviewing the generated code, you can save the job and run it to create the physical tables. However, before doing so, you must create the metadata for the target table by invoking the New Table wizard. (To do so, from the menu of the SAS IT Resource Management client, select File ⇒ New ⇒ Table.)

For more guidance about the processes that enable you to create user-written staging transformations, see “Guidelines for Processing Data with User-Written Staging Transformations” on page 334. This topic also includes information about aggregating, creating information maps, and reporting on the data that is produced by your user-written staging code.

This chapter consists of the four following topics:
- “Guidelines for Processing Data with User-Written Staging Transformations” on page 334
- “Working with User-Written Staging Transformations” on page 351
- “Using the Additional Generated Code” on page 359
- “What Are the Properties of the User-Written Staging Transformation?” on page 362

---

**Guidelines for Processing Data with User-Written Staging Transformations**

*About Processing Data with User-Written Staging Transformations*

The user-written staging transformation enables you to create your own staging code. You can process data from any data source that SAS can read and you can generate user-defined staged tables. These user-defined staged tables can be used as source tables for additional transformations, including the Aggregation and Information Map transformations, in preparation for reporting on the data in those tables.

The following topics provide guidelines that describe how to work with user-written transformations:
- “Staging Data with User-Written Staging Transformations” on page 335
- “Aggregating Data Created by User-Written Staging Transformations” on page 346
- “Creating Information Maps for User-Written Adapters” on page 348
- “Reporting on Data Created with User-Written Staging Transformations” on page 351

These topics explain the process of developing a user-written adapter to be used with the SAS IT Resource Management client. The method described in the following topics is not the only way to create an adapter. You can write an adapter in any way that you...
want. However, this method can help you follow the same standards that are used for the supplied SAS IT Resource Management 3.8 adapters. Following these standards keeps your adapter consistent with other adapters. You can use some or all of the following processes as needed. For information about standards that should be followed to keep your adapter consistent with adapters that SAS IT Resource Management provide, see “About Naming Standards for SAS IT Resource Management Objects” on page 573.

Staging Data with User-Written Staging Transformations

Overview of Staging Data with User-Written Staging Transformations

The staging step reads data from a raw data source and makes SAS staged tables. These staged tables are then used as the source to the Aggregation transformation. The User-Written Staging transformation is provided in the SAS IT Resource Management client to help in the development of the staging process. This transformation enables staged table developers to point to their own SAS code that can read the raw data and create the SAS tables. In addition, the User-Written Staging transformation supplies a set of macros and macro variables that provide information from the metadata that can be useful when creating the target tables.

The following topics discuss best practices or guidelines for functions:

- staging the data with user-written staging transformations
- aggregating the data processed by those transformations
- creating information maps for the aggregated tables of data,
- reporting on that data

For more information about staged tables, see “About Staging the Data” on page 110.

How to Stage Data with User-Written Staging Transformations

Use the following steps as a guide to staging the data with the User-Written Staging transformation.

1. Design the adapter.

   To accomplish this step, you need to thoroughly understand the raw data. You also need to determine what your staged tables should look like. For example, you should determine the names of the staged tables, the column names for each table, the attributes of the columns, and so on.

2. Create an IT data mart.

   On the IT Data Marts tab create an IT data mart for your adapter. For information, see “Create an IT Data Mart” on page 58.

3. Set up the metadata for your staged tables.

   Create the folder for your staged tables and libraries.

   a. Right-click the IT data mart that you just created. Select New ➔ New Folder.

      Create the folder. The name of the folder should be the name of your adapter.
b. Right-click the new folder that you just created and select **New ⇒ New Folder.**
   Create a folder called **Staging.**

**Create a library and its metadata for your staged tables.**

c. Right-click the **Staging** folder and select **New ⇒ Library.** The New Library Wizard opens.

d. Select **Base SAS Library** as the type of library that you want to define. On the next page of the wizard, specify a name such as **Staging** for the new library.

e. On the next page of the wizard, choose **SASITRM.**

f. On the next page of the wizard, specify the libref that is associated with the staged table library.

   For best results, specify the name of the libref as **stgxxxx**, where **xxxx** is a random number to ensure that the libref is not used elsewhere.

   In the **Path Specification** box, click **New** to add a new path.

   **Tip** Use the root path that you specified for the IT data mart that you created and add an identifier to the end of that path. The identifier could be the folder, directory, or name of the libref, according to the standards of your operating environment. For best results, use the same name as the libref you just specified. For example, on Windows, if your root path is **C:\DataMarts\MyAdapter**, and your libref is stg1357, then specify this library path as **C:\DataMarts\MyAdapter\stg1357**.

   **Note:** On UNIX and on z/OS using zFS locations, you can use paths that contain symbolic links. Using symbolic links would be useful if you want to retain flexibility for changing the real physical location of libraries. For example, you could move all of the libraries in an IT data mart to another physical disk by simply redefining one symbolic link. See the UNIX ‘ln’ command for additional details.

g. Continue to follow the prompts of the wizard to create the appropriate metadata for the library.

4. On your operating system, create the physical folder for the library. (The previous step created only the metadata for the library.)

5. Write the SAS code to read the raw data and create SAS tables as output. The complexity of this step varies depending on the raw data that you are reading and the tables that you are creating.

   **Tip** This code can be any SAS program that creates one or more permanent SAS data tables as output. These tables should be put in the location that you created in step 4. It simplifies your work later if you use the same libref that you specified in step 3.

For best results, consider adding the following columns to your staged tables.

- **DATETIME**

   In the adapters that are supplied by SAS IT Resource Management, the staged tables are date and time based. All the tables contain a column called **DATETIME** to hold this information. Using this column name enables you to use the supplied formulas and the duplicate and future checking processes without modification. Its attributes are as follows:

   ```
   attrib DATETIME length = 8
   format = NLDATM.
   ```
label = 'Datetime';

Note: DATETIME is the starting date and time of interval data. If the raw data provides the ending date and time, you should subtract the interval duration from the date and time in order to calculate the starting date and time.

- LSTPDATE

In order to take advantage of the duplicate checking process that is available in SAS IT Resource Management aggregations, include a column called LSTPDATE in your staging tables. This column should be set to the current date and time: LSTPDATE = datetime();

Its attributes are as follows:

attrib LSTPDATE length = 8
   format = NLDATM.
   label = 'LastProcessDate';

- DURATION

Interval-type data is data that is captured or snapshot at given intervals. For interval type data, supplied adapters include a field called DURATION. This field is set to the duration of each interval in seconds. It is useful as the weight variable in an aggregation when creating weighted statistics. Its attributes are as follows:

attrib DURATION length = 8
   format = TIME8.
   label = 'Duration';

Assign an appropriate format and label to your other columns. (You can also do this at a later time in the SAS IT Resource Management client in steps 9.k through 9.m.)

Note: It is not necessary to create aggregation variables such as Hour, Shift, WeekDate, and so on. You can add these columns in step 9.l.

6. Run the program to create the staged tables.


   How to register your staged tables.

   a. On the SAS IT Resource Management client, right-click the staging library that you created in steps 3c through 3g, and select Register Tables. The Register Tables wizard opens.

   b. On the first page of the wizard, you do not need to make any changes. Your library is listed on that page.

   c. The tables that you created in step 6 are listed. Click Select All Tables to register all the tables in metadata.

   d. Continue to follow the prompts of the wizard to complete the registration.

8. If the input to the User-Written Staging transformation is a SAS data set or another type of database table, then create the metadata for it.

   T I P One method that you can use to create the necessary metadata for your input is to create a library in metadata that points to your source data. Then select File => Register Tables to register the tables in metadata.
Note: On UNIX and on z/OS using zFS locations, you can use paths that contain symbolic links. Using symbolic links would be useful if you want to retain flexibility for changing the real physical location of libraries. For example, you could move all of the libraries in an IT data mart to another physical disk by simply redefining one symbolic link. See the UNIX ‘ln’ command for additional details.

9. Create a staging job to populate the staging tables.

How to create a staging job.

a. Right-click the Staging folder in your IT data mart and select New ⇒ Job.

b. Give the job a name such as Staging.

c. From the Transformations tree, expand SAS IT Resource Management. Then drag the User-Written Staging transformation onto the job that you just created in the Diagram tab of the Job Editor window.

d. Drag the staging tables from the Staging folder in your IT data mart onto the job.

e. Connect the User-Written Staging transformation to each of the staging tables so that the tables are outputs of the transformation.

f. If you created input metadata in step 8, then drag the input table to the job. Connect the table as input to the User-Written Staging transformation.

g. Right-click the User-Written Staging transformation and select Properties. From the drop-down list, select the Staging Parameters tab. The Staging page appears.

Note: For information about these properties, see Step 8 of the “Create a User-Written Staging Transformation” topic on page 352.

h. On the Staging page, specify the path to the raw data that you want to process. A macro variable called Rawdata is created in the generated code with this value.

i. Select the Duplicate Checking option in the left panel. The Duplicate Checking page appears. On this page, you can specify duplicate checking and future data actions. The page provides a set of parameters that are used if you decide to implement the duplicate checking process. For information about how to implement duplicate checking of your data, see “Duplicate Checking” on page 341.

j. Select the User-Written option in the left panel. The User-Written page appears. The first parameter on this page enables you to specify the path to your SAS staging program. A value for this parameter is required.

The other parameters enable you to specify what macros and macro variables you want the transformation to generate for your SAS program.

k. Standard SAS IT Resource Management formulas are provided to compute columns such as WEEKDATE and SHIFT. If you want to use any of these formulas, double-click the tables in the job that is opened in the Diagram tab of the Job Editor window. Then select the Columns tab.

l. On the Columns tab, you can add the standard SAS IT Resource Management date columns and their formulas.

The following table lists the standard columns:
### Table 13.1 Table of Standard SAS IT Resource Management Columns

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Length</th>
<th>Format</th>
<th>SAS IT Resource Management Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATETIMEFIFTEENMIN</td>
<td>8</td>
<td>NLDATM</td>
<td>DatetimeFifteenMinute</td>
<td>DatetimeFifteenMinute</td>
</tr>
<tr>
<td>DATETIMEFIVMIN</td>
<td>8</td>
<td>NLDATM</td>
<td>DatetimeFiveMinute</td>
<td>DatetimeFiveMinute</td>
</tr>
<tr>
<td>DATETIMEONEMIN</td>
<td>8</td>
<td>NLDATM</td>
<td>DatetimeOneMinute</td>
<td>DatetimeOneMinute</td>
</tr>
<tr>
<td>DATETIMETENMIN</td>
<td>8</td>
<td>NLDATM</td>
<td>DatetimeTenMinute</td>
<td>DatetimeTenMinute</td>
</tr>
<tr>
<td>DATETIMETHIRTYMIN</td>
<td>8</td>
<td>NLDATM</td>
<td>DatetimeThirtyMinute</td>
<td>DatetimeThirtyMinute</td>
</tr>
<tr>
<td>DATETIMETWENTYMIN</td>
<td>8</td>
<td>NLDATM</td>
<td>DatetimeTwentyMinute</td>
<td>DatetimeTwentyMinute</td>
</tr>
<tr>
<td>DAYDATE</td>
<td>8</td>
<td>NLDATM</td>
<td>DayDate</td>
<td>DayDate</td>
</tr>
<tr>
<td>DAYOFMONTH</td>
<td>8</td>
<td>2</td>
<td>DayOfMonth</td>
<td>DayOfMonth</td>
</tr>
<tr>
<td>DAYOFWEEK</td>
<td>8</td>
<td>WKD</td>
<td>DayOfWeek</td>
<td>DayOfWeek</td>
</tr>
<tr>
<td>HOUR</td>
<td>8</td>
<td>2</td>
<td>Hour</td>
<td>Hour</td>
</tr>
<tr>
<td>Column Name</td>
<td>Length</td>
<td>Format</td>
<td>SAS IT Resource Management Formula</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------</td>
<td>------------</td>
<td>------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>MONTHDATE</td>
<td>8</td>
<td>NLDATE10</td>
<td>MonthDate</td>
<td>MonthDate</td>
</tr>
<tr>
<td>SHIFT</td>
<td>$1</td>
<td>SCHAR1</td>
<td>Shift</td>
<td>Shift</td>
</tr>
<tr>
<td>TIME</td>
<td>8</td>
<td>TOD5</td>
<td>Time</td>
<td>Time</td>
</tr>
<tr>
<td>WEEKDATE</td>
<td>8</td>
<td>NLDATE10</td>
<td>WeekDate</td>
<td>WeekDate</td>
</tr>
<tr>
<td>YEARDATE</td>
<td>8</td>
<td>NLDATE10</td>
<td>YearDate</td>
<td>YearDate</td>
</tr>
</tbody>
</table>

**TIP**  It is easier to add these computed columns to the metadata using the SAS IT Resource Management client than to include them in the physical table that you used to register the table. If you include them when you register the table, then they will all be created as “Data Columns” instead of “Computed Columns.” In that case, you must delete the columns and then re-create them as “Computed Columns.”

From the **Columns** tab, you can import columns from another source or add new columns.

10. [Optional] To import columns from another source, click the Import Columns icon. (It is next to the New button.) In the Import Columns dialog box, expand **Adapters** and drill down to any standard adapter template table. (One of the SAR adapter template tables is a good choice because these tables are small.)

Then, choose the columns that you want to include in your staging tables. Click **OK** to add the columns to your table with the appropriate attributes and formulas.

11. [Optional] To add columns, click the New button. You can add data and computed columns to your staged table. For information, see “Columns in Staged Tables” on page 133.

If you add computed columns, the automatically generated macro called _ITMS_computedColumns can be used in your SAS program to calculate the values of these columns.

**CAUTION:**  
_When creating a computed column, do not base it on another computed column, because the code might not calculate the columns in the correct_
order. For example, if you are computing column A as \(1+1\), and you want another computed column called B that is \(A+5\), then the expression for B should be \((1+1)+5\). It should not be \(A+5\).

Expressions can be simple or complex.

- A simple expression is only the content on the right side of an equation without a semicolon.
- A complex expression contains multiple statements including the necessary semicolons. The following code is an example of a complex expression.

\[
\text{if } 1/A \ (A \neq 0) \text{ then } B = 1/A; \text{ else } B = 0;
\]

This code prevents division by zero, which causes errors when the code runs.

12. Save the job and deploy the SAS code. To do so, right-click the job and select Scheduling ⇒ Deploy. For more information, see “Deploy a Job for Scheduling” on page 377.

13. To make your SAS program more robust, you might want to use some of the macro variables and macros that are provided by SAS IT Resource Management. These macros and macro variables enable your program to handle changes in metadata without changing the program. The following topics discuss some of the changes that you can make to your program.

- “Duplicate Checking” on page 341
- “Future Checking” on page 342
- “Error Checking” on page 343
- “LIBNAME Statements” on page 343
- “Formats” on page 106
- “Helper Macros and Macro Variables” on page 343

For examples of how macros and macro variables can be used, see “Example of Modifying the Code” on page 344.

**Duplicate Checking**

A set of macros is provided to check for duplicate data. These macros are used in all the supplied adapters to handle reading and saving duplicate data. If your SAS program finds data in the raw data that has already been read, then the data is handled based on the setting of the **Duplicate checking options**. These options are accessible on the Duplicate Checking page of the Staging Parameters tab. The following actions are available if you set Duplicate checking options to Yes:

- Discard—delete the duplicate data from the input stream
- Terminate—stop processing
- Force—ignore any duplicate data and continue processing

**TIP** To access the Duplicate checking options, you must first set Enable duplicate checking to Yes. This setting displays all the parameters that are available for the User-Written Staging transformation. If Enable duplicate checking is set to No, none of these parameters appear.

You can use some of the helper macros from the User-Written Staging transformation as well as the standard duplicate-data checking macros to handle duplicate-data checking. For more information about duplicate-data checking macros, see “Duplicate-Data
Checking Macros” on page 590. To implement duplicate checking in your code, perform the following steps.

1. In the DATA statement of the DATA step that reads the raw data, add this macro call:
   \%RMDUPDSN(SOURCE=USR)

   This creates a work data set with duplicate information. For example, suppose that
   the following is the current data statement:

   ```
   data stage.stageTable1
   stage.stageTable2;
   ```

   Change the macro invocation to this:

   ```
   data stage.stageTable1
   stage.stageTable2
   %RMDUPDSN(SOURCE=USR);
   ```

2. At the beginning of the DATA step, add this macro call:
   \%_ITMS_dupInit;

   This initializes the duplicate-data checking process.

3. On the SET or INFILE statement, be sure to include the END= option. This option
   should point to the ENDFILE variable specified on the Duplicate Checking page of
   the Staging Parameters tab of the User-Written Staging Properties dialog box.

4. In the DATA step, you also need to add this macro call:
   \%_ITMS_dupCheck;

   This macro runs the \%RMDUPCHK macro, which performs the duplicate-data
   checking. The parameters for the \%RMDUPCHK macro are specified on the
   Duplicate Checking page of the Staging Parameters tab of the User-Written
   Staging Properties dialog box. You can call this macro multiple times in your code if
   the TIMESTMP column is set in different places.

   **TIP** Put this macro call in the DATA step at any point after the TIMESTMP
   column has a value. TIMESTMP is a parameter in the \%RMDUPCHK macro
   that specifies the date and time column name. (Typically, this column is
   DATETIME, but you can call it anything you want.) Specify the column to use
   on the Staging Parameters tab of the User-Written Staging Properties dialog
   box.

5. Following the DATA step that ran the \_ITMS\_dupCheck macro, add this macro call:
   \%RMDUPUPD;

   This macro completes the duplicate checking process. It adds the new date and time
   stamps from the data that was just read to the duplicate checking tables that are kept
   in the staging library.

**Future Checking**

A set of macros is provided to check for data that has a date and time stamp that is in the
future. (This situation probably means that the data is invalid). These macros assume that
your TIMESTMP variable (as described in the previous duplicate checking page) is
called DATETIME.

To implement future checking, you can use a User-Written Staging transformation helper
macro as well as the standard future processing macros:
• In the DATA step that you use to read the raw data, add this macro call after the DATETIME column has been set:

```%RMSETPTR;
```

*Note:* You can call this macro multiple times if the DATETIME column is set in multiple places.

• After the DATA step that ran the %RMSETFTR macro, add this macro call:

```%_ITMS_futureData;
```

This macro invokes the %RMFUTURE macro for all your staging tables.

**Error Checking**

If you perform error checking in your program, you can take advantage of the abnormal ending routine that is provided at the end of the generated code. If you set the macro variable &trans_rc to a value greater than 4, then the program will be canceled and its return code set to 8 (`abort cancel 8;`).

To set the &trans_rc and the &job_rc error flags outside of a PROC step or DATA step, you can use the `%RCSET(ERROR)` macro. To set those flags inside a DATA step, you can use the `%RCSETDS(ERROR)` macro.

The error parameter for these macros is the error code that you want to specify. For example, you can use the following code to set a return code of 8.

```%rcSet(8);
```

You can use the following code to set the return code to the error code from the proceeding DATA step or PROC step.

```%rcSet(&syserr);
```

The macro definitions for `%RCSET` and `%RCSETDS` can be found at the beginning of the generated code.

**LIBNAME Statements**

All the LIBNAME statements for the source and target tables are generated for you. Therefore, you do not need to include LIBNAME code in the user-written code. However, if you are using tables that are not in the metadata as source or target tables, then you should issue your own LIBNAME statements.

**Helper Macros and Macro Variables**

A set of macros and macro variables can be created for you in the generated code. On the Staging Parameters tab of the User-Written Staging Properties dialog box, select User-Written to access these options. For information about the macro variables and macros that are available, see “Macro Variables” on page 359 and “Macros” on page 359.

**Tip** Set all the options on the macro variables to Yes, and then generate the code. You can then see what macros and macro variables are available and determine whether you want to use them. You can then turn off the macros and macro variables that you do not need.

On the User-Written page of the Staging Parameters tab of the User-Written Staging Properties dialog box, you can also specify the creation of the Tabinfo and Varinfo tables. For information about these tables, see “Tabinfo and Varinfo” on page 361.
Example of Modifying the Code
The following two examples show a simple user-written staging program before it is modified, and then after it is modified to include the helper macros.

Example Code 13.1 Original Program

```vim
/* ********************************************************** */
/* Name: UserWrittenStaging                                   */
/* ---------------------------------------------------------- */
/* Description:                                               */
/* Reads the raw data from the rawdata.txt file that is in     */
/* this format:                                               */
/* ddMONyyyy:hh:mm machineName metric1 metric2                */
/* ddMONyyyy:hh:mm machineName metric1 metric2                */
/* <etc.>                                                      */
/* ********************************************************** */
libname staging 'c:\UserWritten\Staging';
data staging.metric1 (keep = datetime machine metric1 lstpdate)
    staging.metric2 (keep = datetime machine metric3 lstpdate);
attrib datetime label = "DateTime" format = datetime18.;
attrib machine label = "Machine" length = $20;
attrib metric1 label = "Metric1" format = NLNUM16.;
attrib metric3 label = "Metric2*100" format = NLNUM16.;
attrib lstpdate label = "LastProcessDate" format = NLDATM.;
attrib metric2 format = NLNUM16.;
lstpdate = datetime(); /* needed for aggregation */
infile "c:\UserWritten\rawdata.txt" missover;
input datetime datetime15. machine metric1 metric2;
metric3 = metric2 * 100;
output staging.metric1
    staging.metric2;
run;
```

Here is what the program might look after adding the helper macros.

Example Code 13.2 Modified Program

```vim
/* ************************************************************** */
/* Name: UserWrittenStaging                                       */
/* -------------------------------------------------------------- */
/* Description:                                                   */
/* Reads the rawdata from the rawdata.txt file that is in         */
/* this format:                                                   */
/* ddMONyyyy:hh:mm machineName metric1 metric2                    */
/* ddMONyyyy:hh:mm machineName metric1 metric2                    */
/* <etc.>                                                         */
/* ************************************************************** */
/* ***PUT CODE INTO A MACRO IN ORDER TO USE %DO STATEMENTS***     */
%macro readRawdata;
libname staging 'c:\UserWritten\Staging';
data
    staging.metric1 (keep = datetime machine metric1 lstpdate)
    staging.metric2 (keep = datetime machine metric3 lstpdate);
attrib datetime label = "DateTime" format = datetime18.;
attrib machine label = "Machine" length = $20;
attrib metric1 label = "Metric1" format = NLNUM16.;
attrib metric3 label = "Metric2*100" format = NLNUM16.;
attrib lstpdate label = "LastProcessDate" format = NLDATM.;
attrib metric2 format = NLNUM16.;
lstpdate = datetime(); /* needed for aggregation */
infile "c:\UserWritten\rawdata.txt" missover;
input datetime datetime15. machine metric1 metric2;
metric3 = metric2 * 100;
output staging.metric1
    staging.metric2;
run;
```

Here is what the program might look after adding the helper macros.
$do i = 1 \%to \&numTargets;

&&target&i ($\_\_ITMS\_tableOptions(targetTableNum=&i,
generateTableName=NO)
    keep = $\_\_ITMS\_columnList(targetTableNum=&i))

$end;

/* ***DUPLICATE CHECKING OUTPUT TABLE*** */
$RMDDUPDSN(SOURCE=USR)

/* staging.metric1 (keep = datetime machine
    metric1 lstpdate) */
/* staging.metric2 (keep = datetime machine
    metric2 metric3 lstpdate) */

;

/* ***INITIALIZE DUPLICATE CHECKING*** */
$\_\_ITMS\_dupInit;

/* ***GENERATE ATTRIB STATEMENTS FOR COLUMNS IN OUTPUT TABLES*** */
$\_\_ITMS\_attrib();

/* attrib datetime label = "DateTime" format = datetime18.; */
/* attrib machine label = "Machine" length = $20; */
/* attrib metric1 label = "Metric1" format = NLNUM16.; */
/* attrib metric3 label = "Metric2*100" format = NLNUM16.; */
/* attrib lstpdate label = "LastProcessDate" format = NLDATM.; */
attrib metric2 format = NLNUM16.;
lstpdate = datetime(); /* needed for aggregation */

infile "c:\UserWritten\rawdata.txt" missover;
/* ***USE &RAWDATA AND INCLUDE AN END-OF-FILE FLAG FOR*** */
/* ***DUPLICATE CHECKING*** */
infile "\&rawdata" end = _eof missover;
input datetime datetime15. machine metric1 metric2;

/* ***RUN DUPLICATE CHECKING*** */
$\_\_ITMS\_dupCheck;

/* ***RUN FUTURE DATA CHECKING*** */
$RMSETFTR;

/* ***CREATE COMPUTED COLUMNS*** */
$\_\_ITMS\_computedColumns;
metric3 = metric2 * 100;

/* ***OUTPUT DATA TO TARGET TABLES*** */
output
$do i = 1 \%to \&numTargets

&&target&i
$end;

/* output staging.metric1 */
/* staging.metric2; */
run;

/* ***UPDATE DUPLICATE CHECKING FILES*** */
$RMDDUPUPD;
/* ***HANDLE FUTURE DATA*** */
$\_\_ITMS\_futureData;
%mend readRawdata;
%readRawdata;
Aggregating Data Created by User-Written Staging Transformations

After the data is staged, it is ready to be aggregated. The data in the staged tables that you created can be rolled up into aggregation tables. These tables are then available for analysis.

Creating and working with aggregations is described in detail in Chapter 8, “Aggregating the Data.” For information, see “About Aggregation Tables” on page 145.

Use the following tips to keep your user-written adapter consistent with the supplied adapters.

- In the IT data mart that you created for your user-written adapter, create a folder called **Domain Categories**. Within that folder, create one or more folders for your domain categories. (A domain category is a way of grouping different types of data such as System, Disk, or Network data.) Specify a name for these categories that makes sense for your application.

  Many of the supplied adapters have a domain category for each of the staged tables that were created. If you do not have domain categories, create a single folder that has a descriptive name.

- Create an aggregation job for each domain category. Specify a job name using this format: `<domain category> Aggregation`.

- In the supplied adapters, the data in each staged table is used as input to multiple aggregations. The data is typically summarized into different time periods. Most supplied adapters include the following time period aggregations.

<table>
<thead>
<tr>
<th>Aggregation Table Prefix</th>
<th>Date and Time Class Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>DAYDATE</td>
</tr>
<tr>
<td>DayHour</td>
<td>DAYDATE HOUR</td>
</tr>
<tr>
<td>DayShift</td>
<td>DAYDATE SHIFT</td>
</tr>
<tr>
<td>DayShiftHour</td>
<td>DAYDATE SHIFT HOUR</td>
</tr>
<tr>
<td>Week</td>
<td>WEEKDATE</td>
</tr>
<tr>
<td>WeekHour</td>
<td>WEEKDATE HOUR</td>
</tr>
<tr>
<td>WeekShift</td>
<td>WEEKDATE SHIFT</td>
</tr>
<tr>
<td>WeekShiftHour</td>
<td>WEEKDATE SHIFT HOUR</td>
</tr>
<tr>
<td>Month</td>
<td>MONTHDATE</td>
</tr>
<tr>
<td>MonthHour</td>
<td>MONTHDATE HOUR</td>
</tr>
<tr>
<td>MonthShift</td>
<td>MONTHDATE SHIFT</td>
</tr>
<tr>
<td>MonthShiftHour</td>
<td>MONTHDATE SHIFT HOUR</td>
</tr>
</tbody>
</table>
In addition, many adapters supply the following aggregations:

**Table 13.3 Other Supplied Aggregations**

<table>
<thead>
<tr>
<th>Aggregation Table Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detail</td>
<td>This data is not summarized. It is left at the same level as the staging data.</td>
</tr>
<tr>
<td>KeyMetrics</td>
<td>Generally, this data is summarized into the DAYDATE and HOUR level. It also includes a limited number of metrics. This table usually keeps data for a longer period than the other aggregations, so that it can be used in trending and forecasting.</td>
</tr>
</tbody>
</table>

**TIP** For the best results, use these standard prefixes on your aggregation tables. The tables will then conform to the standard that is used for the supplied adapters.

- Consider using rank columns if needed.

  Rank columns can be used to create “Top N” reports and ranked listings. They also provide a way to filter the data. With rank columns, you can filter the data so that only data from a certain time period (relative to the data that has been collected) is processed in the reports. For example, if you want the data for yesterday, you can select all values that have a value of 1 for the rank variable called DayDateRank01.

  Some standard data and time rank columns are listed in the following table.

**Table 13.4 Standard Data and Time Rank Columns**

<table>
<thead>
<tr>
<th>Summarization Level of Aggregation Tables</th>
<th>Staging Column</th>
<th>Rank Column</th>
<th>Rank Column Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>For all aggregation tables that are summarized at the Day level and more granular</td>
<td>DayDate</td>
<td>DayDateRank01</td>
<td>DayDateDescRank</td>
</tr>
<tr>
<td>For all aggregation tables that are summarized at the Week level and more granular</td>
<td>WeekDate</td>
<td>WeekDateRank01</td>
<td>WeekDateDescRank</td>
</tr>
<tr>
<td>For all aggregation tables that are summarized at the Month level and more granular</td>
<td>MonthDate</td>
<td>MonthDateRank01</td>
<td>MonthDateDescRank</td>
</tr>
</tbody>
</table>

- Consider using join columns if needed.

  Join columns are usually rank columns that are copied from another aggregation table. These columns can be used to filter the data for Top 10 reports. For example, a rank column in the DayHour aggregation table is the ranking of that column for each day and hour.
You might want to filter the data by the top 10 for the day, even if you are showing the data by hour. If so, you need to create a join column in the DayHour table in order to get the ranking column from the Day table. By default, the supplied aggregations have join columns for all the non-date and time ranking columns. However, in the user-written adapter, you can create only the ones that you need.

The naming convention for join columns is the following: X_rankColumn, where rankColumn is the name of the rank column from the original table and X is one of the following values:

- D if the rank column is from the Day table
- W if the rank column is from the Week table
- M if the rank column is from the Month table

**Creating Information Maps for User-Written Adapters**

The supplied adapters contain jobs that, when run, create information maps for each of the aggregation tables that were generated. You can also create information map jobs for your user-written aggregations. An information map enables you to access your data with SAS Web Report Studio, SAS Enterprise Guide, and other SAS reporting tools.

*Note:* In SAS Enterprise Guide, you can also access the data directly from the SAS data tables.

Creating and working with information maps is described in detail in Chapter 12, “Information Maps.” For more information, see “About Information Maps” on page 308.

The following tips can be used to keep your user-written adapter consistent with the supplied adapters.

- Create an information map job for each domain category. Specify a name for the job such as `<domain category>`Information Map.

- Each job should have an Information Map transformation for each aggregation in the domain category. The following diagram shows the resulting Information Map transformations for the job.
Figure 13.1 Information Map Transformations

- Use the name of the aggregation table as the name of your information map.
- Information map filters are helpful when using information maps for reporting. Some standard filters that are used in the supplied adapters are shown in the following tables. The filters are listed by the columns on which the aggregation table is summarized: DayDate, WeekDate, and MonthDate.

Table 13.5 Standard Filters Used for Supplied Adapters Based on the DayDate Column

<table>
<thead>
<tr>
<th>Filter Name</th>
<th>Filter Expression and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LastDay</td>
<td>Expression: &lt;&lt;aggTableNameDAYDATERANK01&gt;&gt; = 1</td>
</tr>
<tr>
<td></td>
<td>Description: DayDateDescRank 1</td>
</tr>
<tr>
<td>Last3Days</td>
<td>Expression: &lt;&lt;aggTableNameDAYDATERANK01&gt;&gt; between 1 and 3</td>
</tr>
<tr>
<td></td>
<td>Description: DayDateDescRank 1 – 3</td>
</tr>
<tr>
<td>RollingWeek</td>
<td>Expression: &lt;&lt;aggTableNameDAYDATERANK01&gt;&gt; between 1 and 7</td>
</tr>
<tr>
<td></td>
<td>Description: DayDateDescRank 1 - 7</td>
</tr>
<tr>
<td>RollingMonth</td>
<td>Expression: &lt;&lt;aggTableNameDAYDATERANK01&gt;&gt; between 1 and 31</td>
</tr>
<tr>
<td></td>
<td>Description: DayDateDescRank 1 - 31</td>
</tr>
<tr>
<td>Last14Days</td>
<td>Expression: &lt;&lt;aggTableNameDAYDATERANK01&gt;&gt; between 1 and 14</td>
</tr>
<tr>
<td></td>
<td>Description: DayDateDescRank 1 - 14</td>
</tr>
<tr>
<td>Last90Days</td>
<td>Expression: &lt;&lt;aggTableNameDAYDATERANK01&gt;&gt; between 1 and 90</td>
</tr>
<tr>
<td></td>
<td>Description: DayDateDescRank 1 - 90</td>
</tr>
</tbody>
</table>
### Table 13.6 Standard Filters Used for Supplied Adapters Based on the WeekDate Column

<table>
<thead>
<tr>
<th>Filter Name</th>
<th>Filter Expression and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ThisWeek</td>
<td>Expression: <code>&lt;&lt;aggTablenameWEEKDATERANK01&gt;&gt; = 1</code></td>
</tr>
<tr>
<td></td>
<td>Description: WeekDateDescRank 1</td>
</tr>
<tr>
<td>LastWeek</td>
<td>Expression: <code>&lt;&lt;aggTablenameWEEKDATERANK01&gt;&gt; = 2</code></td>
</tr>
<tr>
<td></td>
<td>Description: WeekDateDescRank 2</td>
</tr>
<tr>
<td>Last2Weeks</td>
<td>Expression: <code>&lt;&lt;aggTablenameWEEKDATERANK01&gt;&gt; between 2 and 3</code></td>
</tr>
<tr>
<td></td>
<td>Description: WeekDateDescRank 2 - 3</td>
</tr>
<tr>
<td>Last4Weeks</td>
<td>Expression: <code>&lt;&lt;aggTablenameWEEKDATERANK01&gt;&gt; between 2 and 5</code></td>
</tr>
<tr>
<td></td>
<td>Description: WeekDateDescRank 2 - 5</td>
</tr>
<tr>
<td>Last12Weeks</td>
<td>Expression: <code>&lt;&lt;aggTablenameWEEKDATERANK01&gt;&gt; between 2 and 13</code></td>
</tr>
<tr>
<td></td>
<td>Description: WeekDateDescRank 2 - 13</td>
</tr>
</tbody>
</table>

### Table 13.7 Standard Filters Used for Supplied Adapters Based on the MonthDate Column

<table>
<thead>
<tr>
<th>Filter Name</th>
<th>Filter Expression and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ThisMonth</td>
<td>Expression: <code>&lt;&lt;aggTableName.MONTHDATERANK01&gt;&gt; = 1</code></td>
</tr>
<tr>
<td></td>
<td>Description: MonthDateDescRank 1</td>
</tr>
<tr>
<td>LastMonth</td>
<td>Expression: <code>&lt;&lt;aggTableName.MONTHDATERANK01&gt;&gt; = 2</code></td>
</tr>
<tr>
<td></td>
<td>Description: MonthDateDescRank 2</td>
</tr>
<tr>
<td>Last2Months</td>
<td>Expression: <code>&lt;&lt;aggTableName.MONTHDATERANK01&gt;&gt; = 2 - 3</code></td>
</tr>
<tr>
<td></td>
<td>Description: MonthDateDescRank 2 - 3</td>
</tr>
<tr>
<td>Last4Months</td>
<td>Expression: <code>&lt;&lt;aggTableName.MONTHDATERANK01&gt;&gt; = 2 - 4</code></td>
</tr>
<tr>
<td></td>
<td>Description: MonthDateDescRank 2 - 4</td>
</tr>
<tr>
<td>Last13Months</td>
<td>Expression: <code>&lt;&lt;aggTableName.MONTHDATERANK01&gt;&gt; = 2 - 14</code></td>
</tr>
<tr>
<td></td>
<td>Description: MonthDateDescRank 2 - 14</td>
</tr>
</tbody>
</table>

You can also make filters for the other ranked and joined columns in your data. For the supplied adapters, there are filters for all the rank and join columns in the aggregation. These filters enable you to create top-ten reports. To generate this type of report, specify “between 1 and 10” in the filter expression.
Reporting on Data Created with User-Written Staging Transformations

To create reports that can be displayed in ITRM Report Center, you must use SAS Enterprise Guide. For information about creating and using reports within the SAS IT Resource Management framework, see the SAS IT Resource Management 3.8: Reporting Guide. This document can be accessed from the http://support.sas.com/documentation/onlinedoc/itsv/ website.

Working with User-Written Staging Transformations

Create a User-Written Staging Transformation

To create a User-Written Staging transformation, perform the following steps:

1. From the IT Data Marts tree of SAS IT Resource Management, double-click the job that is to contain the User-Written Staging transformation. The job opens on the Diagram tab of the Job Editor window.

2. From the Transformations tree of SAS IT Resource Management, expand the SAS IT Resource Management folder.

3. Scroll downward to the User-Written Staging entry. Drag and drop it onto the job on the Diagram tab of the Job Editor window.

4. (Optional) Attach a source table on the left side of the transformation.

   To create a table, select File ➔ New ➔ Table to open the New Table wizard. Respond to the prompts as needed and click Finish. To attach the new table to the transformation, navigate to the location of the table in the tree where you stored its metadata. Drag and drop the table onto the process flow diagram and attach the table to the transformation.

5. Attach a target table to the transformation. (Multiple target tables can be attached to the transformation.)

   T I P  If you cannot attach the table to the transformation, right-click the transformation and from the menu that appears, select Connections. In the User-Written Staging Connections dialog box that opens, the Output Node field of the target table should have a value. If the field does not have a value (or displays <none>), double-click the ellipsis (...) in the Output Node field and select the table to which you want to connect. Then click OK. Click OK again to return to the process flow diagram and connect the target table to the transformation.

6. Right-click the User-Written Staging transformation. From the drop-down menu, select Properties.
The General tab of the User-Written Staging Properties dialog box appears. The Name field displays the default value of the transformation, User-Written Staging.

Figure 13.2  General Tab of the User-Written Staging Transformation

7. In the Name field on the General tab, enter the name of the transformation if you do not want to retain the default name. The name of the transformation can be no more than 60 characters. It must be unique within the job that contains it. This field cannot be blank.

The new name of the transformation appears in the box that represents the User-Written Staging transformation in process flow diagram.

In the Description field, you can enter up to 200 characters of information about the transformation. A value is optional in this field.

8. On the Staging Parameters tab, you can customize the staging transformation with staging parameters, duplicate data checking parameters, and user-written parameters.

a. In the left panel of the tab, select Staging.
Figure 13.3  Standard Staging Parameters

You can specify the following information:

- In the **Raw data input file or directory** field, enter the location of the file or directory that contains the raw data that is to be read into your staging transformation.

  Click **Browse** to open the Select the File or Directory dialog box. In the **Look in** field, the drop-down list displays the files and directories that are available in the metadata repository to which you are connected. From the drop-down list that appears, select the file or directory that contains the raw data that is to be read into your user-written staging transformation.

  For information about the Raw data input file or directory parameter, see “Choose Raw Data Input Type” on page 479.

- In the **Future Data** field, the drop-down list displays the options that are available for handling future data. These options are **Accept**, **Discard**, and **Terminate**. Select the option that you want to use, or use the default value, **Discard**.

  For information about the Future Data parameter, see “Future Data” on page 483.

**Note:** Click the **Reset to defaults** option at the top of the tab to reset all the Staging parameters to the values that were established when SAS IT Resource Management was installed. Click the **Reset** option next to any one of these parameters to reset it to the value that was established when SAS IT Resource Management was installed. Also note that **Reset to defaults** does not reset a parameter that is dependent on another parameter if the parent parameter does not change.
b. In the left panel of the tab, select **Duplicate Checking**. To specify these parameters, use the drop-down list in the **Enable duplicate checking** field to select **Yes**. The following dialog box appears. If you select **No**, the duplicate checking parameters are removed from the panel.

**Figure 13.4 Duplicate Checking Staging Parameters**

![Duplicate Checking Staging Parameters](image)

You can specify the following information, which pertains to the parameters and options that affect how duplicate data checking is performed:

- In the **Duplicate checking options** field, you can specify how duplicate data is to be handled.

  The default value is **USR**. The following values can be selected.

  **Discard** removes duplicates.

  **Force** loads data regardless of whether duplicates are found.

  **Terminate** ends the job if duplicates are found.

**CAUTION:**

Although the job terminates, the resulting staged table might contain data. However, termination of the job indicates an error in processing, and any data in the resulting staged table might be invalid.
• In the **SOURCE variable for %RMDUPCHK macro** field, you can specify the data source for this adapter.

The default value is **USR**.

• In the **IDVAR variable for %RMDUPCHK macro** field, you can specify the name of the SAS variable that identifies the system or machine that generated the input data.

The default value is **MACHINE**.

• In the **TIMESTAMP variable for %RMDUPCHK macro** field, you can specify the name of the SAS variable that contains the datetime stamp. This SAS variable uniquely identifies the time of the event or interval that is being recorded.

The default value is **DATETIME**.

• In the **ENDFILE variable for %RMDUPCHK macro** field, you can specify the name of the SAS variable that is used as the END= keyword for the SAS INFILE statement that reads the raw data.

The default value is **_EOF**.

• In the **INT value for %RMDUPCHK macro** field, you can specify the maximum time gap (or interval) that is allowed between the timestamps on any two consecutive records from the same system or machine. If the interval between the timestamp values exceeds the value of this parameter, then an observation with the new time range is created in the control data set. This is referred to as a **gap** in the data.

The value for this parameter must be provided in the format **hh:mm**, where **hh** represents hours and **mm** represents minutes. For example, to specify an interval of 14 minutes, use **INT=0:14**. To specify an interval of 1 hour and 29 minutes, use **INT=1:29**.

The default value is **00:29**.

**Tip**: For best results, specify an interval that is a little larger than the natural interval of the raw data. For example, if the data is in 10-minute intervals, set **INT=00:12**. If the data is hourly, set **INT=01:02**.

• In the **KEEP value for %RMDUPCHK macro** field, you can specify the number of weeks for which control data is saved. Because this value represents the number of Sundays between two dates, a value of **2** (the default) results in a maximum retention period of 20 days. This value must be an integer.

The default value is **9**.

• In the **REPORT value for %RMDUPCHK macro** field, you can specify whether to display the duplicate-data checking messages in the SAS log or to save the messages in an audit table. If set to **Yes**, this parameter causes all the messages from duplicate-data checking to appear in the SAS log. If set to **No**, the duplicate-data checking messages are saved in an audit data table that is stored in the staging library. The name of the audit table is **source AUDIT** (where **source** is the 3–character data source code).

The default value is **Yes**.

**Note**: If you are monitoring very high numbers of resources, setting this option to **No** can be beneficial. Eliminating the report reduces CPU consumption, shortens elapsed time, and makes the SAS log more manageable.
Note: Click the **Reset to defaults** option at the top of the tab to reset all the duplicate checking parameters to the values that were established when SAS IT Resource Management was installed. Click the **Reset** option next to any one of these parameters to reset it to the value that was established when SAS IT Resource Management was installed. Also note that **Reset to defaults** does not reset a parameter that is dependent on another parameter if the parent parameter does not change.

c. In the left panel of the tab, select **User-Written**. The following dialog box appears.

*Figure 13.5 User-Written Staging Parameters*

You can specify the following information:

- In the **User-written code** field, enter the location where your staging code is stored.
  
  Click **Browse** to open the Select a File dialog box.

- In the **Generate a macro variable with input table name** field, you can choose to generate a macro variable that contains the full table name (libref.table) of the input table. From the drop-down list, select **Yes** if you want to generate the macro variable. Otherwise, select **No**.

- In the **Generate macro variables with target table names** field, you can choose to generate macro variables that contain the full table name
• In the **Generate a macro with target table options** field, you can choose to generate a macro that contains the data set options for each target table. From the drop-down list, select **Yes** if you want to generate the macro. Otherwise, select **No**.

• In the **Generate Tabinfo and Varinfo tables** field, you can choose to generate code that creates the following tables:
  - **tabinfo**, which contains all the target tables
  - **varinfo**, which contains all the columns in all the target tables

  From the drop-down list, select **Yes** if you want to generate the code. Otherwise, select **No**.

• In the **Generate a macro to create target table ATTRIB statements** field, you can choose to generate a macro that contains `attrib` statements for each column in the target tables. From the drop-down list, select **Yes** if you want to generate the macro. Otherwise, select **No**.

• In the **Generate a macro to create computed columns** field, you can choose to generate a macro that contains the computations for any computed columns in the target tables. From the drop-down list, select **Yes** if you want to generate the macro. Otherwise, select **No**.

• In the **Generate a macro to create column lists** field, you can choose to generate a macro that creates a list of all the columns in the table that can be used as a keep list, a retain list, or any other list of columns that is needed. From the drop-down list, select **Yes** if you want to generate the macro. Otherwise, select **No**.

• In the **Generate a macro to assign columns to missing** field, you can choose to generate a macro that contains assignment statements to set all columns in the target table to missing. From the drop-down list, select **Yes** if you want to generate the macro. Otherwise, select **No**.

**Note:** Click the **Reset to defaults** option at the top of the tab to reset all the User-Written parameters to the values that were established when SAS IT Resource Management was installed. Click the **Reset** option next to any one of these parameters to reset it to the value that was established when SAS IT Resource Management was installed. Also note that **Reset to defaults** does not reset a parameter that is dependent on another parameter if the parent parameter does not change.

9. The remaining tabs on the User-Written Staging Properties dialog box consist of standard SAS Data Integration Studio properties. For information about how to use these properties, click **Help** on the tab.

10. Click **OK** to return to the process flow diagram.

11. Click **File ⇒ Save** to save the job.

### Delete a User-Written Staging Transformation from a Job

To delete a User-Written Staging transformation from a job, perform the following steps:
1. From the IT Data Marts tree of SAS IT Resource Management, double-click the job that contains the User-Written Staging transformation. The job opens on the Diagram tab of the Job Editor window.

2. Right-click the box that represents the User-Written Staging transformation.

3. From the drop-down menu, select Delete.

4. Click File ⇦ Save to save the job.

Modify a User-Written Staging Transformation

To modify a User-Written Staging transformation, perform the following steps:

1. From the IT Data Marts tree of SAS IT Resource Management, double-click the job that contains the User-Written Staging transformation. The job opens on the Diagram tab of the Job Editor window.

2. Right-click the box that represents the User-Written Staging transformation.

3. From the drop-down menu, select Properties.

4. Click the tab that contains the information that you want to modify.
   - On the General tab, you can change the name of the transformation. The name of the transformation can be no more than 60 characters. It must be unique within the job that contains it.
   - On the Staging Parameters tab, you can change the standard staging parameters and the user-written staging parameters. For information about these parameters, see “Create a User-Written Staging Transformation” on page 351.

5. The remaining tabs on the User-Written Staging Properties dialog box consist of standard SAS Data Integration Studio properties that can also be modified. For information about how to use these properties, click Help on the tab.

6. Click OK to return to the process flow diagram.

7. Click File ⇦ Save to save the job.

Rename a User-Written Staging Transformation

To rename a User-Written Staging transformation, perform the following steps:

1. From the IT Data Marts tree of SAS IT Resource Management, double-click the job that contains the User-Written Staging transformation. The job opens on the Diagram tab of the Job Editor window.

2. Right-click the box that represents the User-Written Staging transformation.

3. From the drop-down menu, select Properties.

4. In the Name field on the General tab, enter the new name of the transformation. The name of the transformation can be no more than 60 characters. It must be unique within the job that contains it.

   The new name of the transformation appears in the box that represents the User-Written Staging transformation in process flow diagram.

5. Click OK to return to the process flow diagram.

6. Click File ⇦ Save to save the job.
Using the Additional Generated Code

When the SAS code for the User-Written Staging transformation is generated, additional code is generated and precedes the user-written code. This additional code provides information that can be useful in the user-written code. The generation of this additional code is controlled by the options on the User-Written page of the Staging Parameters tab.

Macro Variables

Macro variables for any extended attributes can be entered on the Extended Attributes tab of the User-Written Staging Properties dialog box. The name of each extension is the macro variable name, and the value of the extension is the value of the macro variable. If the name has spaces or other invalid characters, they are removed.

&input
   If there is a source table to the transformation, then this macro variable contains the libref.tablename of the source table.

&target1–&targetn
   These macro variables contain the names of the n target tables in the libref.tablename format.

Macros

These macros are available for use with user-written staging transformations.

- The following macro generates table options for specified target tables.

  %macro _ITMS_tableOptions (targetTableNum=, targetTableName=, generateTableName=YES, generateIndexes=YES);

  • The value for targetTableNum= can be an integer from 1 to n, where n represents the total number of target tables. These values are the same values that are represented by the macro variables &target1, … &target[n] in the generated code.

  The value for targetTableName= is a two-level SAS data set name in the form [libref].[table]. An example of this parameter is targetTableName=STG7536.NTSYSTEM_ITRM.

  Note: You can specify a table by using either the targetTableNum= parameter or the targetTableName= parameter. If both parameters are left blank, then the table options for all the target tables are generated.

  • If you specify generateTableName=NO, the macro generates a list of the table options.

  • If you specify generateTableName=YES, the macro generates the table name with the table options in parentheses after it.

  • The following macro generates an ATTRIB statement for each column of the requested table.
The value for targetTableNum= is an integer from 1 to \( n \), where \( n \) represents the total number of target tables. These values are the same values that are represented by the macro variables &target1, \ldots &target[n] in the generated code.

The value for targetTableName= is a two-level SAS data set name in the form [libref].[table]. An example of this parameter is targetTableName=STG7536.NTSYSTEM_ITRM.

Note: You can specify a table by using either the targetTableNum= parameter or the targetTableName= parameter. If both parameters are left blank, then the macro generates a \( \text{ATTRIB} \) statement for each column for all tables.

The \( \text{ATTRIB} \) statement includes the column name, type, length, format, informat, and label.

\%macro _ITMS_attrib (targetTableNum=, targetTableName=);
  \%\n  \% The following macro generates assignment statements for all the columns of the requested table that set the value to " " or . (missing), depending on the type of column.
  \%\n  \% The value for targetTableNum= is an integer from 1 to \( n \), where \( n \) represents the total number of target tables. These are the same values represented by the macro variables &target1, \ldots &target[n] in the generated code.
  \%\n  \% The value for targetTableName= is a two-level SAS data set name in the form [libref].[table]. An example of this parameter is targetTableName=STG7536.NTSYSTEM_ITRM.
  \%\n  Note: You can specify a table by using either the targetTableNum= parameter or the targetTableName= parameter. If both parameters are left blank, then the macro generates assignment statements for all columns in all tables.

\%macro _ITMS_assignToMissing (targetTableNum=, targetTableName=);
  \%\n  \% The following macro generates a statement for each computed column of the requested table.
  \%\n  \% The value for targetTableNum= is an integer from 1 to \( n \), where \( n \) represents the total number of target tables. These are the same values represented by the macro variables &target1, \ldots &target[n] in the generated code.
  \%\n  \% The value for targetTableName= is a two-level SAS data set name in the form [libref].[table]. An example of this parameter is targetTableName=STG75.NTSYSTEM_ITRM.
  \%\n  Note: You can specify a table by using either the targetTableNum= parameter or the targetTableName= parameter. If both parameters are left blank, then the macro generates a statement for each computed column for all tables.

\%macro _ITMS_computedColumns (targetTableNum=, targetTableName=);
  \%\n  \% The following macro generates a list of all the columns of the requested table.
  \%\n  \% The value for targetTableNum= is an integer from 1 to \( n \), where \( n \) represents the total number of target tables. These are the same values represented by the macro variables &target1, \ldots &target[n] in the generated code.
  \%\n  \% The value for targetTableName= is a two-level SAS data set name in the form [libref].[table]. An example of this parameter is targetTableName=STG75.NTSYSTEM_ITRM.
  \%\n  Note: You can specify a table by using either the targetTableNum= parameter or the targetTableName= parameter. If both parameters are left blank, then the macro generates a list of all the columns for each table.
Note: You can specify a table by using either the targetTableNum= parameter or the targetTableName= parameter. If both parameters are left blank, then the macro generates a list of all the columns for all tables.

```sas
%macro _ITMS_columnList (targetTableNum=, targetTableName=, delimiter=, sqlAlias=);

The additional parameters allow the list to be generated in different ways:

DELIMITER=
This parameter is set to a character string that is placed between each column in the list. The most common value of this parameter is a comma, so that the list can be used in SQL code. If a value is not specified, then the column names are separated by blanks.

SQLALIAS=
This parameter is an alias that can be used as a prefix for each column name. There is a period between this prefix and the column name. The most common use of this parameter is in SQL when a table alias is needed for each column.

Tabinfo and Varinfo

You can choose to create the Tabinfo and Varinfo tables in the Work library. These tables can be used in the user-written code to generate SAS code that is based on the target table and column information.

The Tabinfo table contains one record for each target table. The following columns are included in the Tabinfo table:

TABLENM
specifies the name of the table.

LIBREF
specifies the libref for this table.

ISCOMPRESSED
specifies the COMPRESS data set option. The values can be YES (that is, COMPRESS=YES) or NO (that is COMPRESS=NO).

INDEXOPTION
specifies the INDEX data set option (if there is an index on the table).

The Varinfo table contains one record for each column in all the target tables. The following columns are included in the Varinfo table:

TABLENM
specifies the name of the table.

VARNM
specifies the name of the column.

VARLAB40
specifies the column label.

VARFMT
specifies the column format.

VARINFMT
specifies the column informat.
VARLEN
specifies the length of the column.

VARTYPE
specifies the type of the column. The type can be C (that is, character) or N (that is, numeric).

FORMULA
specifies the expression that is used to create this column, if it is a computed column.

What Are the Properties of the User-Written Staging Transformation?

General Tab

The General tab contains the following information about the table. The fields on this tab can be modified.

Name
identifies the name of the user-written staging transformation that you are specifying.

Description
describes the user-written staging transformation that you are specifying.

Staging Parameters Tab

The Staging parameters tab contains three subgroups of information: Staging, Duplicate Checking, and User-Written. In the left panel of this tab, you can select the subgroup whose properties you want to specify. For information about these properties, see Step 8 of the Create a User-Written Staging Transformation topic on page 352.

Code Tab

The Code tab can display and manage the code that is generated for the User-Written Staging transformation. Click Help for more information about this tab.

Precode and Postcode Tab

The Precode and Postcode tab contains check boxes that enable you to specify that user-written code should be inserted at the beginning or end of the current job or transformation. Click Help for more information about this tab.

Notes Tab

The Notes tab contains areas where you can annotate the table. Click Help for more information about this tab.

Extended Attributes Tab

The Extended Attributes tab contains custom properties that are not part of the standard metadata for the transformation. All extended attributes that are added to this tab are
made into macro variables when the code for this transformation is generated. Click Help for more information about this tab.
Jobs That Process IT Data

Overview of Jobs That Prepare, Stage, Aggregate, Generate Information Maps, Analyze Exceptions, and Report for IT Data

To prepare and process IT resource data, SAS IT Resource Management requires jobs that perform the following tasks:

- Prepare the raw data for staging
- Stage the raw data
- Aggregate the data
- Detect and report on exceptional conditions in the incoming data
- Generate information maps of the data
- Generate performance reports
For information about how to generate the job that prepares the raw data for staging, see “Data Sources Supported by SAS IT Resource Management Adapters” on page 397. The remaining jobs (staging, aggregating, detecting exceptions, generating information maps, and reporting) can be generated in two ways:

- automatically, by using the Adapter Setup or Add Domain Category wizard
- manually, by using the SAS IT Resource Management transformations

**Note:** After the jobs are created, either by using the Adapter Setup or Add Domain Category or by using the SAS IT Resource Management transformations, only the metadata definitions of the tables exist. You must actually execute the jobs in order to load data into the physical tables.

**CAUTION:**
Make sure that all tables that are associated with the job are closed before you run the job. If any one table cannot be accessed with Write access, the job fails with a nonzero return code.

---

**Processing IT Data Using the Adapter Setup or Add Domain Category Wizard**

**Generating Jobs with the Adapter Setup Wizard or Add Domain Category Wizard**

You can automatically generate the metadata for the jobs that process IT resource data by invoking the Adapter Setup or Add Domain Category wizard.

To invoke the Adapter Setup wizard, from the menu bar of the SAS IT Resource Management client select `File ⇒ New ⇒ IT Resource Management ⇒ Adapter Setup`.

**Note:** The Add Domain Category wizard performs in a manner that is similar to (but not completely the same as) the Adapter Setup wizard. For information about this wizard and how to invoke it, see “About the Add Domain Category Wizard” on page 291.

**CAUTION:**
Concurrent accessing of the Adapter Setup or Add Domain Category wizard by different users can cause the resulting jobs to fail if they are also executed concurrently. If the users select the same adapter, identically numbered folders in the IT data mart are created. Concurrent execution of the jobs created by the wizard cause one user’s jobs to fail.

The Adapter Setup wizard appears and prompts you to specify information about the adapters that you want to work with. For any adapter, you can specify one of the following configuration levels that govern the types and number of jobs that the wizard generates.

- **Staging Job Only** creates a staging job only for the adapter. If you select this option, no aggregation jobs, information map jobs, exception jobs, or reporting jobs are created.

- **Minimal** creates a staging job and additional jobs that include metrics, aggregations, report definitions, and exception definitions for a small number of reports. This level is for reporting on a small scale. You might use this level to create jobs that are related to low-priority, non-critical machines.

- **Typical** creates the staging job and a set of jobs that include recommended metrics, aggregations, report definitions, and exception definitions that satisfy a typical set of reports for an adapter. (This configuration level includes the output that is part of the **Minimal** setting.)
This configuration level is the default option.

- **Full** creates a staging job and a comprehensive set of jobs that include most metrics, aggregations, report definitions, and exception definitions that SAS IT Resource Management supports. This level includes all of the jobs that are part of the Typical level. In addition, it includes many of the other metrics that are recommended for an adapter. You might use this level when you want the full benefits of the domain intelligence that is available with the SAS IT Resource Management solution as well as additional information from the full set of metrics that are available from the adapter data sources.

*Note:* Increasing the configuration level results in more complex transformations and jobs. If you select **Full** when you need only the Typical level, the extra complexity causes the Adapter Setup wizard to be slower to complete than is necessary for your needs. Also, the nightly ETL jobs take longer to process.

When you click **Finish**, the Adapter Setup wizard creates the required jobs and all the metadata that is necessary for those jobs to execute. The Adapter Setup wizard requires you to specify the IT data mart where it stores (by default) the jobs and the associated metadata for the adapter that you are working with. These jobs and the associated metadata are stored in the `<adapter><number>` folder that you are working with.

The Adapter Setup wizard creates the following jobs:

- one staging job that contains only the part of the ETL flow that relates to the staging transformation and the target staged tables.

- zero or more aggregation jobs that each contain one Aggregation transformation with target summary tables. The number of aggregation jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you made when specifying the adapter.

- zero or more information map jobs that each contain one Information Map transformation per aggregation table. The number of information map jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you made when specifying the adapter.

- zero or more reporting jobs that each contain one or more Performance Report transformations per information map. The number of reporting jobs that are created varies based on the domain categories (and their respective subcategories), time periods, and reporting selections that you made when specifying the adapter.

- zero or more exception jobs that each contain one Exception transformation with target exception tables. The number of exception jobs that are created varies based on the exception definitions that are available for the adapter and domain categories (and the respective subcategories of their staged tables).

The default name of each job that is created by the Adapter Setup wizard contains the name of the adapter and the domain category that you specified with the wizard.

*Note:* The jobs that the Adapter Setup wizard creates depend on one another to process the raw data for reporting. For example, the aggregation jobs include aggregations that rely on the staged tables that are generated when the staging job is run. As a result, each job should be run only after the jobs that it depends on have been run. The following list shows the types of jobs that the Adapter Setup wizard creates. Each job type in the list is dependent on the job type that precedes it.

1. staging job
2. exception job
3. aggregation job
4. information map job
5. reporting job

For information about how to work with the Adapter Setup wizard, see Chapter 10, “Adapter Setup Wizard,” on page 257.

**Where Does the Adapter Setup Wizard Store the Objects That It Generates?**

The Adapter Setup wizard and the Add Domain Category wizard store the objects that it generates in predetermined locations within the IT data mart that you select. The wizards generate two sets of subfolders for the objects that it creates:

- the **Staging** subfolder, which contains the staging job, staged tables, the library for those tables, and the **Exception** subfolder if exception definitions exist for the selected adapter and domain category

  *Note:* The **Exception** subfolder contains the exception job and the exception tables and the library for those tables.

- the `<Domain Category>` subfolder within the **Domain Categories** folder, which contains the aggregation, information map, and reporting jobs, their associated tables and maps, and the library that is associated with those objects

However, jobs, tables, and libraries can be stored in any location to which you have Write access. To change where an object is stored, right-click the object (in the process flow diagram or in the tree where it is currently stored) and select Properties. On the General tab of the Properties dialog box, click the Browse button that is next to the Location field. The Select a Location dialog box appears. Navigate to the location that you want to use and click OK.

The default location for the staging job, the staged tables, and the associated library is the **Staging** subfolder that is located within the adapter folder of the selected IT data mart.

The following display shows the metadata that is created in the **Staging** subfolder for the second instance of the SAR adapter within the IT data mart. The **Staging** subfolder contains the SAR Staging job, the SAR and SARDEV ITRM staged tables, and the library for those tables—SAR Staging 2763. In addition, the display shows the contents of the **Exception** subfolder. That subfolder contains the SAR2 System Exceptions job, the Exceptions_System target table, and the Exception 2902 library that holds the table.

*Figure 14.1  Default Location of Objects Created by the Adapter Setup Wizard for Staging the Raw Data*
The default location for the remaining jobs, their associated tables, and library is in the **Domain Categories** subfolder that is in the adapter folder of the selected IT data mart.

The following display shows the metadata that is created in the **Domain Categories** subfolder for the second instance of the SAR adapter within the IT data mart. The **Domain Categories** subfolder contains two subfolders of domain objects: Disk and System. Each domain subfolder contains three aggregated tables, the library associated with those tables, the aggregation job, the information map job, and the reporting job.

**Figure 14.2** Default Location of Objects Created by the Adapter Setup and Add Domain Category Wizards for Aggregating, Creating Information Maps, and Reporting on the Staged Data

Note: Information maps are not generated until the information map job runs. When they are generated, they are stored by default in the appropriate **Domain Categories** subfolder, although you can store them in any location to which you have Write access.

**Processing IT Data without the Adapter Setup Wizard**

You can manually generate the metadata for the tasks that process IT resource data instead of invoking the Adapter Setup wizard. To do so, you must first open a job. Then, within that job, you can specify the staging, aggregating, information map, exception, and reporting (Performance Report) transformations that are needed. You can also modify existing jobs by adding and deleting transformations, tables, and information maps.

To generate the metadata for a transformation, perform the following steps:
1. Open a job. If you want to work with an existing job, double-click on that job to open it on the Diagram tab of the Job Editor window of SAS IT Resource Management.

   If you need to create a job, you can invoke the New Object wizard from the File menu of SAS IT Resource Management. For information about how to perform this task, see “Create a Job” on page 370.

   The new job opens on the Diagram tab of the Job Editor window.


   Note: A job can consist of a single transformation, or it can include multiple transformations such as staging transformations, Aggregation transformations, Information Map transformations, Exception transformations, and Performance Report transformations.

3. Drop the transformation that you want to work with onto the job in the Diagram tab of the Job Editor window.

4. Locate and follow the instructions for working with transformations that perform the following tasks:
   - Stage the raw data
     For information about how to stage the raw data, see Chapter 7, “Staging the Data,” on page 109.
   - [Optional] Process exception definitions
     For information about how to work with the exception analysis process, see Chapter 9, “Exception Analysis Processing,” on page 209.
   - Aggregate the data
     For information about how to aggregate the data, see Chapter 8, “Aggregating the Data,” on page 143.
   - Generate information maps of the data
     For information about how to generate information maps, see on page 307.
   - Report on the IT intelligence and analysis that SAS IT Resource Management generates
     For information about how to generate, manage, and view reports, see the SAS IT Resource Management 3.8: Reporting Guide.

   Note: In order to create (or update) the physical tables that are specified by the transformation, the job that contains the transformation must be executed. Jobs can be run immediately from SAS IT Resource Management, or they can be scheduled to execute as part of the operational procedures of an organization. (Due to the size of the aggregation jobs, it is preferable to run them in batch mode.)

---

Working with Jobs

Create a Job

To create a job, perform the following steps:
1. From the menu bar of the SAS IT Resource Management client, select **File** ➔ **New** ➔ **Job** to open the New Job wizard.

2. In **Name** field, you can override the default name that is assigned to the job. You can enter up to 60 characters in this field. A value is required in this field.

3. In **Description** field, enter the information that describes the job. You can enter up to 200 characters in this field. A value is optional in this field.

4. In **Location** field, you can override the default location of the job. To do so, click **Browse** to open the Select a Location dialog box where you can navigate to another location.

   **Note:** If you are working in the IT Data Marts view and you have not selected a folder, but have referenced an IT data mart, then the job is created within the **Contents** subfolder of the last-referenced IT data mart. If you are working in the Folders view, the job is created in **My Folders**.

For information about how to create an IT data mart, see “Create an IT Data Mart” on page 58. To create a folder within an IT data mart, perform the following steps:

**Create a Folder**

a. Navigate to the IT data mart.

   **TIP** You might want to create new subfolders to better organize the objects that you are creating. You can create these subfolders in the **Contents** folder within the IT data mart.

b. From the menu bar of the SAS IT Resource Management client, select **File** ➔ **New** ➔ **Folder**. The New Folder wizard appears.

c. (Optional) Override the default name of the folder with a name that does not exceed 60 characters. A value is required in this field.

   **Note:** For best results, enter a name that indicates the purpose of the folder.

d. (Optional) Enter a description of the folder. You can enter up to 200 characters. A value is optional in this field.

e. (Optional) Override the default location by clicking **Browse** to open the Select a Location dialog box, where you can navigate to another location. A value is required in this field.

f. Click **OK** to create the folder and store it in the IT data mart from which you invoked the New Folder wizard.

   **Note:** In order for a new subfolder to be associated with an IT data mart, create it from the **IT Data Marts** tree in the SAS IT Resource Management client.

5. Click **OK** to create the job and store it in the location that you chose.

   **Note:** The **Diagram** tab of the Job Editor window of SAS IT Resource Management automatically displays the job that you created. (The window is empty except for the job name that is displayed on the banner of the window.)

6. To view the new job in the folder, click **Refresh** in the menu bar. (In order to activate the **Refresh** icon in the menu bar, click anywhere in the left panel of SAS IT Resource Management.)

**Delete a Job**

To delete a job, perform the following steps:
1. Navigate to the location of the job in the IT Data Marts tree.
2. Right-click the job.
3. From the menu that is displayed, select Delete.
4. In the confirmation box, click Yes to delete the job.

**Modifying a Job**

**Add a Transformation to a Job**

*Note:* If you modify a job, you should redeploy it.

To add a transformation to a job, perform the following steps:

1. Navigate to the location of the job in the IT Data Marts tree.
2. Double-click the job to open it on the Diagram tab of the Job Editor window.
3. In the Transformations tree, expand the SAS IT Resource Management folder.
4. Drag and drop the transformation that you want to add to the job onto the process flow diagram.
5. Right-click the transformation to display a menu of options with which you can specify the transformation that you are adding to the job.
   - For information about how to add a staging transformation, see “Working with Staging Transformations” on page 111.
   - For information about how to add an Exception transformation, see “Working with the Exception Transformation” on page 215.
   - For information about how to add an Aggregation transformation, see “Preparing to Create an Aggregation Table” on page 157.
   - For information about how to add an Information Map transformation, see “User-Specified Information Map Transformations” on page 312.
6. Save the job that you modified. To do so, select File ➔ Save.

**Delete a Transformation from a Job**

*Note:* If you modify a job, you should redeploy it.

To delete a transformation from a job, perform the following steps:

1. Navigate to the location of the job in the IT Data Marts tree.
2. Double-click the job to open it on the Diagram tab of the Job Editor.
3. Right-click the transformation that you want to delete.
4. Save the job that you modified. To do so, select File ➔ Save.

**Add a Table to a Transformation**

*Note:* If you modify a job, you should redeploy it.
You can add a table to a staging transformation or an Aggregation transformation. To add a table to a transformation in a job, perform the following steps:

1. Navigate to the location of the job in the IT Data Marts tree.
2. Double-click the job to open it on the Diagram tab of the Job Editor.
3. Right-click the transformation to which you want to add a target table. A menu of options is displayed in the Properties dialog box.
   - The menu for a staging transformation provides an action to Add New Staged Table. For information, see “Working with Staging Transformations” on page 111.
   - The menu for an Exception transformation provides an action to Add New Exception Tables. For information, see “Working with the Exception Transformation” on page 215.
   - The menu for an Aggregation transformation provides an action to Add Aggregation Table. For information, see “Preparing to Create an Aggregation Table” on page 157.
4. Select the table that you want to add to invoke the wizard that generates the metadata for that table.
5. The wizard prompts you for information that is required to specify the metadata for the table. When you are satisfied with your specifications, click Finish to generate the metadata for the table.
6. Save the job that you modified. To do so, select File ⇒ Save.

Delete a Table from a Transformation in the Process Flow Diagram

To delete a table from a transformation in the process flow diagram, perform the following steps:

1. Navigate to the location of the job in the IT Data Marts tree.
2. Double-click the job to open it on the Diagram tab of the Job Editor.
3. Right-click the table that you want to delete. The table is removed from the transformation. However, the metadata of this table and its library are not deleted from the IT Data Marts tree, and its contents are not deleted from the physical file.
4. Save the job that you modified. To do so, select File ⇒ Save.

If you delete the source table of an Aggregation transformation in the process flow diagram, the target tables of that transformation are also deleted. However, if this action is not acceptable, you can reinstate these tables. To do so, select Edit ⇒ Undo.

CAUTION:
To avoid processing errors, delete any reference to a deleted table, as a source or target for any transformation in any other job. For example, Information Map transformations that use the deleted table as a source table should be deleted.

Note: Be sure to redeploy any jobs that reference the deleted table.

Delete a Table from the IT Data Marts Tree

The Delete action deletes the metadata for the table in the IT Data Marts tree. The physical table and the library are not deleted. To delete a table from the IT Data Marts tree, perform the following steps:

1. Navigate to the folder that contains the table in the IT Data Marts tree.
2. Expand that folder and right-click the table that you want to delete.
3. From the menu that appears, select **Delete**.
4. In the confirmation box, click **Yes**.

**CAUTION:**

*A job that accesses a table that is deleted cannot run successfully.*

*Note:* Be sure to redeploy any jobs that reference the deleted table.

**Delete a Table with Its Contents from a Transformation in the Process Flow Diagram**

The **Delete with Contents** action deletes the metadata of the table and the physical table. It does not delete the associated library. To delete a table with its contents from the **IT Data Marts** tree, perform the following steps:

1. Navigate to the folder that contains the table in the **IT Data Marts** tree.
2. Double-click the job to open it on the **Diagram** tab of the Job Editor.
3. Right-click the table whose contents and metadata you want to delete.
4. From the menu that is displayed, select **Delete with Contents**.

**CAUTION:**

*A job that accesses a table that is deleted will not run successfully.*

*Note:* Be sure to redeploy any jobs that reference the deleted table.

**Delete a Table with Its Contents from the IT Data Marts Tree**

The **Delete with Contents** action deletes the metadata of the table and the physical table. It does not delete the associated library. To delete a table with its contents from the **IT Data Marts** tree, perform the following steps:

1. Navigate to the folder that contains the table in the **IT Data Marts** tree.
2. Expand that folder and right-click the table whose contents and metadata you want to delete.
3. From the menu that is displayed, select **Delete with Contents**.

**CAUTION:**

*A job that accesses a table that is deleted will not run successfully.*

*Note:* Be sure to redeploy any jobs that reference the deleted table.

**Erase a Table from a Transformation**

Erasing a table deletes the physical table, its contents, and its metadata. To erase a table, perform the following steps:

1. In the **IT Data Marts** tree, locate the table that you want to erase.
2. Right-click the table that you want to erase. The job that uses the table must be closed and currently not in use before erasing.
3. Select **Erase**.
4. Click **Yes** to confirm that you want to erase this table.

**CAUTION:**
If you erase a table that serves as a source table in other jobs, then these associated jobs might not execute because they are missing a source table. Simply erasing a table does not affect the metadata of the associated jobs. However, if you erase a table and then rerun the job that creates that table, then the data for the deleted table is not created. In addition, the jobs that used that table will fail due to a missing source table.

Note: Be sure to redeploy any jobs that reference the erased table.

**Purge a Table from a Transformation in the Process Flow Diagram**
The **Purge** action removes all observations from physical tables but leaves the physical table structure intact. To purge a table from the process flow diagram, perform the following steps:

1. Navigate to the job that contains the table in the IT Data Marts tree.
2. Double-click the job to open it on the Diagram tab of the Job Editor.
3. Right-click the table whose contents you want to purge.
4. From the menu that is displayed, select **Purge**.
5. In the confirmation box, click **Yes**.

**Purge a Table from the IT Data Marts Tree**
The **Purge** action removes all observations from physical tables but leaves the physical table structure intact. To purge a table from the IT Data Marts tree, perform the following steps:

1. Navigate to the folder that contains the table in the IT Data Marts tree.
2. Expand that folder and right-click the table that you want to purge.
3. From the menu that is displayed, select **Purge**.
4. In the confirmation box, click **Yes**.

**Rename a Job**

To rename a job, perform the following steps:

1. Navigate to the folder that contains the job in the IT Data Marts tree.
2. Right-click the job.
3. From the menu that is displayed, select **Rename**.
4. In the highlighted field, enter the new name of the job.

---

**Running Jobs**

**About Running Jobs**

When an aggregation or exception transformation is executed either interactively or in batch, the input table is read. Therefore, the same table is temporarily unavailable for
writing by other processes. If another process has already begun writing the table, then the same table is temporarily unavailable for reading by this transformation.

Similarly, when this aggregation or exception transformation is executed, the output tables are written. Therefore, the same tables are temporarily unavailable for reading or writing by other processes. If another process has already started reading the table, then that same table is temporarily unavailable for writing by the transformation.

On z/OS, if the table belongs to a SAS Library that is stored in the traditional z/OS file system, then the lock is on the entire SAS library. It is not just on the individual table. If the SAS library is stored in zFS, or on Windows, or UNIX, the lock is on the individual table.

**CAUTION:**

Be careful how you schedule runs of the aggregation or exception transformation. Make sure that other processes such as production jobs that use the same input and output tables are not adversely affected.

**Run a Job Immediately**

After a job is created, and the transformation within it is defined, the job is ready to be run. To run a job immediately on the SAS Application Server where you are currently logged on, perform the following steps:

1. If the job is not open on the **Diagram** tab of the Job Editor window, open it by navigating to the job in the **IT Data Marts** tree and double-clicking it.

2. In the toolbar of the Job Editor window, select **Run**. This action submits the job's source code.

*Figure 14.3 Process Flow of an Aggregation Job in the Job Editor Window*
3. The Diagram, Code, and Log tabs are located at the bottom of the window. You can select the Code tab to view the generated code. After the job executes, you can select the Log tab to view the SAS log.

*Note:* To see the results of the job in the tree view, right-click in the left panel and select Refresh.

Click Properties to specify the scheduling details and authorization requirements of the jobs.

*Note:* In the left pane, locate the job that you want to run. Right-click Properties of that job to specify the scheduling details and authorization requirements of the job that you want to run. If you are running a job in a clustered metadata server environment, make sure that the Enable optional metadata macro variables option is set to No. (In most cases, this option is already set to No.)

**Deploy a Job for Scheduling**

**How to Deploy a Job**

You can deploy a job so that it can be scheduled to run in batch mode on the default SAS Application Server.

To deploy a job to be run in batch mode, perform the following steps:

1. In the IT Data Marts tree of SAS IT Resource Management, navigate to the job that you want to deploy.

   *Note:* By pressing the CNTL key, you can select multiple jobs within an IT data mart to deploy. However, if the server is z/OS, you can deploy only one job at a time.

2. Right-click the job and from the menu that appears, select Scheduling ⇒ Deploy.

   The Deploy a job for scheduling dialog box appears.

   • Under Windows or UNIX operating environments, the following dialog box appears.

   ![Running Jobs 377](image)

   • Under the z/OS operating environment, the following dialog box appears.
Figure 14.5 Deploying a z/OS Job for Scheduling

3. The batch server, the deployment directory, and the name and path of the job that you selected are the default values that are displayed in this window.

   • The **Batch Server** field contains the server where the job is to be executed.
     
     *Note:* Jobs should be deployed to a server that is defined in the Foundation repository.

   • The **Deployment Directory** field specifies the physical path to the directory where the generated code for the job is stored. From the drop-down list, select a different deployment directory. Select **New** to open the New directory window where you can define a new deployment directory.

     * If you define a new deployment directory in the Windows or UNIX operating environments, the new deployment directory will contain the SAS source code for the job.

     * If you define a new deployment directory in the z/OS operating environment, the new directory contains a file that has the SAS source code for the job. It also contains a file of the generalized job control language (JCL) that can run the job. You can modify this generalized file of JCL according to the requirements of your site.

     *Note:* The JCL Deployment Directory can be deployed to a zFS location or a traditional file system (PDS).

   • The **Deployed Job Name** field specifies the name of the file that contains the generated code for the selected job. You can edit the default name, but the name must be unique in the context of the Deployment Directory that was previously specified. This field is available only when you deploy a single job. When you deploy multiple jobs, the filename is the same as the job names, but the name has a .sas extension.
The default value of the **Deployed Job Name** that is displayed is based on the name of your Job object. Therefore, you might need to revise the name in order to make it a legal filename on the operating system to which it is being deployed.

*Note:* For **z/OS** traditional file system locations, if the **Deployment Directory** name points to a partitioned data set (PDS), then the deployed job name specifies a member name for that PDS. The member name of the PDS cannot exceed 8 characters.

- The **Location** field contains the path to the **Folders** tree that contains the job. Click **Browse** to open the Select a Location dialog box where you can select another location.

*Note:* For more information about the fields on this window, click **Help**.

4. Click **OK** to deploy the job.

5. The code is then generated for the job and stored in the directory that is specified. If the deployment is successful, a message is displayed confirming that result. Metadata about the deployed jobs is saved to the current SAS Metadata Server. A status window is displayed and indicates whether the deployment was successful. Another object with the same name as the deployed job is stored in the **IT Data Marts** tree. This deployed job can be identified by the deployed job icon: ![deployed_job_icon]. This deployed job is now available for scheduling.

If you update a job or if your computing environment changes, you must redeploy it so that the latest version of the job is the available for execution. For example, if you add, remove, or change a transformation in a job, you must redeploy it for those changes to take effect.

*Note:* You can also deploy batch jobs from the command line. For information, see “Overview of Using a Command Line to Deploy Jobs” on page 691.

**Schedule a Job to Run in Batch**

After you deploy a job for scheduling, you can deploy it using any scheduling software that is available in your operating environment. An administrator can set up and run your job with any of the following types of software:

- any scheduler that is built in to your operating system.
- any third-party scheduler.
- the Schedule Manager plug-in to SAS Management Console. This software can define a flow, add one or more deployed jobs to it, and schedule the flow to run.

*Note:* For more information about scheduling, see *Scheduling in SAS*. This document is associated with plug-ins to SAS Management Console. It is available at [http://support.sas.com/documentation/onlinedoc/sasmc/index.html](http://support.sas.com/documentation/onlinedoc/sasmc/index.html).

**How to Schedule a Job Using a Built-In or Third-Party Scheduler**

The deployed job is a file that contains SAS code. In order to schedule it using a built-in or third-party scheduler, you must supply an appropriate invocation of SAS, which runs this code.

*Windows Specifics*
- You need to supply a batch file.

*UNIX Specifics*
- You need to supply a shell script.

*z/OS Specifics*
You need to supply the JCL. A file of JCL that can be modified according to the requirements of your site can be found in the deployment directory that you selected.

This invocation must invoke the correct version of SAS with the configuration that is specified in the SAS IT Resource Management installation and configuration instructions.

To run batch jobs using the same SAS configuration as for the application server, depending on platform, do the following:

**Windows Specifics**
Run the sas.bat shell command in the configured application server, which is located here: `<config-dir>\Lev1\SASITRM\sas.bat`

**UNIX Specifics**
Run the sas.sh shell command in the configured application server, which is located here: `<config-dir>/Lev1/SASITRM/sas.sh`

**z/OS Specifics**
For USS tasks, run the sas.sh shell command in the configured application server, which is located here: `<config-dir>/Lev1/SASITRM/sas.sh`

For traditional batch jobs, use the generated PROCLIB member PROCENW0 (or the equivalent for other languages). For example, run this:

```
&<CONFIGDIR>.PROCLIB(PROCENW0)
```

For more information about how to invoke SAS on your operating system, see one of the following documents:

- *SAS Companion for the Microsoft Windows Environment*
- *SAS Companion for UNIX Environments*
- *SAS Companion for z/OS*

After you have set up the SAS invocation, you can then use your preferred scheduler to add this job to the script, batch file, or JCL that invokes SAS. For example, on UNIX, you can use `cron` and add the shell script invocation to the `crontab` file. For third-party schedulers and for schedulers that are supplied as part of the operating system, follow the documentation for that scheduler.

**How to Schedule a Job Using the Schedule Manager in SAS Management Console**

To schedule a job to run in batch mode, perform the following steps:

1. On the main navigation tree of SAS Management Console, right-click **Schedule Manager**. From the drop-down list, select **New Flow** to open the New Flow window.
2. In the Name field, enter the name of the job flow. (The name cannot contain spaces.)

3. Use the drop-down arrow to select the server that you want to use.
   
   If you want to specify a new scheduling server, select **New**. The New Scheduling Server wizard opens. Respond to the prompts as required.

   *Note:* When selecting a scheduling server, make sure that the server is under the Foundation repository.

4. From the **Available Jobs** column, select the jobs that you want to schedule. Use the arrow to transfer those jobs to the **Selected Jobs** column. (In the preceding display, the NewServerFlow called Server_Disk_Aggregation job is selected for scheduling.)

5. Click **Properties** to specify the scheduling details and authorization requirements of the jobs.

   *Note:* If you are running a job in a clustered metadata server environment, make sure that the **Enable optional metadata macro variables** option is set to **No**. (In most cases, this option is already set to **No**.)

6. Click **OK** to define the job flow.
7. Select the new flow under **Schedule Manager**.

8. (Optional) Highlight the flow and select **Actions** ⇒ **Manage Dependencies**. The **Manage Dependencies** dialog box appears, where you can specify one or more conditions that control the starting of the current job.

**Figure 14.8  Manage Dependencies Dialog Box**
9. Select **Actions ➤ Schedule Flow**. The Schedule Flow dialog box appears.

**Figure 14.9** Select a Trigger to Start the Current Flow

10. From the drop-down list, select when to run the flow—to run now or to run manually. Click **Options** to open the Trigger Options box on which you can select a trigger to start the flow, such as a specific date, time, and recurrence. Click **OK**. When prompted, enter a user ID and password for the scheduling server. A message is displayed confirming the successful scheduling of the job.

For information about the functions that can be performed from SAS Management Console, and options that can be specified when scheduling flows, see the online Help for the Schedule Manager plug-in to SAS Management Console and the **SAS Management Console: User's Guide**.

**Redeploy a Job**

If you update a job that you already deployed, you must redeploy it so that the latest version of the job is scheduled. For example, if a table is deleted from a job, then the job must be deployed again.

To redeploy a job, perform the following steps:

1. In the **IT Data Marts** tree of SAS IT Resource Management, navigate to the job that you want to redeploy. You can select multiple jobs within an IT data mart to redeploy.

2. Right-click the job and from the menu that is displayed, select **Scheduling ➤ Redeploy**.

The Redeploy a job for scheduling dialog box appears.

- Under Windows or UNIX operating environments, the following dialog box appears.

**Figure 14.10** Redeploying a Windows or UNIX Job

You can choose to preserve the deployed value of the job's metadata. However, you can change where the job is redeployed by changing the deployment directory and its location. If you define a new deployment directory in the Windows or UNIX operating environments, the new deployment directory will contain the SAS source code for the job. If you change the value in the **Batch**
Server field, make sure that the server that you specify is under the Foundation repository.

A message displays the name of the jobs that will be redeployed. These jobs are all the deployed jobs that are contained on the server that you are connected to. Click Yes to redeploy them.

- Under the z/OS operating environment, you can also choose to preserve the deployed value of the job's metadata. If you want to change where the job is redeployed, select a new value for the Deployment Directory field. If you define a new deployment directory in the z/OS operating environment, the new directory contains the SAS source code for the job. It also contains a file of the generalized JCL that can run the job. You can modify this generalized file of JCL according to the requirements of your site.

The following dialog box appears.

Figure 14.11  Redeploying a z/OS Job

3. A message appears that lists the jobs that were redeployed. If a job was not redeployed, an error message appears.

Redeploy All Jobs on the Server

If you made changes that affect all jobs that are deployed on the server, you must redeploy them so that the latest versions of the jobs are scheduled. For example, if the computing environment of the server where the deployed jobs are stored changes, the jobs must be deployed again.

Note: The code that is generated for a job contains the credentials of the person who created the job. If those credentials have changed, and a deployed job contains
outdated user credentials, the deployed job will fail to execute. In that case, redeploy the job with the appropriate credentials.

To redeploy jobs, perform the following steps:

1. From the menu bar of the SAS IT Resource Management client, select **Tools ➔ Redeploy Jobs for Scheduling**.

   ![Tools Menu of SAS IT Resource Management](image)

   A message then displays the names of the jobs that will be redeployed. These jobs are all the deployed jobs that are contained on the server that you are connected to. Click **Yes** to redeploy them.

2. Under the z/OS operating environment, you can choose to preserve the deployed value of the job's metadata. If you want to change where the job is redeployed, select a new value for the **Deployment Directory** field. If you define a new deployment directory in the z/OS operating environment, the new directory will contain the SAS source code for the job. It will also contain a file of the generalized JCL that can run the job. You can modify this generalized file of JCL according to the requirements of your site. Code is generated for the jobs that you redeployed. The code is saved to the deployment directory of the SAS Application Server that is used to deploy jobs.

---

**Running an “Overall” Job with the %RMRUNETL Macro**

You can choose to run your staging, aggregation, information map, and reporting jobs within a single processing macro. The staging job is run first. Then the aggregation jobs are run in parallel using Multi-Processing (MP) Connect. Those jobs are followed by the information map jobs that are also run in parallel. Lastly, the report jobs are run in parallel. If the staging job fails, the aggregation, information map, and report jobs are not
run. After each job completes, the SAS log is examined by the program. The completion status of the job (Success, Warning, or Error) is sent by email to the specified recipient. If the log displays warnings or errors, the email includes the text of the error or warning along with the corresponding line number in the log file.

Note: To see the results of the job in the tree view, right-click in the left panel and select **Refresh**.

For information about how to set up the %RMRUNETL macro that provides this ability, see “%RMRUNETL” on page 615.

Note: In the left pane, locate the job that you want to run. Right-click the job’s **Properties** to specify the scheduling details and authorization requirements of the job that you want to run. If you are running a job in a clustered metadata server environment, make sure that the **Enable optional metadata macro variables** option is set to **No**. (In most cases, this option is already set to **No**.)

---

**Allocating the Raw Data File Externally**

When a job is deployed, the file that was entered in the Raw data file or directory field of the Staging Parameters tab of the staging transformation (or in the Adapter Setup wizard) appears in the generated code as part of a macro assignment (a **%let** statement). In a production environment, it is possible that the raw data file changes from day to day. The raw data file might also need to be allocated externally, such as in the JCL of a z/OS batch job.

Note: For adapters that accept files or directories as input, the code is **%LET RAWDATA=raw-data-assignment**.

If the raw data file or directory is allocated externally, it is used in preference over the location referred to in the **%let** statement. For completeness, the **%let** statement can be removed, but this is not necessary.

**CAUTION:** Do not remove or comment out the **%let** statement for adapters that do not have a raw data file or a directory. For some adapters such as the SAP ERP, SAS EV, MS SCOM, HP Reporter, VMware Data Acquisition, and VMware vCenter adapters, the **%let** statement is present in the code. However, that statement does not specify a file or a directory. Instead, the **%let** statement points to the libref of the SAS library that is associated with the raw data. (The location of the input library typically remains fixed, unlike the name or location of individual raw data files.)

If the job is redeployed, the raw data assignment is reset and needs to be removed again, unless the raw data parameter in the Staging Parameters tab is removed beforehand.

When allocating the raw data file externally for adapters that are based on MXG, the correct fileref must be used. (On z/OS, the fileref is assigned with a DD JCL statement.)

For adapters that are not based on MXG, use a fileref of RAWDATA. For adapters that are based on MXG, use the filerefs in the following table:

<table>
<thead>
<tr>
<th>Table 14.1</th>
<th>Table of Filerefs for Adapters That Are Based on MXG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter</td>
<td>Fileref</td>
</tr>
<tr>
<td>IBM DCOLLECT</td>
<td>DCOLLECT</td>
</tr>
<tr>
<td>Adapter</td>
<td>Fileref</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>IBM EREP</td>
<td>EREP</td>
</tr>
<tr>
<td>BMC Mainview IMS</td>
<td>IMSLOG</td>
</tr>
<tr>
<td>DT Perf Sentry with MXG</td>
<td>NTSMF</td>
</tr>
<tr>
<td>IBM SMF</td>
<td>SMF</td>
</tr>
<tr>
<td>ASG TMON2CIC</td>
<td>MONICICS</td>
</tr>
<tr>
<td>ASG TMONDB2</td>
<td>TMDBIN</td>
</tr>
<tr>
<td>ASG TMONDB2 V5</td>
<td>TMD2BIN</td>
</tr>
<tr>
<td>CA TMS</td>
<td>TMC</td>
</tr>
<tr>
<td>IBM TPF</td>
<td>TPFIN</td>
</tr>
<tr>
<td>IBM VMMON</td>
<td>MWINPUT</td>
</tr>
</tbody>
</table>
Part 3

Appendixes

Appendix 1
SAS IT Resource Management Components .......................... 391

Appendix 2
Data Sources Supported by SAS IT Resource Management Adapters .......................................................... 395

Appendix 3
Staging Parameters .......................................................... 477

Appendix 4
Jobs That the Adapter Setup and the Add Domain Category Wizards Create .................................................. 525

Appendix 5
Duplicate-Data Checking .................................................... 537

Appendix 6
Data Model ........................................................................ 547

Appendix 7
Naming Standards ............................................................. 573

Appendix 8
Macros ............................................................................. 581

Appendix 9
Best Practices and Troubleshooting Tips .............................. 639

Appendix 10
Method for Overriding Locations at Execution Time ............ 665

Appendix 11
Statistics ........................................................................... 681

Appendix 12
Open-Source System Management Tools ........................... 683

Appendix 13
Deploying Jobs in Batch Mode .......................................... 691
Appendix 1
SAS IT Resource Management Components

Server Tier Components

SAS IT Resource Management Server for the 64-bit-enabled AIX, HP-UX on Itanium, Solaris and Solaris for x64, Linux for x64, Windows for x64 and z/OS operating environments uses the following components:

• Base SAS
• SAS IT Resource Management Server
• MXG from Barry Merrill (z/OS only and included in the SAS IT Resource Management license)
• Demand Technology Performance Sentry (Windows for x64)
• SAS Metadata Server
• SAS Data Integration Studio
• SAS Enterprise BI Server
• SAS/SHARE
• SAS/ETS
• SAS/STAT
• SAS High-Performance Forecasting procedures
• SAS/ACCESS Interface to ODBC (for 64-bit-enabled AIX, HP-UX on Itanium, Linux for x64, Solaris and Solaris for x64, and Windows for x64)
• SAS/ACCESS Interface to DB2
• SAS/ACCESS Interface to Oracle
• SAS/ACCESS Interface to PC Files

SAS Visual Analytics server for Linux for x64 and Windows for x64 for non-distributed mode only operating environments uses the following components:

• SAS LASR Analytic Server
• SAS Visual Analytics server

Note: SAS IT Resource Management does not include the Explorer component of SAS Visual Analytics.
Middle-Tier Components

Note: Starting with SAS IT Resource Management 3.6, support is provided for a clustered middle tier. For information, see “About the Clustered Middle Tier” on page 393.

SAS IT Resource Management web tier for the 64-bit-enabled AIX, HP-UX on Itanium, 64-bit-enabled Solaris, Solaris for x64, Linux for x64, and Windows for x64 operating environments uses the following components:

• SAS IT Resource Management Report Center
• SAS Environment Manager
• SAS Web report Studio
• SAS Information Delivery Portal web application
• SAS BI Dashboard
• SAS BI Portlets
• SAS Web Infrastructure Platform
• SAS Web Application Server

SAS Visual Analytics middle tier for Linux for x64 and Windows for x64 for non-distributed mode only operating environments uses the following components:

• SAS Visual Data Builder
• SAS Visual Analytics Administrator
• SAS Visual Analytics Designer
• SAS Visual Analytics Hub
• SAS Visual Analytics Report Viewer

Note: SAS IT Resource Management does not include the Explorer component of SAS Visual Analytics.

Client Tier Components

SAS IT Resource Management SAS client for the Windows 32-bit and Windows for x64 operating environments uses the following components:

• SAS IT Resource Management client
• SAS Management Console (64-bit-enabled AIX, HP-UX on Itanium, Linux for x64, 64-bit-enabled Solaris, Solaris for x64, and Windows for x64
• SAS Data Integration Studio
• SAS Enterprise Guide
• SAS Add-In for Microsoft Office
• SAS Information Map Studio
• SAS OLAP Cube Studio
About the Clustered Middle Tier

Starting with ITRM Report Center 3.6, a clustered middle tier is supported. Servers can be clustered on the same physical machine or across multiple physical machines. A clustered middle tier provides high availability, load balancing, high performance, and scalability. For more information, see SAS 9.4 Intelligence Platform: Middle-Tier Administration Guide

Customers can cluster either vertically or horizontally.

- Vertical clustering provides cluster nodes on the same machine. The SAS Deployment Wizard enables you to specify the number of cluster nodes.

- Horizontal clustering provides a cluster node on multiple machines. You can deploy a middle-tier cluster node at any time. (A middle-tier cluster node is an optional machine that can be specified in your plan file.)

Separate logging facilities for each application node are provided for both vertical and horizontal clusters. The log file for each node is kept inside a separate folder under the configured log directory. The folder name is suffixed with the number of nodes available in the cluster such as SASServer10_1, SASServer10_5, or SASServer10_n.

SAS relies on session affinity. Therefore, every request from a client is directed to the same instance of application server that was used when the client logged on. If this node goes down, then the session of the logged-in user is replicated on another node that is available in the cluster. This feature increases the high availability of the ITRM Report Center. However, you might lose your work if your logged-in node goes down in the following circumstances:

- when you are in the process of creating, viewing, editing, or deleting an object, such as a gallery, a folder, or an album

- when you are in the process of opening an object, such as a gallery, a resource, or an album

- when you are accessing a watch list

In such cases, a message appears in the ITRM Report Center application that advises you to redo the operation.

ITRM Report Center maintains a cache of all report objects in the middle tier. This cache is replicated across all nodes of the clustered middle tier. If your login action connects to a node for which cache is being replicated, the following message appears: The ITRM Report Center cache build is in progress. Please log off and try again later. Contact your ITRM Report Center Administrator for more information. When the replication of the cache completes, you can connect to that node again.

Note: If multiple requests are being processed by a node and that node goes down, ITRM Report Center might display more than one error message.
Appendix 2
Data Sources Supported by SAS IT Resource Management Adapters

Data Sources Supported by SAS IT Resource Management Adapters ........ 397
Supported Adapters ........................................................................ 397
MXG Adapters — Accessing Raw Data ........................................... 405
  About Accessing MXG Raw Data ................................................. 405
  Processing SMF Records in UNIX and Windows Environments ......... 406
Amazon CloudWatch — Accessing Raw Data ................................... 407
  Preparing Amazon CloudWatch Data for SAS IT Resource Management .... 407
  Extracting Data from Amazon CloudWatch ................................ 407
  How to Run the Batch Script Interactively .................................. 408
  Notes about Amazon CloudWatch ............................................. 409
BMC Perf Mgr — Accessing Raw Data .......................................... 410
  Preparing BMC Perf Mgr Data for SAS IT Resource Management ....... 410
  Extracting Data from BMC Perf Mgr ......................................... 410
  Notes about BMC Perf Mgr ..................................................... 411
CSV Adapter — Accessing Raw Data ............................................. 412
  Preparing CSV Data for SAS IT Resource Management ................ 412
  Accessing CSV Files That Contain Data Encoded in UTF-8 .............. 414
DT Perf Sentry — Accessing Raw Data ........................................... 414
  Preparing DT Perf Sentry Data for SAS IT Resource Management ....... 414
  Preparing DT Perf Sentry Data for Processing on z/OS ................... 415
  Extracting Data from DT Perf Sentry ....................................... 415
  Notes about DT Perf Sentry .................................................. 416
Ganglia — Accessing Raw Data ................................................... 416
  Preparing Ganglia Data for SAS IT Resource Management ............... 416
  Preparing the Ganglia Adapter for Staging .................................. 417
  How to Turn On the XCMD Option ......................................... 417
  Notes about the SSH Host Command ...................................... 418
HP Perf Agent — Accessing Raw Data .......................................... 419
  Preparing HP Perf Agent Data for Staging ................................. 419
  Extracting Data from HP Perf Agent ....................................... 419
  Example 1 .......................................................................... 420
  Example 2 .......................................................................... 421
RRDtool — Accessing Raw Data .................................................. 421
  Preparing RRDtool Data for SAS IT Resource Management ............. 421
  Preparing the RRDtool Adapter for Staging ................................. 422
  Working with the SSH Host Command ................................... 422
SAR — Accessing Raw Data ........................................ 422
  Preparing SAR Data for SAS IT Resource Management ........ 422
  Extracting Data from SAR ...................................... 423
  Using the sar Command ........................................ 423

SNMP — Accessing Raw Data .................................... 424
  Sources of SNMP Data ......................................... 424
  Extracting Data By Using HP NNM Tools ....................... 425
  Extracting Data By Using the Round-Robin Database Tool (RRDTOOL) ........................................ 426
  Notes about the SNMPWALK Command ......................... 427
  Working with the SSH Host Command .......................... 428
  Working with the ITMS_SNMP_DeviceType Lookup Table ........ 428
  Working with Management Information Base (MIB)
    Definitions for SNMP Staged Tables ......................... 429

Web Log — Accessing Raw Data ................................ 430
  Preparing Web Log Data for SAS IT Resource Management .... 430

Database Adapters: HP Reporter, MS SCOM, SAP ERP, SAS EV, and VMware 431
  What Are the Database Adapters? ............................. 431
  Preparing a Database Adapter for Staging .................... 431
  Duplicate-Data Checking for Database Adapters ............... 432

HP Reporter - Accessing Data .................................. 433

MS SCOM - Accessing Data ..................................... 436
  About Accessing MS SCOM Data ................................ 436

SAP ERP - Accessing Data ...................................... 437
  Preparing SAP ERP Data for SAS IT Resource Management .... 437
  Install the Components of ITM Adapter for SAP ERP ......... 437
  Establish Communications between SAS and SAP ............... 437
  Create SAS Metadata Objects Using SAS Management Console 438
  Configure Sample Data Extraction Jobs Using SAS Data Integration Studio ....................... 438

SAS Environment Manager (SAS EV) — Accessing Data ...... 440
  About the SAS Environment Manager Adapter ................. 440
  Preparing SAS Environment Manager Data (Data Marts) for
    SAS IT Resource Management ................................ 440
  How to Specify the Raw Data Library for the SAS
    Environment Manager Adapter ............................... 441

Working with IBM SMF Custom Tables ........................... 447
  IBM SMF Custom Tables ....................................... 447
  How to Load IBM SMF Data into User-Defined Tables ........ 448

Working with MXG Code to Stage Data .......................... 450
  About MXG Adapters ......................................... 450
  IMACWORK and RMFINTRV Customizations Relevant to
    the RMF Domain Category of the SMF Adapter .............. 451
  IMACSHFT Customizations Relevant to All Domain
    Categories of the SMF Adapter ............................. 451
  Customizations Relevant to the Jobs Domain Category of the SMF Adapter ....................... 452
  Customizations Relevant to the CICS and DB2 Domain
    Categories of the SMF Adapter ............................. 452
  Customizations Relevant to the Jobs Domain Category of the CA TMS Adapter ....................... 453
  Customizations Relevant to the ASG TMON2CIC Adapter ....... 454
  Customizations Relevant to the ASG TMONDB2 and ASG
    TMONDB2 V5 Adapters ....................................... 454
  Specify Spin Libraries for ASG TMON2CIC and IBM SMF .......... 455
SAS IT Resource Management supports adapters that enable you to load raw data about IT resources from many data sources. It converts that raw data into a standard form that facilitates aggregation and reporting on your IT resources. These adapters extract data from raw data files and load that data into staged tables in the IT data mart.

The following table lists each SAS IT Resource Management adapter and identifies the software versions of the raw data sources that were used to verify each of them. The remainder of this appendix provides information about how to prepare the raw data source for use by SAS IT Resource Management.

**Note:** The specific software versions of the raw data sources in this table have been used to verify each SAS IT Resource Management adapter. This information is not an exclusive list of all data source versions that are supported. Earlier versions of some data source software might be supported and future releases of some data source software might be compatible and supported by adapters for SAS IT Resource Management. For information about supporting a data source version that is not included in the following table, contact your SAS Installation Representative or on-site SAS support personnel.

The following topics provide information about how to access raw data for each adapter. These topics might also provide information about how adapters process that data, when those processes differ from the standard approach used by SAS IT Resource Management.

---

**Data Sources Supported by SAS IT Resource Management Adapters**

SAS IT Resource Management supports adapters that enable you to load raw data about IT resources from many data sources. It converts that raw data into a standard form that facilitates aggregation and reporting on your IT resources. These adapters extract data from raw data files and load that data into staged tables in the IT data mart.

The following table lists each SAS IT Resource Management adapter and identifies the software versions of the raw data sources that were used to verify each of them. The remainder of this appendix provides information about how to prepare the raw data source for use by SAS IT Resource Management.

**Note:** The specific software versions of the raw data sources in this table have been used to verify each SAS IT Resource Management adapter. This information is not an exclusive list of all data source versions that are supported. Earlier versions of some data source software might be supported and future releases of some data source software might be compatible and supported by adapters for SAS IT Resource Management. For information about supporting a data source version that is not included in the following table, contact your SAS Installation Representative or on-site SAS support personnel.

The following topics provide information about how to access raw data for each adapter. These topics might also provide information about how adapters process that data, when those processes differ from the standard approach used by SAS IT Resource Management.

---

**Supported Adapters**

The name of an adapter represents the data source from which SAS IT Resource Management gathers raw data.

All SAS IT Resource Management adapters are supported on all SAS IT Resource Management operating environments unless there is a technical limitation that is associated with the raw data (log file) sources. For example, the raw data might reside on a device that is not compatible with the architecture of the host system on which the SAS IT Resource Management server is installed. In that case, that raw data file might not be usable as input unless further processing is performed.
### TIP

The log records from the TMON2CIC and TMONDB2 adapters are typically compressed. If you want to process data from those input sources on platforms other than z/OS, de-compress the data before staging it.

### Table A2.1 Table of Supported Adapters

<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon CloudWatch</td>
<td>Amazon CloudWatch is a monitoring service for AWS cloud resources and for the applications that run on AWS. Amazon CloudWatch can collect and track metrics, collect and monitor log files, and set alarms. Amazon CloudWatch can monitor AWS resources such as Amazon EC2 instances, Amazon S3 and EBS volumes, and Amazon RDS DB instances. It can also monitor custom metrics generated by applications and services as well as any log files that are generated.</td>
<td>SAS IT Resource Management 3.8 supports data collection for these AWS services only: EC2, EBS, RDS, and S3.</td>
</tr>
<tr>
<td>ASG TMON2CIC</td>
<td>ASG TMON for CICS TS for z/OS (formerly from Landmark) 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 ASG TMONCICS or as a subtype of SMF.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>ASG TMONDB2 and ASG TMONDB2 V5</td>
<td>ASG TMON for DB2 (formerly from Landmark) works with the SQL Analyzer to manage DB2 applications and critical DB2 resources by providing a single view of DB2 data-sharing group performance. This adapter tracks DB2 buffer pools, lock contention and serialized resource usage, transaction statistics from ASG TMON for CICS to ASG TMON for DB2, and dynamic and static SQL calls. This adapter 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. Note: For V4 and earlier versions, use ASG TMONDB2. For higher versions, use ASG TMONDB2 V5.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
<td>Latest Verified Version of the Data Source</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>BMC Mainview IMS</td>
<td>BMC Mainview for IMS (formerly IMF) supplies transaction information such as CPU usage, number of I/Os, and response time. When you collect BMC Mainview for IMS data instead of IBM IMS data, BMC recommends that you collect a duration of one hour of consistently high activity. The hour should start at the beginning and end at the end of an RMF interval.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>BMC Perf Mgr</td>
<td>BMC Performance Manager for Servers (formerly BMC PATROL) collects UNIX and Windows enterprise system management data.</td>
<td>v3</td>
</tr>
<tr>
<td>CA TMS</td>
<td>The Computer Associates CA 1 Tape Management product (formerly TMS) controls and protects tape data sets and volumes in z/OS environments.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>Comma Separated Values (CSV)</td>
<td>The Comma Separated Values adapter is a SAS product that reads any character delimited file.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>DT Perf Sentry</td>
<td>Demand Technology Performance Sentry (formerly NTSMF) collects data from Windows systems and for Windows server applications such as Exchange, SQL Server, and IIS. SAS IT Resource Management also supports a separate Demand Technology Performance Sentry adapter that is z/OS based. The Demand Technology Performance Sentry with MXG adapter that is z/OS based is for raw data sources that are supported through MXG.</td>
<td>v4.0</td>
</tr>
<tr>
<td>DT Perf Sentry with MXG</td>
<td>Demand Technology Performance Sentry (formerly NTSMF) with MXG collects data from Windows systems and for Windows server applications such as Exchange, SQL Server, and IIS. (SAS IT Resource Management also supports a separate Demand Tech Perf Sentry adapter that is not MXG based.)</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
<td>Latest Verified Version of the Data Source</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Ganglia</td>
<td>Ganglia is a scalable distributed monitoring system for high-performance computing systems such as clusters and grids.</td>
<td>3.7.1</td>
</tr>
<tr>
<td>HP Perf Agent</td>
<td>HP Performance Agent (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.</td>
<td>v11</td>
</tr>
<tr>
<td>HP Reporter</td>
<td>HP Reporter software (formerly OpenView Reporter) captures HP Performance Agent measurement data that is stored in a relational database via SAS/ACCESS to Oracle or ODBC.</td>
<td>v4.0</td>
</tr>
</tbody>
</table>
| IBM AS400    | IBM OS/400 Collection Services  
*Note: The staging code that is required for the IBM AS400 data source is not automated by a SAS IT Resource Management adapter. Instead, SAS IT Resource Management supplies a User-written Staging transformation and templates that contain table and column metadata for this adapter for use with user-written staging code.* | MXG 34.08* |
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
</table>
| IBM DCOLLECT | IBM DFSMS Data Collection Facility 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: IBM DCOLLECT provides information and statistics for volumes that are managed by DFSMSHsm (ML0 and ML1).  
  - tape capacity planning: IBM DCOLLECT provides statistics for tapes that are managed by DFSMSHsm.  
• SMS configuration information | MXG 34.08* |
| IBM EREP     | IBM Environmental Record Editing and Printing Program processes the error records from the MVS, VM, and VSE operating systems to produce formatted reports. Depending on the requested report, these IBM EREP reports can show the status of the entire installation, an I/O subsystem, or an individual device. IBM 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. | MXG 34.08* |
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
</table>
| IBM IMS      | IBM Information Management System (IMS) is the transaction and hierarchical database management system from IBM.  
  Note: The staging code that is required for the IBM IMS data source is not automated by a SAS IT Resource Management adapter. Instead, SAS IT Resource Management supplies a User-written Staging transformation and templates that contain table and column metadata for this adapter for use with user-written staging code. | MXG 34.08* |
| IBM SMF      | 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. IBM RMF is the IBM strategic product for z/OS performance measurement and management. IBM RMF is the base product that collects performance data for z/OS and Sysplex environments to monitor system performance. Because IBM RMF data is a subtype of IBM SMF data, the IBM SMF adapter can be used with IBM RMF data without requiring additional customizations. | MXG 34.08* |
<p>| IBM TPF      | The IBM Transaction Processing Facility operating system works with application programs to process transactions in a real-time environment. The IBM TPF system is designed for businesses and organizations that have large networks and high volumes of online transactions. | MXG 34.08* |</p>
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM VMMON</td>
<td>IBM VM Monitor Collection product collects performance information that is associated with VM, including measurements for user activity, processor storage, I/O, and applications.</td>
<td>MXG 34.08*</td>
</tr>
<tr>
<td>MS SCOM</td>
<td>Microsoft System Center Operations Manager monitors Windows systems, Microsoft software, and applications to provide a view of the health of an organization’s Windows environment.</td>
<td>System Center Management Pack for Windows Server Operating System v2012 AWS Management Pack for Microsoft System Center Operations Manager (SCOM) v2012</td>
</tr>
<tr>
<td>RRDtool</td>
<td>RRDtool is the OpenSource industry standard, high-performance system for the data logging and graphing of time series data. It compiles on Microsoft Windows and many Linux and UNIX platforms.</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
| SAP ERP      | Enterprise Resource Planning (ERP) Software from SAP (formerly SAP R/3), via the SAS IT Management Adapter for SAP, collects SAP ERP and SAP Business Warehouse (BW) workload performance measurements.  
  - For SAP ERP, 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. | SAP ERP(ECC): v6.0  
SAP BW(BI): v7.0 |
| 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. | Dependent on the operating system.  
For information about specific operation system release versions, see “Accessing Raw Data for SAR” in Appendix 2, “Data Sources Supported by SAS IT Resource Management Adapters,” in the SAS IT Resource Management 3.8: Administrator’s Guide. |
<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
<th>Latest Verified Version of the Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS Environment Manager</td>
<td>SAS Environment Manager (SAS EV) is a web-based application that collects information about SAS resources as well as the events and alerts that are logged in the SAS environment. The SAS Environment Manager adapter supports the Agent Collected Metrics (ACM) and Audit and Performance Management (APM) data marts.</td>
<td>v2.5</td>
</tr>
<tr>
<td>SNMP</td>
<td>Simple Network Management Protocol is a component of the Internet Protocol Suite. The SNMP adapter also supports gathering SNMP data from round-robin databases (RRDs) that are used in many network management tools.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>VMware vCenter</td>
<td>VMware vCenter Server is an operational console for VMware and includes the VMware vCenter database that serves as the raw data source for this SAS IT Resource Management adapter. The vCenter database contains VMware performance and utilization measurements for both the virtual machines and the physical servers on which they run, including detailed CPU, memory, storage, and I/O metrics. The vCenter relational database supports Oracle, Microsoft SQL Server or, for VMware vCenter releases prior to 5.5, an IBM DB2 database. For the VMWare vCenter Server Appliance on Linux, the relational databases supported are Oracle for the external database or PostgreSQL for the embedded database. It is accessed by SAS/ACCESS to Oracle or ODBC. Note: Hosting the vCenter database in IBM DB2 is no longer an option for VMware vCenter Server 5.5. For more information, see <a href="https://www.vmware.com/support/vsphere5/doc/vsphere-esx-vcenter-server-55-release-notes.html">https://www.vmware.com/support/vsphere5/doc/vsphere-esx-vcenter-server-55-release-notes.html</a>.</td>
<td>v6.5</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
<td>Latest Verified Version of the Data Source</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
</tbody>
</table>
| VMware Data Acquisition | VMware Data Acquisition is a transformation that can extract topology and configuration information from the VMware vCenter database more frequently than once a day. The vCenter relational database supports Oracle, Microsoft SQL Server or, for VMware vCenter releases prior to 5.5, an IBM DB2 database. For the VMware vCenter Server Appliance on Linux, the relational databases supported are Oracle for the external database or PostgreSQL for the embedded database. It is accessed by SAS/ACCESS to Oracle or ODBC.  
<Note>: This is not an adapter. However, a staging transformation is available for this source.                                                                                       | v6.5                                       |
| Web Log               | The Web Server Log adapter reads and analyzes web logs that conform to the Common and W3C Extended Log Formats (CLF and ELF.)                                                                                       | Not applicable                            |

* SAS IT Resource Management uses MXG for this adapter.

<Note>: The specific software versions of the raw data sources in this table have been used to verify each SAS IT Resource Management adapter. This information is not an exclusive list of all data source versions that are supported. Earlier versions of some data source software might be supported. Future releases of some data source software might be compatible and supported by adapters for SAS IT Resource Management. For information about supporting a data source version that is not included in the previous table, contact your SAS Installation Representative or on-site SAS support personnel.

For data sources (and for raw data sources) that are user-written, staging code is supported by the wizards of SAS Data Integration Studio, and the transformations that are supplied by SAS IT Resource Management. The New Table wizard of SAS Data Integration Studio can create the transformations that can stage raw data from any input source.

---

**MXG Adapters — Accessing Raw Data**

**About Accessing MXG Raw Data**

MXG creates SAS data sets for each of the data sources that it supports. These data sets can be accessed directly by the adapter staging code.
Note: Starting with SAS SAS IT Resource Management 3.5, the IT Resource Management staged tables and columns for adapters based on MXG are the same as the MXG data set and variable names on which they are based. They no longer use the former SAS IT Resource Management format of seven characters, and an eighth character to represent the statistic in the summarization levels.

MXG supports the following data sources:

- ASG TMON2CIC
- ASG TMONDB2
- ASG TMONDB2 V5
- BMC Mainview IMS
- CA TMS
- DT Perf Sentry with MXG
- IBM DCOLLECT
- IBM EREP
- IBM SMF
- IBM TPF
- IBM VMMON

For information about the IBM SMF performance areas that are collected by MXG, see “SMF Adapter - RMF Domain Category” on page 557 and “SMF Adapter - Jobs, TSO, and OMVS Domain Categories” on page 558.

Note: For information about working with IBM SMF Custom Tables, see “Working with IBM SMF Custom Tables” on page 447. For information about working with MXG Code to Stage Data, see “Working with MXG Code to Stage Data” on page 450.

Processing SMF Records in UNIX and Windows Environments

In UNIX or Windows SAS IT Resource Management server environments, SMF raw records can remain in the z/OS environment. The staging transformation can read these records directly using the SAS FTP access method.

Alternatively, FTP can be used to separately download these SMF records to an ASCII environment. In this situation, the local SMF filename should be specified in the SMF staging transformation instead of FTP. In a production environment, this download might be done along with the daily, operational SMF gathering process, which typically runs overnight. To achieve this, the FTP batch job should override the DCB parameters for the input SMF data with RECFM=U and BLKSIZE=32760. For more information, see the INSTALL member of the MXG source library (MXG.SRCLIB). For information about how to access that library, see “About MXG Adapters”.
Amazon CloudWatch — Accessing Raw Data

Preparing Amazon CloudWatch Data for SAS IT Resource Management

Amazon CloudWatch is a monitoring service for Amazon Web Services (AWS) cloud resources and the applications that you run on AWS. It collects and tracks metrics about your resources and applications and sends notifications when alarms are triggered. This information is stored in a repository from which the metrics can be retrieved.

The Amazon CloudWatch adapter that SAS IT Resource Management provides consists of these components:

• The AWS batch script fetches performance metrics data from the AWS CloudWatch repository and stores the data in text files. A separate text file is created for each metric.

• The Amazon CloudWatch staging transformation code reads data from the text files and writes it to a SAS data set. Supplied templates create the staged tables and variables that are needed by SAS IT Resource Management.

Note: The Adapter Setup wizard can be used to specify the Amazon CloudWatch adapter. The wizard produces a detail aggregation table in addition to the Amazon CloudWatch staging transformation.

Extracting Data from Amazon CloudWatch

Use a Windows batch script to fetch the data from the AWS CloudWatch repository. Here are the prerequisites for using the batch script:

• Windows PowerShell must be installed on your machine. (Windows PowerShell is a task automation and configuration management framework from Microsoft. It consists of a command-line shell and associated scripting language built on the .NET Framework.)

• AWS CLI software must be installed on a Windows machine (for example, the SAS IT Resource Management client) where the script runs. This installation requirement is necessary because the batch script uses AWS CLI commands to fetch the data from the AWS CloudWatch repository. The latest version of the AWS CLI software can be found here: http://aws.amazon.com/cli/. (AWS Command Line Interface (CLI) is a unified tool for managing your AWS services.)

Note: The machine that hosts the batch script must be available when the batch script is scheduled to run.

• The Windows environment variable, AWS_CLI_HOME, must be configured so that it points to the AWS CLI installation directory.

• The IAM user must be specified. This user fetches the data from the AWS CloudWatch repository. Therefore, it should have the access and permissions necessary to use the AWS services and to fetch Amazon CloudWatch metrics.

• The AWS Access Key ID and AWS Secret Access Key must be configured as the default profile. These fields are credentials for the account of the IAM user. They should be saved at this location: %USERPROFILE%/.aws/credentials.
Figure A2.1  Credentials for IAM User

```
[default]
aws_access_key_id=xxxxxxxxxxxxx
aws_secret_access_key=xxxxxxxx
```

- The raw data files are generated at this location: `%USERPROFILE%/raw_data_files`.
- The batch script can be found at this location: `<SAS_INSTALL_DIR>/SASFoundation/9.4/itmsmvadat/sasmisc/AWSDATA.bat`.
- The batch script, AWSDATA.bat, can be run as follows:
  - For day-to-day operations, without parameters, to fetch data from yesterday’s data, that is (today -1).
  - Interactively, with one parameter (`–h`) to fetch data from the prior hour.
  - Interactively, with `start_date` and `end_date` parameters to fetch data from the start date through the end date. (The format for these dates is `yyyy-mm-dd`.)

**Tip**  AWS CloudWatch stores data for only the past 14 days. Therefore, the start date cannot be older than 14 days from the current date.

By default, AWS CloudWatch data is available in 5-minute periods. In the following example, AWS data from October 15, 2015 through October 19, 2015 is collected:

```
C:\users\AWSDATA.bat 2015-10-15 2015-10-19
```

The maximum number of data points (observations) that can be returned from a single AWS CloudWatch GetMetricStatistics request is 1,440. Therefore, using the default settings of 5-minute intervals, 288 observations can be returned from a request that is run once a day.

**Note:** If you choose 1–minute intervals for your data, more than 1,440 observations could be returned. In this case, AWS CloudWatch posts an error message. To resolve this problem, schedule your batch script to run more frequently during the day. Make sure that the output files from these runs are specified so that they do not overwrite one another.

**How to Run the Batch Script Interactively**

To support backloading data or testing, you might want to run the batch script interactively.

**Note:** The batch script can run only on a Windows machine. Therefore, if the SAS IT Resource Management server is on Windows, the script can run on the server itself. However, if the SAS IT Resource Management server is on a different platform, copy the batch script to a Windows machine (for example, the SAS IT Resource Management client machine).

Install the AWS CLI on that machine and set the credential file with the AWS access parameters for the AWS account. You can make the following changes to the batch script:
Gather Data for a Specific Period of Time

1. Specify one date to fetch data for that specified day.
2. Specify two dates to fetch data for the specified start date through the specified end date.

*Note:* Use this format for dates: `yyyy-mm-dd`.

Change the Location Where the Raw Data Files Are Generated

By default, raw data files are generated at this location: `%USERPROFILE%\raw_data_files` on the Windows machine from which the batch script is run. To change the location, perform the following steps:

1. Locate this code in the batch script:
   ```powershell
   set datapath=%USERPROFILE%\raw_data_files
   ```
2. Change the value of the `datapath` field to the desired location (for example, `set datapath=\networkpath\shared_location`).

The raw data files are generated at this location: `\networkpath\shared_location\raw_data_files`.

Change the Value of the `-h` Parameter

By default, the `-h` parameter fetches data for last 3,600 seconds, the prior hour.

1. Locate this code in the batch script:
   ```powershell
   get-date((get-date).ToUniversalTime().addSeconds(-3600))
   ```
2. Change the value `-3600` to the new value. This value is the number of seconds between the current datetime and the required datetime. The negative sign means that the system needs the previous datetime. For example, `-18000` fetches data for the previous five hours; `-86400` fetches data for the previous day.

Notes about Amazon CloudWatch

The AWS Management Pack enables Microsoft System Center Operations Manager (MS SCOM) to access your AWS resources (such as instances and volumes). IT can then collect performance data and monitor your AWS resources. The AWS Management Pack is an extension to SCOM.

Preparing BMC Perf Mgr Data for SAS IT Resource Management

BMC Performance Manager for Servers data is collected by BMC Performance Manager, which was formerly BMC Patrol. BMC Perf Mgr data can be collected from the following operating systems:

- Windows NT
- UNIX
- SAP ERP

The BMC Perf Mgr Agent maintains parameter history data about the systems that it monitors. For more information, see your BMC Perf Mgr documentation.

BMC Perf Mgr enables each metric to be sampled at its own interval. This interval can be set by the BMC Perf Mgr administrator. SAS IT Resource Management requires that the sample rates be specified on minute boundaries. (However, you can also specify a sample rate of 30 seconds.)

SAS IT Resource Management provides support for three Knowledge Modules:

- Windows NT Knowledge Module
- UNIX Knowledge Module
- SAP ERP Knowledge Module Version 2.2

For information about the performance areas that are collected by BMC Perf Mgr, see “BMC Perf Mgr Adapter - BMC Perf Mgr Domain Category” on page 551.

Extracting Data from BMC Perf Mgr

A raw data file of BMC Perf Mgr history data can be generated in two ways:

- extracting data from the BMC Perf Mgr History Knowledge Module

  The history knowledge module organizes the collection of the history data and ensures that it is sent to a central server from which it can be extracted. For more information about this method, see the documentation from BMC Perf Mgr about the History Loader Knowledge Module.

- extracting data by using the \texttt{dump_hist.exe} command

  This command extracts the same history data that is extracted from the History Knowledge Module. However, it does not manage the transferal of the data to a central location. (This option is useful if you prefer writing your own scripts to control the extraction and transferal of the data to a central location.)

  \textit{Note}: When transferring the history data across platforms, ensure that the data retains its ASCII text format.

Although these two methods produce slightly different output, both can be processed by the staging transformation of SAS IT Resource Management. The BMC Perf Mgr Operator Console retrieves the historical data that is stored by the Agent. The \texttt{dump_hist} line command copies the parameter history data that is maintained by the BMC Perf Mgr Agents. The BMC Perf Mgr Agent Reference Manual contains more
detailed information about the `dump_hist` command. (The `dump_hist.exe` program is provided as part of the BMC Performance Manager software.)

The following command copies parameter history data for one day for the file that is indicated by `filename`. The command uses start (`-s`) and end (`-e`) parameters to specify the date and time of data that is to be copied. The format of these parameters is `MMddhhmm[yyyy]`, where

- `MM` = month
- `dd` = day
- `hh` = hour
- `mm` = minute
- `yyyy` = year, which is optional

The following code copies the full day of data from July 18, 2007.

```bash
-dump_hist -s 071800002007 -e 071823592007 > filename
```

The following example shows the format of the text file that is created by the preceding `dump_hist` command. This file can be read into the staging transformation of SAS IT Resource Management.

```
machinename/NT_CPU.CPU_0/CPUprcrUserTimePercent
 Thu Jul 18 10:00:57 2007 26.981
 Thu Jul 18 10:01:58 2007 5.35963
 Thu Jul 18 10:02:58 2007 0.598205
 Thu Jul 18 10:03:58 2007 0.333915
machinename/NT_CPU.CPU_0/CPUprcrPrivTimePercent
 Thu Jul 18 10:00:57 2007 61.0279
 Thu Jul 18 10:01:58 2007 1.20528
 Thu Jul 18 10:02:58 2007 1.56053
 Thu Jul 18 10:03:58 2007 1.05312
machinename/NT_SYSTEM.NT_SYSTEM/SYSsysTotalProcTimePercent
 Thu Jul 18 10:00:57 2007 88.013
 Thu Jul 18 10:01:58 2007 6.56211
 Thu Jul 18 10:02:58 2007 2.1812
 Thu Jul 18 10:03:58 2007 1.36592
```

To dump data for a single server, add the `--host <host name>` parameter to the previous command. The command then dumps a full day of data for the single server that is identified by `<host name>`.

For additional information about the syntax of the `dump_hist`, see the *PATROL® Script Language Reference Manual*.

---

**Notes about BMC Perf Mgr**

When staging BMC Perf Mgr data on z/OS, allocate the z/OS file with an LRECL= 200. (BMC Perf Mgr data typically has variable length records, but they do not exceed 200 bytes in length.)

Processing BMC Perf Mgr history data into a staged table might require the following two issues to be resolved:

- different sample rates are collected for each metric

Two metrics 'A' and 'B' are not necessarily sampled at the same rate. Metric 'A' might be sampled at 1-minute intervals, and 'B' might be sampled at 5-minute intervals. To
combine these two metrics into the same observation in a table is invalid because each value should eventually be weighted by the duration variable. To resolve this problem, the staging code of SAS IT Resource Management includes a variable in each BMC Perf Mgr table called DURGRP. DURGRP is a string that represents the duration group to which a metric belongs. In this example, metric 'A,' which is sampled every minute, is included in the observation with a DURGRP value of 60 (60 seconds). Metric 'B' is included in an observation with a DURGRP of 300 (300 seconds).

The DURGRP variable is used only during staging to ensure that the metrics are reduced and summarized by their respective duration values (assuming that they are weighted by DURATION).

If numerous null values are present in each observation, then the BMC Perf Mgr data in the SAS IT Resource Management tables might look unusual. The number of DURGRPs and null values depends on the number of different sample rates that are applied to metrics that belong to the same table.

- Datetime Stamps of Samples Are Not Exactly Aligned

In this example, two metrics 'A' and 'B' are both sampled at 1-minute intervals. In the following example history data, the first sample occurred at x for both metrics. However, in the second sample, the datetime stamps differ by a second. That is, 'B' is sampled later than 'A'. The first sample for each metric is combined into a single observation because the duration and datetime stamps are the same. However, this is not the case for the second sample.

<table>
<thead>
<tr>
<th>machinename/NT_CPU.CPU_0/A</th>
<th>Thu Jul 18 10:00:57 2007 26.981</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thu Jul 18 10:01:58 2007 5.35963</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>machinename/NT_CPU.CPU_0/B</th>
<th>Thu Jul 18 10:00:57 2007 61.0279</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thu Jul 18 10:01:57 2007 1.20528</td>
</tr>
</tbody>
</table>

During the staging of the raw data, SAS IT Resource Management detects that this second sample has datetime values that are related. It then collapses the data into one observation. The result is that the data in the staged table is less sparse. However, the datetime and duration values are only near approximations.

---

**CSV Adapter - Accessing Raw Data**

**Preparing CSV Data for SAS IT Resource Management**

CSV (Comma Separated Values) files are flat files that contain rows of data. The values (or columns) on each row are separated by some sort of delimiter (CSV has come to mean any delimited data, not just comma delimited data). The delimiter is either a single character or a string of characters.

**Table A2.2 Examples of Delimiters**

<table>
<thead>
<tr>
<th>Type of Delimiter</th>
<th>Delimited Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comma Delimited (,)</td>
<td>7.8048232979 ,68.79 ,7110.58</td>
</tr>
</tbody>
</table>
### Type of Delimiter | Delimited Data
--- | ---
Bang Delimited (!) | 7.8048232979!68.79!7110.58
String Delimited (abc) | 7.8048232979abc68.79abc7110.58

*Note:* In each of the preceding table entries, there are three sets of values.

CSV files often have a header line that contains the names of the columns. The names must also be delimited like the data.

### Table A2.3  Examples of Delimiters in Header Rows

<table>
<thead>
<tr>
<th>Type of Delimiter</th>
<th>Delimited Header Rows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comma Delimited (,)</td>
<td>Column 1, Column 2, Column 3</td>
</tr>
<tr>
<td>Bang Delimited (!)</td>
<td>Column 1!Column 2!Column 3</td>
</tr>
<tr>
<td>String Delimited (abc)</td>
<td>Column 1abcColumn 2abcColumn 3</td>
</tr>
</tbody>
</table>

*Note:* The header row can be on any row although it is usually the first row. The data rows begin anytime after the header row, but they usually begin on the second row. Values that contain, or could contain, the delimiter are enclosed in quotation marks (""") to indicate that the delimiter should be ignored.

The CSV adapter can read most styles of CSV files. There is a set of parameters on the **Staging Parameter** tab of the CSV staging transformation that enable you to describe the following data:

- what the delimiters are
- whether there can be embedded delimiters
- what row contains the header
- what row contains the start of the data starts

The adapter can also read a CSV file that does not have a header row. In that case, the columns are named: Column1-Columnn.

The CSV adapter can read multiple CSV files (all the files in a specified directory) at the same time as long as the files have the same structures. In other words, if they have a header row, then the header rows must be the same. If they do not have a header row, then the files must have the same number of columns. If these conditions are not satisfied, then the adapter cannot read the data. In addition, an error is displayed when you try to create the new staged table. When reading multiple CSV files, the adapter creates a single staged table as output with all the data combined.

Because this data is being read by SAS IT Resource Management, the data is expected to include a date/time or time stamp. If there is a column in the CSV file that has a header of DATETIME, then the adapter uses that column as the standard SAS IT Resource Management DATETIME column. (The case of DATETIME is not significant.) Otherwise, a DATE column and a TIME column are combined to create the DATETIME column. If none of these headers are found in the CSV file, then the DATETIME column is created from the first encountered columns that have a datetime, date, or time value. If no date or time columns are found in the data, then the DATETIME is set to missing.
Accessing CSV Files That Contain Data Encoded in UTF-8

If your CSV raw data files contain data that is encoded in UTF-8, then you must set the encoding on the staging LIBNAME statement in order to access them. To do this, perform the following steps:

1. In the SAS IT Resource Management client, navigate to the staging library for your CSV staged tables and right-click that library.
2. Select Properties.
3. Select the Options tab.
4. Click Advanced Options.
5. Select the Options for any host tab. In the Encoding to use when reading a file field, enter utf8.
6. Click OK.

DT Perf Sentry — Accessing Raw Data

Preparing DT Perf Sentry Data for SAS IT Resource Management

SAS IT Resource Management provides both a native DT Perf Sentry adapter and an adapter based on MXG (DT Perf Sentry with MXG). SAS IT Resource Management supplies aggregations with the native DT Perf Sentry adapter. Therefore, using the native DT Perf Sentry adapter is recommended.

Note: Demand Technology Performance Sentry software is included in your SAS Software Depot for SAS IT Resource Management when the server tier is licensed on a Windows system. The executable software that installs Demand Technology Performance Sentry is in the \products\perfsentry__94110__prt__xx__sp0__1 folder of the SAS Software Depot. The Performance Sentry license enables you to manage up to 100 Windows systems, and expires 180 days after installation. At that time, you must contact Demand Technology to arrange to continue the use of this software at your site. For information about this software, see http://www.demandtech.com.

The Demand Technology Performance Sentry product (formerly NTSMF) collects a variety of Windows NT performance objects and their associated counters. DT Perf Sentry gathers and calculates object counter values that are based on the counter type. It then writes them on a periodic basis to an ASCII-formatted, comma-delimited, or tab-delimited data file. This file is read directly into SAS IT Resource Management.

The following requirements apply to the collection of DT Perf Sentry data:

- For Windows and UNIX operating environments, if you transfer files across operating systems, make sure that the files retain their ASCII format. (If you want to process your data on z/OS, then the data must be converted from ASCII format to EBCDIC. For information, see “Preparing DT Perf Sentry Data for Processing on z/OS”.)

- Discovery records must be collected in DT Perf Sentry smf log files and must be written for all types of data records.
• If your version of Performance Sentry Administration enables you to select which Discovery record types are collected, select the type 5 records. However, record types 6 and 7 can also be selected because these records do not add any significant overhead in terms of space or performance.

• Compressed and uncompressed records can be processed.

• The delimiter that is used in DT Perf Sentry data must be a comma or a tab character.

• Total records must not be written to the data file.

• DT Perf Sentry filters must not be used.

For information about the performance areas that are collected by DT Perf Sentry, see “DT Perf Sentry Adapter - DT Perf Sentry Server-Based Domain Categories” on page 552 and “DT Perf Sentry Adapter - DT Perf Sentry Exchange Domain Category” on page 552.

Preparing DT Perf Sentry Data for Processing on z/OS

In addition to the preceding requirements, if you want to process DT Perf Sentry logs on z/OS, you must allocate a PDS with the following DCB attributes on z/OS:

```
DSORG=PO, RECFM=VB, LRECL=256
```

Note: Accept the default for BLKSIZE.

Extracting Data from DT Perf Sentry

The log file that is created by the DT Perf Sentry agent program can be read directly into SAS IT Resource Management 3.1.1 and later. It contains two types of records:

• discovery records that contain the format of the data records

• data Interval records that contain the counters for the performance areas that are being measured

Each DT Perf Sentry SMF file should be maintained as a separate SMF file. Concatenating SMF files is not recommended. The DT Perf Sentry adapter accepts the pathname to either a raw data file or a directory that contains the input files for the adapter.

If a directory is specified, the directory cannot contain subdirectories or any files other than valid DT Perf Sentry raw data files. DT Perf Sentry does not manage the transferal of the data to a central location.

• On the UNIX and Windows operating environments, place the multiple SMF files into a single directory where they can be read into the staging transformation in SAS IT Resource Management. No other files or subdirectories should be in this directory. Use the file management utility of your choice to transfer data.

• On the z/OS operating environment, use the File Transfer Protocol (FTP) to transmit each smf log on to a unique PDS member. FTP converts each smf log from ASCII to EBCDIC as it is transmitted. By specifying the PDS name in the input location, each member is processed.

For more information, see the Demand Technology Performance Sentry (NTSMF) User Guide.
Notes about DT Perf Sentry

After installation, DT Perf Sentry logs the performance data that is based on default parameter values that are stored in the chosen Data Collection Set (DCS). The parameter values determine what data elements to collect and how frequently to collect them.

For best results, use these collection sets: “Default Collection Set” for Windows server and “Exchange Server Starter Set” for Exchange.

For more information about Data Collection Sets, see the "Performance Sentry Administration" chapter of the Demand Technology Performance Sentry (NTSMF) User Guide for version 4. This document is also available at http://demandtech.com in the Product Documentation section of the Downloads tab.

These collection sets are designed to correspond to the aggregations that SAS IT Resource Management provides for the DT Perf Sentry adapter. However, you do not have to use these sets in order to load DT Perf Sentry data into SAS IT Resource Management IT data marts. You can modify the objects and counters within the Data Collection Sets as needed.

Note: You can also access the ITRM Windows Server and ITRM Exchange collection sets for prior versions of Demand Technology Performance Sentry from this website: http://support.sas.com/documentation/ondlinedoc/DTPerfSentry/index.html.

Ganglia — Accessing Raw Data

Preparing Ganglia Data for SAS IT Resource Management

Ganglia is a scalable distributed system monitor tool for high-performance computing systems such as clusters and grids. It enables the user to remotely view live or historical statistics (such as CPU load averages or network utilization) for all machines that are being monitored.

Time series metrics from Ganglia are stored in a round-robin database (RRD) using the RRDtool. The SAS IT Resource Management adapter for Ganglia reads the RRD that was created using Ganglia.

Note: Before running the Adapter Setup wizard, install the RRDtool. The round-robin database tool, RRDtool, is a freeware package that is available for download from Tobias Oetiker.

The Ganglia RRD data can be gathered at any interval (step), any metrics can be gathered, and any consolidation function (CF) can be used. Because SAS IT Resource Management has its own aggregation process, the data read from the round-robin databases should be detail data, not consolidated data. To store detail data using the RRDtool, the RRDs should store the data with the CF set to Average. In addition, the average should be generated based on one step of data, where a step is the interval of time that was specified when the RRD was generated. If the data in the RRD is consolidated, then SAS IT Resource Management requires that the CF staging parameter be set accordingly for that consolidation. If this staging parameter is left blank, then the data in all of the CFs in the RRD are collected.

The adapter can read a single round-robin database, or it can read all round-robin databases in a directory. If multiple round-robin databases are read, the data is combined into a single staging table.
Because a round-robin database can store only numeric data, users of the RRDtool generally store identifying character data in the name or path of the round-robin database. The filename of each round-robin database is saved by the Ganglia adapter in a field called filename. The filename field that is saved by the Ganglia adapter creates Grid performance metrics or any relevant computed columns with this identifying information.

Note: You can backload data from the Ganglia adapter. To do so, use the rrdtool fetch --start option and rrdtool fetch --end option staging parameters to specify the date range of data to be read. For information about backloading, see “How to Backload Raw Data” on page 643.

Preparing the Ganglia Adapter for Staging

To read the raw data from the RRDtool database, Perl scripts are run as part of the staging process. This means that Perl must be installed on the machine that the SAS program runs on (that is, the SAS Workspace Server, the SAS batch server, or interactive SAS).

The Perl scripts that are used by the staging code are generated as part of the code generation of the staging job. This code can be viewed and modified as necessary in the Code tab of the job.

To run these scripts in batch mode, set the XCMD option for the Batch server. To do so, change set USERMODS_OPTIONS= to set USERMODS_OPTIONS=XCMD.

To run these scripts from within the SAS Workspace Server, the SAS option XCMD must be turned on. By default, this option is off in the SAS Workspace Server. For instructions on how to turn on the XCMD option, see “How to Turn On the XCMD Option”.

How to Turn On the XCMD Option

1. Launch SAS Management Console. Log on as an administrator.
2. Expand the Server Manager in the left panel.
3. Expand the SAS Application Server that was specified when you configured SAS IT Resource Management. (This server is typically named SASApp or SASITRM.) Then expand <SAS Application Server> - Logical Workspace Server.
5. Select the Options tab and click Advanced Options.
6. Select the Launch Properties tab to open the following dialog box.
7. Select the **Allow XCMD** check box.

8. Click **OK** to close all the open dialog boxes.

9. Stop and then restart your Object Spawner service.

### Windows Specifics

To stop your Object Spawner service, select **Start** ⇒ **All Programs** ⇒ **SAS** ⇒ **SAS Configuration** ⇒ `<configuration-name>` ⇒ **Object Spawner** ⇒ **Stop**. To restart your Object Spawner service, select **Start** ⇒ **All Programs** ⇒ **SAS** ⇒ **SAS Configuration** ⇒ `<configuration-name>` ⇒ **Object Spawner** ⇒ **Stop**.

### UNIX Specifics

To stop and then restart your Object Spawner service, from the command line, change directories to `SAS-config-dir/Lev1/SASMain/ObjectSpawner`. Stop the Object Spawner by issuing this command: `$ ./ObjectSpawner.sh stop`. When you receive a confirmation that the Object Spawner has stopped, start it again by issuing this command: `$ ./ObjectSpawner.sh start`. You should receive a confirmation that the Object Spawner has started.

### Notes about the SSH Host Command

The SSH host command is an executable object that is available as part of the functionality of the Ganglia, RRDtool, and SNMP adapters. This command specifies the RSH or SSH version of the command and the name of the host for running the **rrdtool** command. The **rrdtool** command facilitates reading data from round-robin database files that are located on other host names. Entering the SSH version of the command triggers this SSH functionality. This is the format of the command: `ssh user@host name`. It is entered in the **rsh/ssh host command** field on the **Staging Parameters** tab of the Properties dialog box for the adapter’s staging transformation.

If you enter a value in the **rsh/ssh host command** field that begins with **SSH**, then SAS IT Resource Management assumes that this job is running on a UNIX environment. The Perl script is changed so that it uses the UNIX find command to get the list of round-robin database files from the other host names.
To enable this functionality, set up SSH authentication using the SSH key-gen file. Then copy the file that stores the key to the host where the RRDtool executable and raw data are located. After the SSH key-gen file is copied, make sure that you can access the target host that is issuing the SSH command from the source host. If you have alias names for your target host, make sure that you execute the SSH command manually from the source host with that alias. By doing this, the command generates the host/RSA key for that alias host name. Thus, the expected warning or error message is avoided during execution of the staging job. The following message is an example of the warning or error message:

```
Host key verification failed
```

To use this SSH method, go to the Staging Parameters tab of the Properties dialog box for the adapter’s staging transformation. Then fill in values for the following options:

- **Raw data input directory**: Enter the location of the raw data in the target host.
- **rsh/ssh host command**: Start this command with SSH (for example: `ssh user@host name`).
- For the SNMP adapter only, specify the Use snmpwalk to gather character data parameter. To do so, select Yes to use snmpwalk. A script is generated and executes when the staging code runs. This script executes the `snmpwalk` command to gather the RRDtool data for specified character metrics and adds that data directly to the staged tables.
  
  The default value for this option is No.
- For the SNMP adapter, specify the Choose access command parameter. To do so, enter `RRDTool`.
- **rrdtool executable**: Enter the RRDtool location of the target host machine.

---

**HP Perf Agent — Accessing Raw Data**

**Preparing HP Perf Agent Data for Staging**

HP Performance Agent software captures enterprise systems management measurement data from Windows systems and many UNIX variants such as HP-UX, Sun OS/Solaris, IBM AIX, Tru 64 UNIX, and Linux. (HP Performance Agent software was formerly called OpenView Performance Agent.)

For information about the performance areas that are collected by HP Perf Agent, see “HP Perf Agent and HP Reporter Adapters” on page 553.

**Extracting Data from HP Perf Agent**

The log files that contain the performance data can be exported by using `extract`, an HP Performance Agent program. The `extract` program writes the performance data in binary format. This binary file is then read into SAS IT Resource Management.

The following list is a partial list of the options and arguments that can be used to specify how to run the `extract` command. For the complete list of options and arguments that are available, see the HP Performance Agent User’s Manual.
-xp
  exports the extracted data to the specified output file.

d
  extracts all the data from a single day.

-\texttt{f output-filename}
  specifies that the output is to be written to an output file that can be read directly into SAS IT Resource Management.

-gapdcnt
  specifies the types of data to extract.

-i
  specifies the extraction of logical system data for the host and any associated guest machines present in the virtual environment. If -i is not specified, the extraction can still work, but no logical system data is extracted.

\textit{Note:} The -i option applies to the designated host machine in a virtual operating environment. At this time, the -i option applies to the following three platforms: HP-UX (virtual machine configuration), AIX (LPARs or logical partition configuration), and Linux (VMWARE ESX configuration).

-\texttt{r export-template-filename}
  specifies the name of the export template file. This file governs the format that is used for the exported data.

\textit{Note:} See the HP Performance Agent User's Manual for the Windows or for the UNIX operating systems for instructions about running the HP Extract command interactively in Guided mode. Running the command in this mode enables you to create an export-template-file that is used to generate the data that can be read into SAS IT Resource Management. SAS IT Resource Management expects the extracted data to be in a binary format. This format is specified when the export template file is created. The SAS IT Resource Management data model lists the tables and variables for the HP Perf Agent Adapter. The data model is available for review in the SAS IT Resource Management 3.8 Data Model. You can use the data model to specify the HP export function so that it produces a customized export template file that meets the needs of your site.

-\texttt{v}
  generates verbose output report formats.

  Verbose mode enables the echoing of commands and command results.

\textbf{Example 1}

The following command extracts all the data for yesterday (d-1). It exports the data to the output file that is named data.bin, using the template in a file that is named reptfile.mwr. The purge parameter specifies that any existing file is purged in order to make room for the new file. The gapdcnt option specifies that the following types of data are to be extracted and exported: global detail, application detail, process detail, disk device detail, configuration detail, netif detail, and transaction detail.

\texttt{extract -xp d-1 -gapdcnt -r reptfile.mwr -f data.bin,purge -v}

The log file that is created by HP Performance Agent software can be read directly into SAS IT Resource Management. Alternatively, you can store multiple log files in a directory that can be read into SAS IT Resource Management.

It is advisable to put the extract command into a shell, bat, or Perl script that runs once a night by means of a scheduling tool. (Perl is an open-source programming
language that can be used for data manipulation tasks.) Cron can be used for scheduling on UNIX systems, and Task Manager can be used on Windows operating systems. The extracted files from each server can then be transferred to a centralized location to be read by SAS IT Resource Management using the file transfer utility of your choice. Delete the older raw data files to preserve disk space.

**Example 2**

The following shell script runs on Linux and extracts yesterday's data into files that have date extensions as part of the name.

```
$ cat /var/opt/perf/datafiles/itrm-extract/extract.sh
# shell script to do HPOV extracts
/opt/perf/bin/extract -xp d-1 -gapdcnt \ 
   -l /var/opt/perf/datafiles/logglob \ 
   -r /var/opt/perf/reptfile.mwr \ 
   -f /var/opt/perf/datafiles/itrm-extract/server1-'date +%y%m%d'.bin, purge -v
```

The output file that is generated by the preceding shell script is of the form `server1-yymmdd.bin`. (If yesterday's date is November 26, 2007, then the name of the output file is `server1-071126.bin`). The output file is placed in the directory that is located here: `/var/opt/perf/datafiles/itrm-extract`. For more information about generating HP Perf Agent data files, see the *HP Performance Agent User's Manual*.

---

**RRDtool — Accessing Raw Data**

**Preparing RRDtool Data for SAS IT Resource Management**

The round-robin database tool, RRDtool, is a freeware package that is available for download from Tobias Oetiker.

*Note:* Before running the Adapter Setup wizard, install RRDtool.

The RRDtool adapter reads any round-robin databases that have been created with RRDtool. The data can be gathered at any interval (step), any metrics can be gathered, and any consolidation function (CF) can be used. Because SAS IT Resource Management has its own aggregation process, the data read from the round-robin databases should be detail data, not consolidated data. In order to store detail data using RRDtool, set the CF to any statistic, and then set the number of steps for each consolidation point to 1. This keeps the data at the detail level, that is, one record for each time interval.

*Note:* The RRDtool adapter reads the data even if it has been consolidated. If the data in the RRD is consolidated, then SAS IT Resource Management requires that the CF staging parameter be set accordingly for that consolidation. If this staging parameter is left blank, then the data in all of the CFs in the RRD are collected.

The adapter can read a single round-robin database, or it can read all round-robin databases in directory. If multiple round-robin databases are read, the data is combined into a single staging table.

Because a round-robin database can store only numeric data, users of RRDtool generally store identifying character data in the name or path of the round-robin database. For
example, SNMP data is often stored in round-robin databases. In addition, the device and interface information is usually used in the name of the round-robin database to identify the metrics that are being gathered. The filename of each round-robin database is saved by the RRDtool adapter in a field called filename. Therefore, it can be used to create computed columns with this identifying information. For example, if you have two round-robin databases: `c:\RRD\ABC.rrd` and `c:\RRD\XYZ.rrd`, then you can create a computed column with the following expression: `scan(filename, 3, ")`.

This enables you to store the name of each RRD (“ABC” and “XYZ”) in a new column.

Note: You can backload data from the RRDtool adapter. To do so, use the `rrdtool fetch --start Option` and `rrdtool fetch --end Option` staging parameters to specify the date range of data to be read. For information about backloading, see “How to Backload Raw Data” on page 643.

Preparing the RRDtool Adapter for Staging

To read the raw data from RRDtool, run Perl scripts as part of the staging process. This means that Perl must be installed on the machine that the SAS program runs on, that is, the SAS Workspace Server, the SAS batch server, or interactive SAS.

The Perl scripts that are used by the staging code are generated as part of the code generation of the staging job. This code can be viewed and modified as necessary in the Code tab of the job.

To run these scripts in batch mode, set the XCMD option for the Batch server. To do so, change `set USERMODS_OPTIONS=` to `set USERMODS_OPTIONS=XCMD`.

To run these scripts from within the SAS Workspace Server, the SAS option XCMD must be turned on. By default, this option is off in the SAS Workspace Server. For instructions about turning on the XCMD option, see “How to Turn On the XCMD Option” on page 417.

Working with the SSH Host Command

The SSH host command is an executable object that is available as part of the functionality of the RRDtool, SNMP, and Ganglia adapters. This command specifies the RSH or SSH version of the command and the name of the host for running the `rrdtool` command. For more information about the SSH Host command, see “Notes about the SSH Host Command” on page 418.

SAR — Accessing Raw Data

Preparing SAR Data for SAS IT Resource Management

System Activity Reporter (SAR) data can be collected from the following operating systems:

- HP-UX 10.2 and later
- IBM AIX 3.2 and later
- SunOS Solaris 5.8 and later
- Linux (Use Sysstat 4.0.1 or Sysstat 5.0.0 and later.)
SAR performance data can be set up to write continuously to a binary file by means of the `sapd` command. At appropriate intervals, the `sar` command can be used to write the binary file to an ASCII file. The ASCII file is read into a staging transformation of SAS IT Resource Management.

For information about the performance areas that are collected by SAR, see “SAR Adapter - SAR Domain Category” on page 555.

**Extracting Data from SAR**

The following `sapd` and `sar` commands and shell scripts that collect SAR data are usually available in the `/usr/lib/sa` directory:

- The `sapd` command collects performance data into a binary file.
  
  The `sa1` shell script is a wrapper for the `sapd` command and can be scheduled to run automatically through cron.
  
  By default, the binary file that is created by the `sa1` shell script is called `/var/adm/sa/sa$DATE` (where `$DATE` is the current date). To save the binary data in a different location, modify the `sa1` shell script accordingly.
  
  The following cron entry shows an example of running the `sa1` shell script to collect performance data every five minutes. The `sa1` shell script is run every 20 minutes by cron, and within the `sa1` shell script, the `sapd` command collects data for four 300 second (that is, 5-minute) intervals:
  
  ```
  0,20,40 * * * * /usr/lib/sa/sa1 300 4
  ```

- The `sar` command extracts the data from the binary file that was created by the `sapd` command. It then creates an ASCII file that can be read by the SAR staging transformation of SAS IT Resource Management 3.1.1 and later.
  
  The `sa2` shell script is a wrapper for the `sar` command, and can be scheduled to run automatically through cron.
  
  By default, the binary file is `/var/adm/sa/sa$DATE`. To change the location of the binary file or the location of the ASCII file, modify the `sa2` shell script accordingly.
  
  The following cron entry shows an example of running the `sa2` shell script on Linux to create ASCII files once a day at 12:55AM:

  ```
  55 0 * * * /usr/lib/sa/sa2 -A
  ```

  *Note:* The switches for the `sar` command can be passed as parameters to the `sa2` shell script.

**Using the sar Command**

The `sar` command can be used to collect the following types of data:

- global data (data for the entire system)
- processor level data (data for each processor on the system)

If processor level data is collected, it can be staged in the SARCPUB table. Each UNIX environment has its own set of options that can be specified with the `sar` command. SAS IT Resource Management recommends setting the following switches:

- for HP-UX operating environments:
To collect global data as well as per-processor data on HP-UX, you must create two files by executing two `sar` commands.

- To collect global data, execute the following command:
  
  ```
  ```

- To collect processor level data, execute the following command:
  
  ```
  sar -Mu -f /var/adm/sa/sa$DATE > /var/adm/sa/sar$DATE_processor
  ```

- for AIX operating environments:

  To collect global data as well as per-processor data on AIX, you must create two files by executing two `sar` commands.

  - To collect global data, execute the following command:
    
    ```
    sar -bdkqrvy -f /var/adm/sa/sa$DATE > /var/adm/sa/sar$DATE_global
    ```

  - To collect processor level data, execute the following command:
    
    ```
    sar -A -P ALL -f /var/adm/sa/sa$DATE > /var/adm/sa/sar$DATE_processor
    ```

- for Linux operating environments:

  To collect both global and processor level data, use the following `sar` command:

  ```
  ```

- for SunOS Solaris operating environments:

  You cannot capture processor level data on SunOS Solaris. To collect global data, execute the following `sar` command:

  ```
  ```

All of the files that are created by the `sar` command should be placed in a single directory that is read by the staging transformation in SAS IT Resource Management 3.1.1 and later. In the staging transformation, all the files in this directory are read and used to update the SAR data mart.

**Note:** For more information, see your system's documentation about the `sar` and `sapd` commands and the sa1 and sa2 shell scripts.

---

**SNMP — Accessing Raw Data**

**Sources of SNMP Data**

Simple Network Management Protocol (SNMP) data can be collected from the following sources:

- HP Network Node Manager (HP NNM)
- Round-Robin Database

Reporting on the data available from the SNMP adapter can be enhanced by mapping devices to their device type. For information about how to enable this functionality, see “Working with the ITMS_SNMP_DeviceType Lookup Table” on page 428.

The SNMP adapter is designed with a data model that contains MIB2 data and can be extended to other MIBs. For information about how to do so, see For “Working with
Management Information Base (MIB) Definitions for SNMP Staged Tables” on page 429.

In order to read the raw data from either HP NNM or RRDtool, it is necessary to create Perl scripts as part of the staging process. This means that Perl must be installed on the machine that the SAS program runs on, that is, the SAS Workspace Server, the SAS batch server, or interactive SAS.

Note: If you run the staging job without having the Perl script installed, then the staging transformation cannot execute successfully to extract the data. You might find the following text about the missing Perl script in the SAS log file:

```
Stderr output: 'perl' is not recognized as an internal or external command, operable program or batch file. NOTE: 0 records were read from the infile RAWDATA.
```

The Perl scripts that are used by the staging code are generated as part of the code generation of the staging job. This code can be viewed and modified as necessary in the Code screen of the job. To run these scripts in batch mode, set the XCMD option for the Batch server. To do so, change `set USERMODS_OPTIONS=` to `set USERMODS_OPTIONS=XCMD`.

By default, on the Workspace Server, this option is turned off. For instructions to turn on the XCMD option, see “How to Turn On the XCMD Option” on page 417.

Extracting Data By Using HP NNM Tools

For versions of HP NNM that are earlier than HP NNMi 8.x, there are tools that produce a repository of SNMP data that can be processed the SAS IT Resource Management solution.

The two commands to produce the SNMP data are:

- `snmpCollect`, which gathers SNMP data into binary files
- `snmpColDump`, which reads the binary files and writes the data into ASCII files that can be processed by the SNMP staging transformation

The `snmpCollect` executable uses a file called `snmpCol.conf` to determine the metrics to collect and the devices from which to gather data.

You can create the `snmpCol.conf` file by using either of the following methods.

- Use the sample UNIX script (`snmpmkcf`) that SAS IT Resource Management provides. The sample script reads the `snmphost` file and the `snmpvars` file and creates the `snmpCol.conf` file. The sample script and the `snmphost` and `snmpvars` files are in a location that is based on the operating environment.

  **Windows Specifics**
  `SASHome\SASFoundation\9.4\itmsmvadata\sasmisc`

  **UNIX Specifics**
  `SASHOME/SASFoundation/9.4/misc`

  **z/OS Specifics**
  `&prefix.ITRM.CPMISC`

- The `snmphost` file contains a list of the device names for which SNMP data is being gathered.

  **Note:** The job can run successfully even if, in the Perl script, the alias of the host name contains a hyphen (-) or an underscore (_).
The snmpvars file contains a list of the SNMP metrics that are to be gathered from each device. By default, the values in this list are the metrics that are in the recommended staging tables.

Note: This method creates the snmpCol.conf file more quickly than using the NNM graphical user interface.

- Use the HP NNM graphical user interface to create snmpCol.conf. The user interface prompts you to select the metrics that you want to gather and the devices about which you want to gather data. Using your responses, it then creates the snmpCol.conf file.

When the snmpCol.conf file is created, you can run the snmpCollect command to gather data. You can run the collect as often as you choose. The command collects a set of files in the location that you specify. For each metric and interface, two files are generated:

- metricName.interface-number, that contains the raw data
- metricName.interface-number!, that contains the information about the metrics that are collected

For example, the files called ifOctets.3 and ifOctets.3! are generated for the metric that is called ifOctets and for interface 3. The SNMP staging code runs the snmpColDump command against these files to get the raw data that is to be read and loaded into staged tables. In order to read the data, the snmpColDump executable requires both the file that contains the binary data and file that contains the information about the metrics that are collected.

Tip: The binary data files continue to accumulate until they are deleted. For best results, these data files (whose names do not end with "!") should be moved to another location before staging. The snmpCollect command then creates a new set of binary files into which the data is to be collected. The files that contain the information about the metrics (whose names end with "!") should be copied (not moved) to the other location as well. In this way, the snmpCollect command can continue to use these metrics as it collects the raw data. The staging code can then read the files from the location to which they were moved or copied.

Extracting Data By Using the Round-Robin Database Tool (RRD TOOL)

The SNMP adapter can read data from a round-robin database that was created with RRDtool.

Note: The round-robin database tool, RRDtool, is a freeware package that is available for download from Tobias Oetiker. This software is widely used, often in conjunction with Tobias Oetiker's MRTG package, which is a real-time monitor of data.

The SNMP adapter reads only those round-robin databases that contain the following elements:

- one round-robin database for each combination of the device
- the network interface to which the device is connected
- the metric

The data can be gathered at any interval, and any metrics and devices can be gathered.

In order to produce the correct set of round-robin databases, SAS IT Resource Management provides a sample Perl script (snmpuprd.pl) for data collection and storage in the round-robin database. The section at the top of the script enables you to specify modifications that control how the data is collected. The Perl script uses the snmphost
and snmpvars files to determine which metrics to gather from your devices. (The Perl script and the snmphost and snmpvars files are in a location that is based on the operating environment.

Windows Specifics
SASHome\SASFoundation\9.4\itmsmvadata\sasmisc

UNIX Specifics
SASHOME/SASFoundation/9.4/misc

z/OS Specifics
&prefix.ITRM.CPMISC

The Perl script also uses the `snmpwalk` command to collect the snmp data. When the script is correctly set up, you can use your operating system's scheduling facility to run the script at the appropriate interval.

Note: In some instances, the data might be collected by a tool other than the snmpuprd.pl script that is provided with SAS IT Resource Management. In that case, it might be necessary to modify the staging code to handle the format differences. This code can be modified by one of the following methods:

- Edit the code from the staging job’s Code window. To do so, change the Code Generation Mode option at the top of the screen to All user written.
- Deploy the job. The deployed code can be modified from an external editor. The code to be modified begins with this comment line:

```c
/*---- Create script to read data from an RRD ----*/
```

Note: You can backload data from the `rrdtool`. To do so, specify the Number of days to load option in the Staging Parameters property tab of the SNMP staging transformation. (This option is available only if the chosen access command is `RRDTool`.) For information about backloading, see “How to Backload Raw Data” on page 643.

Notes about the SNMPWALK Command

The `snmpwalk` command is an executable that is available as part of the Net-SNMP package. This package is available as freeware that you can download from the Sourceforge.net website. The `snmpwalk` command provides an easy way to read SNMP data from specified devices.

The SNMP adapter uses snmpwalk in two places:

- Using RRDtool: If you choose to store your raw data using RRDtool, the script that is provided with SAS IT Resource Management uses `snmpwalk` to gather the data to put in the round-robin database.
- Staging the data: The SNMP staging transformation provides the ability to collect the non-numeric data at staging time instead of at the normal regular intervals that the rest of the SNMP data is collected. This can be useful for character data that does not change frequently. If you want to collect character data and are using RRDtool to gather your raw data, then you must collect it at staging time. (RRDtool does not store character data.) If you are using HP NNM, you can set it up to gather the character data at regular intervals along with the rest of the data. Alternatively, you can choose to collect it at staging time.

If you want to use the snmpwalk method, go to the Staging Parameters tab of the Properties dialog box for the SNMP transformation. On the Use snmpwalk to
gather character data option, select Yes. Then fill in values for the following options:

- **snmpwalk executable**: Enter the path and the .exe file that contains the `snmpwalk` command.
- **HostFile for snmpwalk**: Enter the path and file that contains a list of the devices to poll for character data.
- **Community value for snmpwalk**: Check with your SNMP administrator to ascertain the correct value for your site. If you choose to use snmpwalk, then a script is generated and executes when the staging code runs. This script executes the `snmpwalk` command in order to gather the SNMP data for specified character metrics and adds that data directly to the staged tables.

The typical value for this option is **public**.

**Working with the SSH Host Command**

The SSH host command is an executable object that is available as part of the functionality of the Ganglia, RRDtool, and SNMP adapters. This command specifies the RSH or SSH version of the command and the name of the host for running the `rrdtool` command. For more information about the SSH Host command, see “Notes about the SSH Host Command” on page 418.

**Working with the ITMS_SNMP_DeviceType Lookup Table**

To provide better reporting, the SNMP adapter includes a SAS data table that enables you to indicate the type of device for each device for which you are gathering data. This table is located by default in the SASHELP library and contains no data. To use this table to define your device types, perform the following steps from the SAS IT Resource Management client:

1. Locate, or create, the IT data mart that you want to use for staging SNMP data.
2. Locate the Administrative folder. Right-click the library within that folder. (The library is called `Adminnnnn`, where `nnnn` is a random number that was generated when the IT data mart was created.)

   Select View Libname.

3. Select the entire LIBNAME statement in the displayed box. Then right-click the LIBNAME statement and select **Copy**.
4. Launch an interactive session of SAS. Use the Paste function to paste the LIBNAME statement into an Editor window.
5. Submit the LIBNAME statement.
6. In the Explorer window, locate the SAS data table called `Itms_snmp_devicetype` by drilling down into the SASHELP library.
7. Use the **Copy** and Paste functions to copy this table to the `Adminnnnn` library.
8. Now you can edit the table that you copied to `Adminnnnn` library. To do so, use VIEWTABLE to add and update rows. (To access VIEWTABLE, double-click the table in the Explorer window.)

   The value in the **Device** column should be the name of the device, and deviceType is the type of device.
• The name of the device should match the device for which SNMP is gathering data. Make sure that the device names use the same case.

• DeviceType can be any character string that helps identify the device. For example, "Router," "Switch," or "Server" would be reasonable choices for device Type.

You can also update this table programmatically as long as the table has the device and deviceType columns.

After this table is populated, when you run the staging code, the deviceType column in all the SNMP staging tables will have the correct value from the lookup table. If a device is not in the deviceType table, then deviceType is set to "Unknown."

If your devices are named using a convention (for example, the device type is always the first part of the name, like router_2123), you can create the deviceType value programmatically. To do so, change the expression for the deviceType column in the staged table metadata. By default, the expression for the deviceType column is:

\[ \text{put(device, ?? $deviceType.)} \]

You can change this to a different expression. An example is: \( \text{upcase(scan(device, 1, ",")}) \)

Or, you can use standard SAS DATA step code to create an expression. An example is:

```sas
if (device eq: "R") then
   deviceType = "Router";
else if (device eq: "W") then
   deviceType = "Switch";
else if (device eq: "S") then
   deviceType = "Server";
else
   deviceType = "Unknown";
```

---

**Working with Management Information Base (MIB) Definitions for SNMP Staged Tables**

The SAS macro %rmmssnmp enables the SNMP adapter to read Management Information Base (MIB) definitions and create the metadata for SAS IT Resource Management staged tables. This macro enables you to generate staged data from any MIBs that you have. The SAS macro is available in the SAS autocall macro library so that you can use it from any SAS session.

To use the macro, you must first create a job with an SNMP transformation in SAS IT Resource Management. To do so, perform the following steps:

1. In the SAS IT Resource Management client, navigate to the IT Data Marts tree.

2. Navigate to an existing IT data mart, or create a new one. (To create a new IT data mart, from the menu bar, select **New ⇒ IT Resource Management ⇒ IT Data Mart**. The IT Data Mart wizard opens and prompts you to enter information to specify your new IT data mart.)

3. Create a folder in the IT data mart for your new job and tables.

4. In the new folder, create a new job. (To create a new job, select **New ⇒ Job**. Then enter the information to specify your new job.)
5. In the process flow diagram, drag the SNMP transformation from the **SAS IT Resource Management** folder of the **Transformations** tree and drop it onto the job.

6. Save and close the job.

7. Select the job in the tree and in the **Basic Properties** window, scroll to the **Metadata ID** property, and make a note of the value. This is the job ID that you need to run the macro in the next set of steps.

After the job is created, you can run the `%rmmssnmp` macro. To do so, perform the following steps:

1. Invoke an interactive SAS session.

2. Specify the parameters for the `%rmmssnmp` macro. For information, see “Introduction to the Macros in SAS IT Resource Management” on page 583.

3. Submit the macro call to read the MIB definitions. The macro can generate a report of the staged tables that would be created from this definition, or it can create the staged table metadata.

---

**Web Log — Accessing Raw Data**

**Preparing Web Log Data for SAS IT Resource Management**

SAS IT Resource Management can process the following types of files from the Web Log adapter:

- Common Log Format (CLF) that can be produced by Microsoft and Apache web servers
- Extended Log Format (ELF)
- Microsoft IIS original format
- Oracle WebLogic

SAS IT Resource Management examines the file to determine which type it is, without the type having to be specified. However, some web logs are produced with different delimiters than the expected default. For example, Oracle WebLogic uses a format very similar to Extended Log Format. However, it uses a tab character instead of a space. This delimiter must be specified in the staging transformation properties or supplied as part of the Adapter Setup wizard prompts.

In addition, some web logs do not provide information about the machine that they were running on or what website they were associated with. For this reason, you can also specify the machine and sitename as parameters to the staging transformation or Adapter Setup wizard prompts. Web log files can be concatenated to form one input stream, but they must all have the same web log format.
Database Adapters: HP Reporter, MS SCOM, SAP ERP, SAS EV, and VMware

What Are the Database Adapters?

Several adapters extract raw data from databases. The following adapters are database adapters:

- HP Reporter
- MS SCOM
- SAP ERP
- SAS EV
- VMware

Preparing a Database Adapter for Staging

SAP ERP and SAS EV Adapters: The raw data for the SAP ERP and SAS EV adapters must be in SAS data sets. If raw data does not exist, the staging job ends with an error message.

HP Reporter, MS SCOM, and VMware adapters: The data sources for the HP Reporter, MS SCOM, and VMware adapters add performance data to relational databases as follows:

- For the HP Reporter adapter, the relational database can be one of the following:
  - an ORACLE database on a UNIX or Windows operating system
  - a Structured Query Language (SQL) database
  - a Microsoft Data Engine (MSDE) on a Windows operating system
- For the MS SCOM adapter, the relational database must be a Microsoft SQL Server database.
- For the VMware adapter, the relational database can be one of the following:
  - an ORACLE, Microsoft SQL Server or, for VMware vCenter releases prior to 5.5, an IBM DB2 database on a UNIX or Windows operating system
  - starting with VMware 5.0, and for the VMware vCenter Server Appliance on Linux, Oracle for the external database or PostgreSQL for the embedded database

Note: For more information, see “VMware vCenter - Accessing Data” on page 731.

If an ODBC server definition must be created that points to that database, see the “ODBC Sources” topic in the “Overview of Common Data Sources” chapter in the SAS 9.4 Intelligence Platform: Data Administration Guide. This document can be found at this location: http://support.sas.com/documentation/onlinedoc/intellplatform/index.html. Find the section that corresponds to the type of database that contains your data, and follow the instructions for that section.

These instructions include the steps required to perform the following tasks:
• define the ODBC driver on your system, if necessary
• register the database server
• create and register the database library that points to your database

If you want to establish connectivity to a SQL Server Database by using ODBC, follow the instructions for “Establishing Connectivity to an Oracle Database by Using ODBC.” (The descriptions of ODBC connections to Oracle and Microsoft Access databases can be helpful when you connect to similar data sources.)

When creating and registering the database library that points to your database, you are prompted to specify several fields, including the **Database Schema Name**, which can be left blank.

The data from one of these databases is read directly into the Adapter Setup wizard. You can set up the library that points to the database in SAS Management Console. After the library is defined, it can be specified as the raw data input to the appropriate staging transformation.

**Duplicate-Data Checking for Database Adapters**

**Enabling Duplicate-Data Checking for Database Adapters**

The staging transformations for the HP Reporter, and MS SCOM adapters do not provide a parameter for duplicate-data checking. Duplicate-data checking is always enabled for these adapters. (Duplicate-data checking is not automatically enabled for the VMware adapter.)

For more information, see Appendix 5, Duplicate-Data Checking on page 537.

**Subsetting Input Data By Using Duplicate-Data Control Data Sets**

The input data from all adapters can be subset by using duplicate-data control data sets. Subsetting means that only newly identified records can be processed and written to staged tables. (The ranges in the duplicate-data control data sets are not used to determine what data is to be processed.)

**Note:** If you want to backload data, you must delete the duplicate-data control data sets. The staging job can then process all the data that is available in the database or in the raw data tables.

**Backloading Data By Using Macro Variables**

You can backload data for HP Reporter, MS SCOM, SAS EV, and VMware staged tables that are added to the process flow diagram after the staging job has already run once. Backloading data can be accomplished by overriding the default action of the duplicate-data control data sets that subset the incoming data. To do so, set the macro variables ITRM_LoadFromDate and ITRM_LoadToDate to valid start and end datetime values. Then, this datetime range is used to subset the data from the database instead of the ranges in the duplicate-data control data sets.

```plaintext
%let ITRM_LoadFromDate=14FEB2010:00:00:00;
%let ITRM_LoadToDate=15FEB2010:23:59:00;
```

**Note:** When these macro variables are used with the VMware adapter, you must specify the values for these macro variables in Coordinated Universal Time (UTC). (UTC time is the same as Greenwich Mean Time (GMT).)

The following list explains when the data is subset:
• For the HP Reporter adapter, the data is subset as it is extracted from the raw data tables.
• For the MS SCOM adapter, the data is subset while extracting from the database.
• For the SAS EV adapter, the data is subset after it is initially extracted from the raw data tables.
• For the VMware adapter, the data is subset after it is initially extracted from the raw data tables.

For information about backloading, see “How to Backload Raw Data” on page 643.

---

**HP Reporter - Accessing Data**

HP Reporter, formerly HP OpenView Reporter, captures enterprise systems management measurement data from Windows systems and many UNIX variants such as HP-UX, SunOS Solaris, IBM AIX, Tru 64 UNIX, and Linux.

For information about the performance areas that are collected by HP Reporter, see “HP Perf Agent and HP Reporter Adapters” on page 553.

If the HP Reporter raw data is in a Microsoft Access database, you need to set up a PC files library.

To set up a library, perform the following steps:

1. Log on to SAS Management Console as an unrestricted user.
   
   To access SAS Management Console, from your Windows desktop, select **Start ➔ Programs ➔ SAS ➔ SAS Management Console**.
   
2. Navigate to the Data Library Manager.
3. Right-click **Libraries** and select **New Library** from the drop-down list. The New Library Wizard opens.
   
   As shown in the following display, select **Generic Library** from the list of Resource Templates.
4. On the next page of the wizard, enter the name of the new library. Use the **Browse** button to display the list of folders from which you can select the **Location** that you want to use for your library.
5. On the next page of the wizard, from the list of available servers select **SASITRM**.

6. On the next page, specify the fields as shown in the following display.

![Figure A2.5 Enter Information for the Libref](image-url)
In the Libref field, enter the name by which you want to refer to the new library.

In the Engine field, enter pcfiles.

In the Option(s) to be appended field, enter the specifications for the server, port, and path.

The following example shows how to enter these specifications.

```
server="server56.na.co.com" port=9621
path="D:\Public\ReporterDatabase29Feb2008.mdb";
```

Note: You do not need to specify a path in the Path Specification box. The path should be entered in the Option(s) to be appended field, as shown in the preceding code fragment.

7. Click Next and then Finish to create the new library.

---

**MS SCOM - Accessing Data**

### About Accessing MS SCOM Data

The MS SCOM adapter can read performance data from the SQL Server Operations Manager data warehouse. For the MS SCOM adapter, the relational database must be a Microsoft SQL Server database. The MS SCOM adapter captures the performance data from Windows environments.


Note: In SAS IT Resource Management 3.6 and later, the data model is updated to extract the 2003, 2008, and 2012 version measurements. If you are using previous releases of SAS IT Resource Management and are unable to migrate to SAS IT Resource Management 3.6, 3.7, or 3.8, you can use the %RMMSCOM macro. This macro supports the extraction of the measurements of all other management packs (from any management pack version later than 2003). For information about how to run the %RMMSCOM macro, see “%RMMSSCOM” on page 604.

The MS SCOM data source is SQL Server Database. Therefore, you need to set up the ODBC server definition in order to access the data from the database.

The data from the SQL Server database is read directly into the Adapter Setup wizard. Once ODBC setup is defined, you can create the database server and set up the library that points to the database in SAS IT Resource Management or in SAS Management Console. After the library is defined, it can be specified as the input database to the MS SCOM staging transformation.

Note: For more information about setting up an ODBC server definition, see “Preparing a Database Adapter for Staging” on page 431.

Note: For information about using MS SCOM to access resources from Amazon CloudWatch, see “Notes about Amazon CloudWatch” on page 409.
SAP ERP - Accessing Data

Preparing SAP ERP Data for SAS IT Resource Management

Enterprise Resource Planning (ERP) Software from SAP (formerly SAP R/3), via the SAS IT Management Adapter for SAP, collects SAP ERP and SAP Business Warehouse (BW) workload performance measurements. The SAS server that is used to run the batch ETL work for SAS IT Resource Management can also run the Remote Function Call (RFC) server. The SAP Advanced Business Application Programming (ABAP) code that is executed on the SAP system sends the requested data to the RFC server. The data is stored on that RFC server or on a disk drive that can be accessed on the network.

To enable this communications process, perform the tasks that are listed in the following topics.

Install the Components of ITM Adapter for SAP ERP

Part of the server installation includes transport files that must be moved to the SAP system and installed there. These files include the ABAP programs that enable the extraction of the performance data. For information about how to install these files, along with other components that need to be installed, see the SAS IT Management Adapter for SAP: User's Guide.

Establish Communications between SAS and SAP

The following information pertains to the establishment of communications between SAS and SAP:

• In the previous releases (2.7 and 3.1) of SAS IT Resource Management Adapter for SAP, a SAS RFC server was needed. This server enabled communication between the SAS/ACCESS Interface to R/3 and the SAP system.

• From SAS IT Resource Management Adapter 3.2 and later, the SAS IT Resource Management Adapter for SAP enables the SAS/ACCESS Interface to R/3 to communicate directly with the SAP system. Therefore, a SAS RFC server is not required.

However, SAS/ACCESS Interface to R/3 software requires additional setup to connect to the SAP system. For more information, see the chapter called "Installing SAS/ACCESS Interface to R/3 Software" in the Post-Installation Instructions for SAS/ACCESS 4.4 Interface to R/3.

• A SAS RFC server is needed for the LIBNAME engine on z/OS. SAS/ACCESS Interface to R/3 for z/OS includes RFC servers for z/OS, AIX, and Windows.

• The SAS RFC server is no longer supported for the SAS/ACCESS Interface to R/3 for Windows and UNIX.

For more information about running the RFC server on z/OS, see the chapter called “Installing SAS/ACCESS Interface to R/3 Software on z/OS” in the Post-Installation Instructions for SAS/ACCESS 4.4 Interface to R/3. This document is available at http://support.sas.com/.
Create SAS Metadata Objects Using SAS Management Console

In SAS IT Resource Management Adapter for SAP, the deployment is done automatically by the SAS Deployment Wizard. In the previous version of the adapter, the metadata of the jobs and tables had to be deployed manually.

Configuration steps are now automated. Therefore, all SAS metadata server objects that represent SAP systems, authentication domains, and data libraries are automatically accessible through SAS Management Console after the SAP Adapter is installed.

However, you must provide correct SAP server details along with the credentials in place of existing (sample) details for those particular objects. To complete the installation of the SAP Adapter, perform the following customization steps:

1. In SAS Management Console, log on as the administrative user.
2. From the navigation pane, select User Manager. From the list of users, select IT Resource Management SAP Users Accounts. Click New to enter the correct credentials (user ID and password) for the SAP server.

Make sure that SAS Demo User, or any user ID that does not have the administrative rights, is included in the SAS IT Resource Management SAP Users Group in SAS Management Console.

3. From the navigation pane, select Server Manager. Enter correct SAP Server details (that is, server name and system number) for the SAS IT Resource Management SAP Server.
4. Modify the SASV9.CFG file to replace “en” with “u8” if your SAP system is a Unicode system. The default path for SASV9.CFG is <SASHome>SASFoundation\9.4.
5. Enter SAS Demo User or any user ID and password (that does not have the administrative rights) to the get_sap_lib_info.sas program. The default location for this program is <Config>Data\ITManagementAdapterSAP\CustomSASCode.
6. If you want to extract data from any new SAP server or multiple servers, enter the correct libref for the preprocglobal.sas program.

For more information about how to customize and create new objects on different environments, see the section called “Define an SAP Server and an SAP Library” in the SAS IT Resource Management Adapter for SAP: User’s Guide.

Configure Sample Data Extraction Jobs Using SAS Data Integration Studio

In SAS IT Resource Management Adapter for SAP, the deployment is done automatically by the SAS Deployment Wizard. In the previous version of the adapter, the metadata of the jobs and tables had to be deployed manually. After the installation is complete, a new folder named SAS IT Resource Management Adapter for SAP is added to the Products folder.

The following section describes the SAS IT Resource Management jobs that are provided with the SAS IT Resource Management Adapter for SAP. The SAS IT Resource Management jobs require customization so that they reference the SAP servers. Each sample job is used to achieve a particular objective. These sample jobs are installed automatically during deployment in the Jobs folder.
To customize the SAS IT Resource Management Adapter for SAP for your SAP environment, you need to review and change several jobs or programs in the SAS Data Integration Studio or SAS IT Resource Management client.

The following scenario describes the jobs that handle both single and multiple SAP servers.

1. **0010 Step 1 Select SAP Servers**: This job lists the servers that are monitored. The job appends the attributes of the source SAP servers to the Admin SAP Server Libraries table. The job uses the Libref Collector transformation, which extracts the details of all the SAP libraries registered in the SAS Metadata Server.

   You need to apply a filter if you want to restrict some libraries of SAP servers. Otherwise, you can leave the job as it is shipped.

   To customize this job, provide the libref values of the relevant SAP servers to the macro variable in Preprocglobal.sas program, which is used in this job.

2. **0020 Step 2 Suggest Destinations for Selected SAP Servers**: This job extracts host information from those SAP servers.

3. **0030 Step 3 Create Final List of Servers and Destinations**: This job checks for duplicate servers and release compatibility.

4. **0040 Step 4 Create Mapping for SAP Program Types**: This job creates a table that maps SAP programs to applications.

5. **0110_1A Extract Default Performance Data from SAP Server**: This job extracts default SAP performance data.

6. **0110_1B Extract All Performance Data from SAP Server**: This job extracts all the SAP performance data.

   **Note**: You need to deploy or schedule either the 0110_1A or 0110_1B job. The job extracts the SAP ERP performance data and stores it in the raw data SAS library. Ensure that it is run on a regular basis so that you do not lose performance data. (Some sites run it every hour.) This job writes to the raw data library, appending data each time it is run, so that no data is overwritten.

   The raw data library must be specified as the input raw data library to the SAP ERP staging transformation. The ETL process that this transformation runs reads the raw data library and generates staged tables into the IT data mart. However, it does not clear the contents of the raw data library.

   **TIP** Automate a backup job that copies the raw data library to an archive location. Then empty the raw data library before the execution of the next extraction job.

   **Note**: To generate the reports, it is recommended to run Adapter extraction using the direct extraction method. For more detailed information about these tasks, see the *SAS IT Resource Management Adapter 3.8 for SAP: User’s Guide*.

For information about the performance areas that are collected by SAP ERP, see “SAPR3 Adapter - Systems, Machines, Tasks, and Transactions” on page 554 and “SAPR3 Adapter - SAPBTCH (Batch Job) and SAPWKLD (Workload)” on page 555.
SAS Environment Manager (SAS EV) — Accessing Data

About the SAS Environment Manager Adapter

SAS IT Resource Management provides the SAS Environment Manager (SAS EV) adapter. This adapter supports these raw data sources:

- agent-collected metrics (ACM)
- audit, performance, and measurement (APM)

Note: Here are the ACM and APM data source locations on Windows:

- SAS ACM data source raw data tables are located here: `C:\<levelroot>\Web\SASEnvironmentManager\emi-framework\Datamart\acm`
  
  For example, raw data tables might be here:
  
  **Windows Specifics**
  
  `C:\SAS\Config\Levl\Web\SASEnvironmentManager\emi-framework\Datamart\acm`

- SAS APM data source raw data tables are located here: `C:\<levelroot>\Web\SASEnvironmentManager\emi-framework\Datamart\artifacts`
  
  For example, raw data tables might be here:
  
  **Windows Specifics**
  
  `C:\SAS\Config\Levl\Web\SASEnvironmentManager\emi-framework\Datamart\artifacts`

These raw data sources might require that you customize the SAS Environment Manager framework to stage the data appropriately for the SAS Environment Manager adapter.

Preparing SAS Environment Manager Data (Data Marts) for SAS IT Resource Management

Starting with SAS IT Resource Management 3.7, the SAS Deployment Wizard automatically deploys the SAS Environment Manager service management architecture framework. After installing SAS Environment Manager, you can view its contents at this location: `C:\<levelroot>\Web\SASEnvironmentManager\emi-framework`

The following display shows the contents of the SAS environment manager directory.
After SAS is installed, you need to perform additional manual steps before configuring the service management architecture framework. You must perform these steps to collect the SAS tables of reporting data that are needed for the SAS Environment Manager adapter. The manual steps are listed here:

SAS_Environment_Manager_Service_Architecture_Quickstart.pdf, which is available under the emi-framework folder. (For example, on Windows the document can be found under this folder: `C:\SAS\ITRMVA\Lev1\Web\SASEnvironmentManager\emi-framework`.)

**How to Specify the Raw Data Library for the SAS Environment Manager Adapter**

For both ACM and APM data type sources, the raw data library must be specified as the input raw data library to the SAS Environment Manager adapter staging transformation. The ETL process that this transformation runs reads the raw data library and generates staged tables into the IT data mart.

To set up a library, perform the following steps:

1. Open the SAS Environment Manager adapter staging job. Log on to the SAS IT Resource Management client as an unrestricted user.

   **CAUTION:**

   You must use the staging transformation to create the raw data libraries that this adapter requires. Do not use SAS Management Console to create these libraries.

2. Right-click the SAS Environment Manager adapter staging transformation and select **Properties**. The SAS Environment Manager Staging Properties window appears.
3. Select the **Raw Data Input Libraries** tab, as shown in the following display.
The following actions are available:

- The **New** button adds a new row in the table that displays all the raw data input libraries. This action enables you to specify a library that can be used to stage raw data for the SAS EV adapter.

- The **Add** button lets you select an existing library that can be used to stage raw data for the SAS EV adapter. The selected library must have a **Library Type** of ACM or APM. It must also have a value for the **Server Name**.

- The **Remove** button deletes the selected library.

4. To create a new library, select **New**.

5. Enter the raw data library name and location.

   **Note:** For the **Name** field, enter the name of the library that is associated with the ACM or APM data source.
6. On the next page of the wizard, select the SAS Application Server name.
7. On the next page of the wizard, specify the library type, server name, libref, and data path.
To complete this page, perform the following steps:

a. **Library Type** identifies the SAS library that is required for the SAS EV adapter. Use the down arrow to select ACM or APM. A value is required in this field.
   - Select **ACM** if your raw data input consists of agent-collected metrics.
   - Select **APM** if your raw data input consists of audit, performance, and measurement data.

   *Note:* By default, the Adapter Setup wizard creates staged tables for both ACM and APM data types. If you want to process only one type of table (that is, either the ACM or APM tables), you must manually delete the tables that you do not want to use. Alternatively, instead of using the Adapter Setup wizard, you can create the staging transformation manually and specify that only one type of table be processed.

b. **Server Name** is the name of the server where the raw data is collected or processed. A value is required in this field. The value can contain a maximum of 200 characters.

c. **Libref** is the name that is associated with the library. A value is required in this field. Libref names must be unique within the SAS Application Server.

   **CAUTION:**

   *A libref can consist of no more than eight characters.* The libref must begin with a letter (A through Z) or an underscore (_). The remaining characters of the libref must be letters (A through Z), numerals (0 through 9),
or an underscore (_). The libref cannot contain spaces. If your libref does not conform to these rules, the library is not created.

d. **Data Path** specifies the location of the raw data input library. The length of this path can be no more than 200 characters. A value is required in this field.

Enter values in this field manually. Alternatively, click **Browse** to select a path to the library from the Select a Directory dialog box that displays the directory structure of your file system.

*Note:* **Browse** is disabled when the selected application server is running on a machine that uses the z/OS operating system. Enter the z/OS path manually by using either a prefix for a traditional z/OS file system path (**MY.DATAMART**) or a root directory in the zFS hierarchical file system (**/u/myname/datamart**).

8. The last page of the wizard enables you to review the summary.

---

**Figure A2.12** Summary Page of the New Library Wizard

---

**Working with IBM SMF Custom Tables**

**IBM SMF Custom Tables**

SAS IT Resource Management provides support for more than 1,100 tables in the IBM SMF adapter. However, it does not support every table that MXG can produce from IBM
SMF data. For those instances, you can extend the functionality of the IBM SMF staging transformation to load data into user-defined tables for which SAS IT Resource Management does not provide a template. These are called IBM SMF custom tables.

To create an IBM SMF custom table, you must create (or register) metadata about the physical MXG data set or table. You can use the New Table wizard to do so. The physical table must exist first and it must contain a column (variable) called DATETIME to enable it to be added to a user-defined table. If the default definition for the MXG data set does not contain DATETIME, it can be added simply by using MXG exits. This process is documented in the first step of the following task. Once the MXG data set is registered, it can be added as an output table to the IBM SMF staging transformation. It can also subsequently be read into an Aggregation transformation.

**How to Load IBM SMF Data into User-Defined Tables**

To load IBM SMF data into user-defined tables for which SAS IT Resource Management does not provide a template, perform the following steps:

1. If your MXG data set (with the DATETIME variable present) already exists as a physical table, skip this first step.

   Otherwise, create it now using regular MXG coding techniques. If a DATETIME variable is not defined for the MXG data set, you must identify the variable that contains the datetime stamp for each event or interval that the data represents. Then, modify the EX exit member that contains the OUTPUT statement for that table to also contain an assignment statement of the form:

   \[
   \text{DATETIME}=\text{mxg\_variable};
   \]

   You must also add the DATETIME variable to the output data set's keep list. To do so, add it to the \_Kdddddd. For example:

   ```
   \%MACRO _KTY1415 DATETIME
   \%
   The preceding example adds the DATETIME variable to the keep list for the TYPE1415 table. Look up the correct names for the EX member and the \_Kdddddd macro for your data source in the MXG documentation.

2. Because you do not want the SAS IT Resource Management staging transformation to write to this copy of the MXG data set, make a copy of the physical MXG data set. You can put the copy in any writable library, such as the Staged library of your IT data mart.

3. Modify the MXG\_PROPS\_SMF format that maps the name of the tables to the MXG code that has to be executed. Locate the source for this format in your SASHELP.ITMS\_FORMATS catalog. In the format, the value to be formatted is the MXG data set name, and the resulting label is a string of MXG code members and macro names. Add a new line to the format containing your MXG data set name and the name of the MXG code and macros using what is there as a template. Make sure that the text strings start in the same columns. When you execute PROC FORMAT, revise the LIBRARY= parameter in the PROC statement to ensure that the output catalog in the PROC FORMAT statement is pointing to the FORMATS catalog in the Admin library. This revision of the LIBRARY= parameter creates the format in your Admin library that precedes the SASHELP.ITMS\_FORMATS in your FMTSEARCH SAS option. Therefore, this format is used instead of the one supplied at installation time.

   Note: Your own formats can be put in the FORMATS catalog in the Admin library or in your own catalog. If you use a different catalog, you need a LIBNAME
statement for that library. You then need to add to the FMTSEARCH option to point to your formats. For example:

```sas
options insert=(fmtsearch=(mylib.formats));
```

(For information about the INSERT option, see *SAS 9.4 System Options: Reference.* )

The task of allocating the Admin library requires you to have Update access to it. The allocation can be achieved only when no other SAS IT Resource Management ETL jobs are running against this IT data mart. You must execute the following statement in a SAS session:

```sas
libname admin "path_of_Admin_library";
```

where "path_of_ADMIN_library" can be found in your SAS IT Resource Management or SAS logs, or by querying the ADMIN library of your IT data mart within SAS IT Resource Management.

4. Start SAS Data Integration Studio and use the Register Tables wizard from the *File* menu to register your MXG data set as a user-defined table.

To register your MXG data set as a user-defined table, perform the following steps:

a. On the first page of the Register Tables wizard, select SAS as the source type.

b. In the *Library* field, select the library that contains your MXG data set. If you copied your MXG data set to a library that has already been defined in metadata, select the appropriate library from the SAS Library list. If you copied it to a library that has not yet been defined in metadata, and the library is not in the list, then you must define a new SAS Library in metadata. You can do so by selecting New.

c. On the following screen, select the MXG data sets that you want to import metadata from.

d. Choose a folder to store the metadata. It should be a folder in the same IT data mart that contains the job to which you want to add this table.

e. Select Finish on the confirmation screen to import the metadata. The MXG data sets should appear in the folder that you selected in the previous step.

   *Note:* A slightly different icon is associated with the table because it is not backed by a SAS IT Resource Management staged table template.

5. Add the new user-defined table as an extra output of the IBM SMF staging transformation in your existing jobs. To do so, perform the following steps:

a. Double-click the appropriate job. It appears on the *Diagram* tab of the Job Editor window.

b. In the Transformations tree of SAS IT Resource Management, expand the SAS IT Resource Management folder and locate the IBM SMF staging transformation. Drop that staging transformation onto the Job Editor window. The staging transformation appears in the process flow diagram for the job.

c. Right-click the IBM SMF staging transformation and select Add output.

d. Drag the new user-defined table from the IT data mart to the drop zone that now appears on the process flow diagram.

e. Save the job.

6. Run the job or deploy it for subsequent batch execution, as you would any other SAS IT Resource Management job.
Working with MXG Code to Stage Data

About MXG Adapters

Raw data sources that are supported through MXG, such as z/OS data sources, might require that you customize some of the MXG code. These changes might be required in order to stage the data appropriately for the MXG adapters that SAS IT Resource Management provides.

SAS IT Resource Management uses the following environment variables to locate the MXG sourclib and format data sets:

- `MXGSRC=` Location of the MXG Sourclib library
- `MXGFMT=` Location of the MXG format library

**Tip** In order to be processed correctly, your raw data sources might need to be stored with specific attributes, such as the data control block (DCB) parameter. For best results, review the staging parameters and the defaults that apply to your adapter. For more information, see Appendix 3, “Staging Parameters” on page 477.

On z/OS, these configuration settings are specified in the COMMON member of the `<hlq>CONFIG PDS`, using the SET SAS system option. To override the physical locations to which these environment variables refer, you must manually add one of the following options to the SITE member of your high-level-qualifier.CONFIG data set:

```shell
SET='MXGSRC (<custom> <sourclib>)'
SET='MXGFMT <formatlib>'
```

In the preceding code fragments, the following definitions apply:

- `custom` is the path to your MXG custom source library. It is referred to as MXGUSER.SRCLIB.
- `sourclib` is the path to your MXG source library. It is referred to as MXG.SRCLIB.
- `formatlib` is the path to your MXG format library. It is referred to as MXG.FMTLIB.

**Tip** The MXG source and format libraries must be specified using a SAS configuration file as noted above, and not via JCL or other external allocation method. Otherwise, the staging job fails with the following message:

```
ERROR: MXGFMT or MXGSRC configuration settings have been overridden by the pre-allocation of LIBRARY or SOURCLIB datasets. These allocations must be removed.
```

For information about configuration files or the SET SAS system option, see the Operating Environment Specific Information (that is, the Companion) for your SAS installation at [http://support.sas.com/documentation/onlinedoc/base/index.html](http://support.sas.com/documentation/onlinedoc/base/index.html).

SAS IT Resource Management supports the following MXG adapters:

- IBM DCOLLECT
- IBM EREP
IMACWORK and RMFINTRV Customizations Relevant to the RMF Domain Category of the SMF Adapter

The IMACWORK and RMFINTRV members define the service classes (for those running in goal mode) or performance groups (for those not running in goal mode) that make up the workloads at your site. As with all MXG customizations, copy the member that you want to modify from MXG.SRCLIB to MXGUSER.SRCLIB. Edit these copies according to the instructions or comments therein. Both members contain important notes about the mixing of service classes with reporting classes (in goal mode) and control performance groups with report performance groups (not in goal mode). A good job of customizing these members ensures useful information in the XRMFWKL, XRMFWKP, and XRMFINTRT tables.

Notice that the RMFINTRV member permits the specification of more workloads than the IMACWORK member permits by itself. Depending on your requirements, you could edit just one, or both, of these members.

If you want to simultaneously process SMF data from multiple machines and if these machines have defined different RMF intervals, then you must also review the setting of the INTERVAL= macro parameter of the %VMXGRMFI macro in the RMFINTRV member. The value that you choose for this parameter must be an interval into which all RMF intervals that are being processed divide evenly, without a remainder. For example, if the RMF intervals of two machines are 10 minutes and 15 minutes, use INTERVAL=HALFHOUR. Review the comments in the RMFINTRV member for all possible values for INTERVAL=. Even if you choose to process the data from different machines in different executions of the same staging job, subsequent analysis of the data is more effective if both sets of the data are processed with the same value for the INTERVAL= parameter.

IMACSHFT Customizations Relevant to All Domain Categories of the SMF Adapter

The IMACSHFT member is used to define your shift patterns. By default, the SHIFT variable in the SAS IT Resource Management staged tables is populated from a formula that is supplied with SAS IT Resource Management, and is not propagated from MXG. The definition of the SAS IT Resource Management shift formula can be changed to any valid SAS expression, or set of DATASTEP statements.

Note: The SHIFT variable in MXG is automatically preserved in a column called SHIFT_MXG. If you want to use the value that is in SHIFT_MXG as your SHIFT variable, assign it to the SHIFT column. You can do so by using this ASSIGNMENT statement:

SHIFT=SHIFT_MXG;
Customizations Relevant to the Jobs Domain Category of the SMF Adapter

**IMACSPIN Customizations**
The IMACSPIN member is used to specify the number of days for which incomplete jobs are retained in SPIN data sets. They are retained until either the jobs become complete or the time specified in the IMACSPIN member elapses. The default value is zero.

For information, see the comments in the IMACSPIN member.

**IMACINTV Customizations**
To enable the collection of SMF interval data, you must first ensure that your system is configured to generate the SMF interval accounting records. Work with your systems programming team to determine the changes that might be required in MVS system data set, SYS1.PARMLIB(SMFPRMxx).

When that change is made, you must also modify the IMACINTV MXG member. The default is set so that no TYPE30_V (SMF interval accounting) records are written to SAS data sets. You must copy IMACINTV from MXG.SRCLIB to MXGUSER.SRCLIB and remove the comments from around the OUTPUT statement, as described in the comments in the member.

*Note:* You can be selective about how many observations (or records) are written, by coding **IF** and **THEN** statements. The comments in the member contain examples.

Customizations Relevant to the CICS and DB2 Domain Categories of the SMF Adapter

**IMACEXCL and UTILEXCL Customizations**
The IMACEXCL member contains the original methods by which modifications to the CICS SMF type 110 record were supported in the MXG code that read them. These original methods have been superseded by the UTILEXCL member. The UTILEXCL member is the preferred method to dynamically create a new IMACEXCL member that is customized to support the actual SMF data being used at your site. The code is designed to run once, to generate the IMACEXCL member. You must then store that member in MXGUSER.SRCLIB to enable the SMF records to be decoded correctly into the SAS data sets.

**ASUMCICX Customizations**
SAS IT Resource Management has added response time counters to the summarized CICS table that MXG generates by default. To implement this feature, copy the ASUMCICX member from the ITRM.CPMISC pds to your MXGUSER.SRCLIB. Failure to do this causes warning messages to be issued about missing variables.

*Note:* SAS IT Resource Management is adapted to include the new metrics that the ASUMCICX member creates. This MXG member is stored in a location that is based on the operating environment.

Windows Specifics
SASHome\SASFoundation\9.4\itmsmvadata\sasmisc

UNIX Specifics
Before you use the ASUMCICX member, you must run the UTILEXCL MXG job. This job creates and implements the IMACEXCL member that is customized for your site. Documentation for ASUMCICX and UTILEXCL can be found inside each member.

**IMACUOW Customizations**

By default, ASUMCICX and ASUMUOW write zero observations to the SAS data set. To process unit-of-work data, you must modify the IMACUOW MXG member. Copy it to your MXGUSER.SRCLIB and comment out (or delete) the first definition of the two macros, _NOOBS and _YESOBS. Then remove the comment indicator from the second definition, so that the macros are defined as follows:

```
MACRO _NOOBS %
MACRO _YESOBS %
```

In addition, if you have MQ series data that you want to add to the CICS and DB2 unit-of-work process, modify the code as instructed in IMACUOW to remove the comment indicator from the following statement:

```
%LET MXGMQADD=YES;
```

**IMACUOWT Customizations**

By default, no ASUMUOWT observations (or records) are written to the SAS data set. To process unit-of-work data from ASG TMON for CICS and SMF DB2, you must modify the IMACUOWT MXG member. Copy it to your MXGUSER.SRCLIB and comment out (or delete) the first definition of the two macros, _NOOBS and _YESOBS. Then remove the comment indicator from the second definition, so that the macros are defined as follows:

```
MACRO _NOOBS %
MACRO _YESOBS %
```

**Customizations Relevant to the Jobs Domain Category of the CA TMS Adapter**

By default, there is no single DATETIME variable that represents the date and time of each observation. Copy members IMACTMS5 and EXTMSDSN to your MXGUSER.SRCLIB. In the IMACTMS5 member, add the variable DATETIME to both the _KTMSDSN and _KTMSTMS macros by using the following code:

```
MACRO _KTMSDSN DATETIME %
MACRO _KTMSTMS DATETIME %
```

In the EXTMSDSN member, insert the following line of code in front of the OUTPUT statement:

```
RETAIN DATETIME *&SYSDATE:*&SYSTIME*DT;
```
Customizations Relevant to the ASG TMON2CIC Adapter

If you are processing compressed TMON CICS records, you must perform the following steps:

1. Copy the member EXITMON6 to your MXGUSER.SRCLIB, and follow the instructions therein to assemble and install the MXG INFILE exit "TMON". When specified in the INFILE statement, it permits both compressed and uncompressed records to be processed without intervention.

2. Copy the member IMACTMO2 to your MXGUSER.SRCLIB. As described therein, modify it to remove the comments from these three lines of code:

   MACRO _MONI;
   INFILE MONICICS TMON STOPOVER LENGTH=LENGTH COL=COL;

   This change causes the INFILE statement to use the TMON exit described in the preceding step.

3. Run the staging job.

Customizations Relevant to the ASG TMONDB2 and ASG TMONDB2 V5 Adapters

If you are processing compressed TMON DB2 records for either of these adapters, you must perform the following steps:

1. Copy the member EXITMON6 to your MXGUSER.SRCLIB, and follow the instructions therein to assemble and install the MXG INFILE exit "TMON". When specified in the INFILE statement, it permits both compressed and uncompressed records to be processed without intervention.

2. If you are running a version of ASG TMON DB2 prior to V5, copy the member IMACTMDB to your MXGUSER.SRCLIB. As described therein, modify it to remove the comments from these three lines of code:

   MACRO _TMDB;
   INFILE TMDBIN TMON STOPOVER LENGTH=LENGTH COL=COL END=END;

   This change causes the INFILE statement to use the TMON exit that is described in the preceding step.

   If you are running version 5 (or higher) of ASG TMON DB2, copy the member IMACTMD2 to your MXGUSER.SRCLIB. Add the following three lines to the bottom of the member:

   MACRO _TMD2;
   INFILE TMD2IN TMON STOPOVER LENGTH=LENGTH COL=COL;

   This change causes the INFILE statement to use the TMON exit that is described in the preceding step.

3. Run the staging job.
Specify Spin Libraries for ASG TMON2CIC and IBM SMF

The ASG TMON2CIC and IBM SMF adapters require that you specify a spin library for spin data. The staging transformations for these adapters create and register a separate spin library. Any existing data is moved to the new spin library as part of the installation, update, or migration process.

For the ASG TMON2CIC and IBM SMF adapters, a spin library must be created. You can create this library on the Spin Library tab of the staging transformation properties. On this tab, you can specify various parameters of the spin library or accept the default values. The spin library is then created only after you open the Spin Library tab and select OK. (If you are using the Adapter Setup wizard to specify the ASG TMON2CIC and IBM SMF adapter, the wizard creates the spin library for you.)

To specify a spin library for ASG TMON2CIC or IBM SMF, perform the following steps:

1. From the Properties window of an ASG TMON2CIC or IBM SMF staging transformation, click the Spin Library tab.

2. Confirm that the IT data mart is correct for the current job. The value in this field cannot be changed.

3. Specify the Name and Description of the spin library. SAS IT Resource Management generates default values for these parameters that include a standard naming convention for the library name (adapter name + Spin + unique number). For best results, if you modify the library name, use a standard naming...
convention that implements unique, identifiable names for all spin libraries that you register. A name value is required and a description is optional.

4. Confirm the values for the Server and Libref fields for the IT data mart and spin library. The values in these fields cannot be changed.

5. Enter the value for the Path Specification field for the metadata path that stores the spin library. SAS IT Resource Management generates the default path `<adapter name> + Spin + <unique number>`. You can accept the default path, enter a new path, or click Browse to select a path. A value is required in this field.

   Note: Browse is disabled when the selected application server is running on a machine using the z/OS operating system. When entering a z/OS path manually, you can use either a prefix for a traditional z/OS file system path (MY.DATAMART) or a root directory in the zFS hierarchical file system (/u/myname/datamart).

6. If you are creating and registering libraries on z/OS, specify the following values:
   - file system device
   - the number of cylinders to use as the primary and secondary space allocation for the data set
   - the number of volumes to use when allocating space

   A value is required for these parameters only if you are working with z/OS.

7. Click OK. The staging transformation creates the spin library as specified.

**Limit IBM SMF Records**

You might want to limit the IBM SMF records that are processed into an aggregation table to specific systems. To do so, you can use an aggregation filter. However, the disadvantage of using an aggregation filter is that the staging code is unnecessarily processing system data that will not be aggregated. In addition, this requires that a filter be set on each and every SMF aggregation. It is more efficient to filter data during the staging job processing.

To limit the IBM SMF records in order to process only specific systems in SAS IT Resource Management during a staging job process, add an IF statement in the IMACFILE MXG member. For example, to process only those records from a 'PROD' and 'TEST' system, perform the following steps:

1. Place a copy of the IMACFILE MXG SOURCLIB member into your user MXG SOURCLIB.

2. Modify the user IMACFILE MXG SOURCLIB member with the following SAS statement:  
   ```sas
   IF SYSTEM IN ('PROD','TEST'); /*Only process records for these systems*/
   where the systems for which you want to process IBM SMF records are listed in the IN clause.
   ```

   For more examples or information about coding the IF statement, see the documentation inside the IMACFILE MXG SOURCLIB member.

   Note: IMACFILE is a specific exit point taken by all SMF records, immediately after the SMF header is read. This exit point can be used if you want to bypass the processing of a record based on the machine that produced it.
How MSU and MIPS Columns Are Included in Staged Tables for the SMF Adapter

Overview of the MIPS and MSU Automation Process

In SAS IT Resource Management 3.2 and later, additional columns are included. These columns enhance the reporting of resource utilization for various categories of SMF activity, such as systems, LPARs, workloads, workload periods, jobs, TSO and OMVS sessions, and more. The additional columns reflect MSU (millions of service units) and MIPS (millions of instructions per second) based on CPU time expended during the activity. These columns are distinct from other MSU-related columns that are already present in the SMF raw data. The following topics explain how the population of these new resource utilization columns in several of the SMF performance-based adapters and tables were automated.

Calculation Dependencies for MIPS and MSU Columns

The calculation of MIPS and MSU columns for SMF staged tables depend on the following items:

- the creation of the MXG RMF interval data set. The following columns are extracted directly or derived from this data:
  - ID of the physical machine (MXG column SYSTEM)
  - ID of the physical CEC (MXG column CECSER)
  - CPU Model ID (MXG column CPCFNAME)
  - CPU Model Capacity Type (Full or Sub, value determined from CPCFNAME value)
  - Number of CPUs for the CPU model (MXG column NRCPUS)
  - Number of IFA specialty engines configured for use (MXG column NRIFAS)
  - Number of ZIP specialty engines configured for use (MXG column NRZIPS)
  - Total configured CPU engines. This column is the key merge column with the IBM Large System Performance Reference (LSPR) information.
    - If the CPU model is full capacity, this column is calculated as the sum of all configured standard, IFA, and ZIP engines.
    - If the CPU model is sub-capacity, the MXG column NRCPUS value is used.
  - Adjusted CPU Model ID:
    - If the CPU model is full capacity, the value of this column is determined by recalculating CPU engine specification to include the quantity of those IFA and ZIP engines that are also configured.
    - If the CPU model is sub-capacity, the MXG column CPCFNAME value is used.
  - Software service unit rate constant (MXG column CECSUSEC)
  - Hardware service unit rate constant (MXG column SU_SEC)
• CPU Model MSU capacity (MXG column CPCMSU)
• Minimum datetime present in the RMF interval data for the combination of the previously listed columns
• Maximum datetime present in the RMF interval data for the combination of the previously listed columns
• the availability of Vendor-supplied LSPR Resource Chart from IBM, from which the following columns are extracted:
  • CPU Model ID (This column is labeled Processor in the Vendor-Supplied LSPR Resource Chart. It is a key column that is used for merging with RMF interval data.)
  • CPU model available CPUs (This column is labeled #CP in the resource chart.)
  • IBM Processor Capacity Index (Also known as MIPS, this column is labeled PCI in the Vendor-Supplied LSPR Resource Chart.)
  • CPU Model MSU capacity (Also known as MSU, this column is labeled MSU in the Vendor-Supplied LSPR Resource Chart.)
• the normalization of all CPU times used in MSU and MIPS calculations. (Based on current information, these CPU times are normalized in MXG.)

As noted in the preceding list of required items, MSU columns and MIPS columns require that the MXG RMF Interval data set be created. This table requires SMF record types 70, 71, 72, 75, and 78 to be present in the raw data that is being processed. If these record types are not present, the RMF Interval data set will be empty and the MIPS columns will be missing. For more information, see “New MSU and MIPS Fields in the XJOBS Table That Depend on RMF Data” on page 465.

The presence of these record types is especially important when staging the XJOBS table if you have a separate staging job for the XJOBS staged table. If the RMF data is not stored on the same raw data file as the SMF records for jobs, concatenate the two SMF files together. Thus, SMF records that are related to jobs and RMF data are both available to the XJOBS staging job. It is not necessary to add the RMF Interval table, XRMFINT, to the XJOBS staging job.

**Working with LSPR Tables**

SAS IT Resource Management supplies an initial copy of a SAS data set that is called ITMS_SMF_LSPRDATA. The version of the Large System Performance Reference (LSPR) table that forms the basis for the table that is shipped with SAS IT Resource Management 3.6 and later is z/OS V2 R1. It is dated January 2015.

This data set is stored in the SASHELP library and contains LSPR information that is based on the IBM table for z/OS V2 R1. The data set also contains columns that enhance the reporting of resource utilization for various categories of System Management Facility (SMF) activity. Among these categories are systems, logical partitions (LPARs), workloads, workload periods, TSO and OMVS sessions, and jobs. The additional columns are distinct from other MSU-related columns that are already present in the SMF raw data. They reflect MSU and MIPS and are based on the CPU time expended during the activity. You can use the LSPR tables to prepare and initialize the MIPS and MSU columns.

SAS IT Resource Management can merge the LSPR information with staged Resource Management Facility (RMF) interval data. For information about this topic, see “Staging Methodology for MIPS and MSU Columns” on page 463.
Initialization and Preparation of the MIPS and MSU Columns

Methods for Including MIPS and MSU Columns in Staging Tables

**TIP** The following methods update the SAS IT Resource Management Admin library. Therefore, make sure that you have a backup copy of that library before you proceed.

To import MIPS and MSU columns for inclusion in your staging tables and to save them into a permanent SAS data set, perform one of the two following methods:

- Method 1, which is applicable to all operating systems
- Method 2, which is applicable to all operating systems except z/OS

The following method, Method 1, is applicable to all operating systems.

**TIP** Be sure to specify `http` instead of `https` in the FILENAME statement. In addition, verify that the URL specified for isprurl is the location of the LSPR table that is appropriate for your site.

Run the following code:

```sas
libname admin "<location-of-the-ADMIN-library>";

data work.isprdata;
  infile isprurl;
  retain found_toc found_thead found_th td_idx 0;
  retain CPCFMODL LSPRPCPU LSPRPCI LSPRMSU;
  length CPCFMODL $8;
  keep CPCFMODL LSPRPCPU LSPRPCI LSPRMSU;
  array td_array{3} LSPRPCPU LSPRPCI LSPRMSU;
  input @;
  if not found_toc and index(_infile_,'Table of contents') = 0
    then return;
  found_toc=1;
  if index(_infile_,'<thead>') then found_thead=1;
  if index(_infile_,'</thead>') then found_thead=0;
  if not found_thead and index(_infile_,'<th ') then do;
    then do;
```
found_th = 1;
CPCFMODL = reverse(scan(reverse(_infile_),2,'<>'));
end;

else if not found_thead and found_th and index(_infile_,'<td ')
then do;
td_idx + 1;
td_array{td_idx} = input(reverse(scan(reverse(_infile_),2,'<>'),comma10.));
if td_idx = 3
then do;
output;
td_idx = 0;
found_th = 0;
end;
end;
run;

proc sort data=work.isprdata out=admin.itms_smf_isprdata;
  by CPCFMODL;
run;

Note: The *filename* statement of the preceding code is lengthy. After you copy and paste it into your SAS Program Editor, edit the statement so that it does not use more than one line. In addition, make sure that there are no extraneous spaces in the statement.

The following method, Method 2, is applicable to all operating systems except z/OS.

1. Create a Microsoft Excel spreadsheet that contains selected information from published (and currently available) IBM LSPR information. (You must reference the current published location of the IBM LSPR information. This information is currently located at https://www-304.ibm.com/servers/resourcelink/lib03060.nsf/pages/lsprindex?OpenDocument.)

Copy and paste a selected set of columns from the published LSPR data into a Windows Excel spreadsheet. The resulting workbook should look like the following table and reflect the information that is documented in the topic called “Calculation Dependencies for MIPS and MSU Columns” on page 457.
2. Once created, the Microsoft Excel spreadsheet can be read into the following PROC IMPORT and DATA step code. This code creates a permanent SAS data set that resides in an SAS IT Resource Management Admin library.

3. Run the following code:

```sas
/* Read the Microsoft Excel workbook that contains extracted information from IBM LSPR documentation and create a SAS data set from it. */

PROC IMPORT OUT=WORK.LSPRDATA
    DATAFILE=<"location-of-spreadsheet"> DBMS=EXCEL REPLACE;
    SHEET="Sheet1$";
    GETNAMES=NO;
    MIXED=NO;
    SCANTEXT=YES;
    USEDATE=YES;
    SCANTIME=YES;
RUN;

/* Extract selected fields of information from the vendor-supplied LSPR resource information. */

DATA WORK.LSPRDATA(keep=CPCFMODL LSPRCPUS LSPRPCI LSPRMSU);
    SET WORK.LSPRDATA;
    LENGTH CPCFMODL $ 8;
    IF _n_=1 THEN DELETE;
    CPCFMODL=F1;
    LSPRCPUS=F2;
    LSPRPCI=F3;
    LSPRMSU=F4;
RUN;

/* Store IBM LSPR resource information in SAS data set in a SAS IT Resource Management Admin library. */
```
LIBNAME ADMIN <'location-of-ITRM-Admin-library'>;
PROC SORT DATA=WORK.LSPRDATA out=ADMIN.ITMS_SMF_LSPRDATA;
   BY CPCFMODL;
RUN;

How to Retain the Original LSPR Table
Applying software maintenance or hot fixes might automatically update the LSPR table in SASHELP. If you backed up the SASHELP library from your original SAS IT Resource Management installation, you can restore the default LSPR table information that was included in that library. To do so, perform the following steps:

Note: You need to have exclusive access to the SASHELP library before you restore the original LSPR table in the SASHELP library.

1. Make a backup copy of the SASHELP library.
2. Submit the following SAS code:

   /*Allocate the backup copy of the SASHELP library */
   /*that uses PROC COPY to copy only the LSPR table */
   /*with the SELECT statement. */
   /*Make sure you have exclusive udate access to the */
   /*SASHELP SAS library before you submit code. */
   libname bkuphelp <physical-location-of-backup-sashelp>;
   proc copy in=bkuphelp out=SASHELP;
       select ITMS_SMF_LSPRDATA;
   run;

Sample JCL for z/OS sites:

   //jobname JOB
   //STEP1 EXEC SASPROC,OPTIONS='SASHELP=SASHELP'
   //SASHELP DD DSN='&prefix.llWn.SASHELP',DISP=OLD
   //SYSIN DD *
       libname bkuphelp <physical-location-of-backup-sashelp> ;
       proc copy in=bkuphelp out=SASHELP;
           select ITMS_SMF_LSPRDATA;
       run;
   /*Output contents of LSPR data information */
   PROC PRINT=SASHELP.ITMS_SMF_LSPRDATA;
   RUN;

Note:

   • &prefix is the prefix specified at the time of your installation.
   • 11 is the code for the language of your installation.
   • Wn is the encoding for your installation.

Sample names for the configuration file and SASHELP libraries are here:

   USERID.CONFIG(ENW0)
   USERID.ENW0.SASHELP
   USERID.D54002.ENW0.SASHELP
3. Review the output from the PRINT procedure to make sure that the SAS data set with the LSPR information has been updated.

**Staging Methodology for MIPS and MSU Columns**

The following steps describe the methodology that SAS IT Resource Management uses to stage RMF interval data.

1. After MXG stages the RMF interval data and before SAS IT Resource Management begins its staging transformation processing, code is executed to extract the necessary columns from the RMF interval data (MXG data set RMFINTRV). This code captures the distinct resource utilization entries from the RMF interval data that has just been staged. Another code step also extracts the current contents of the existing Resource Utilization table.

2. Using the recently staged RMF interval data, code is executed to determine whether the available CPU models in the data are full capacity models or sub-capacity models. This model capacity information and a calculation of total available CPUs for the full capacity models are included with the rest of the RMF interval data extracted previously.

3. The existing Resource Utilization table is merged with the staged RMF interval data in preparation for merging with the IBM LSPR information.

4. The latest available LSPR information from IBM is read so that it can be included in the Resource Utilization table. The latest available LSPR information is available from one of the following two sources:
   - a SAS IT Resource Management supplied SAS data set in a SASHELP library
   - an updated copy in a SAS IT Resource Management Admin library that was created by the customer. For information about this process, see “Working with LSPR Tables” on page 458.

5. The combined Resource Utilization table information (from the previous resource utilization table data and the new RMF interval data) and the extracted IBM LSPR resource information are merged together by the common column CPCFMODE. The merged result is the adjusted CPU model. This merge creates a new current copy of the Resource Utilization table, which replaces the existing copy. (The staging code created an empty Resource Utilization Table for this purpose.)

As a result of this merge, a machine in your RMF data might not be listed in your LSPR table. In that case, SAS IT Resource Management halts the staging job and writes the following ERROR messages to the SAS log.

```
ERROR: The SMF data for system <number> is associated with a mainframe model.
ERROR: <number> which does not appear in your LSPR table.
ERROR: To preserve the integrity of your data mart, this job will stop.
```

- If the LSPR information and the subsequent calculations that are based on it are important to you, you should update your LSPR table as soon as possible. Do not attempt to rerun the staging job until the updated table has been implemented and stored in your Admin library. For information about updating your LSPR table, see “Working with LSPR Tables” on page 458.

- If you are not interested in the LSPR information, you can bypass the error and continue processing the data. To do so, set the LSPR_ERROR_ON macro
variable at the beginning of your staging job. The following code bypasses the error and enables processing to continue:

```
%LET LSPR_ERROR_ON=N;
```

This code sets all subsequent calculations that are based on the LSPR information to missing values. This results in other computed columns also having missing values. This situation is not statistically incorrect, but it can misrepresent MIPS and MSU usage in aggregations. The SAS log will contain notes about this instead of errors.

**NOTE:** The SMF data for system is associated with a mainframe model `<number>` which does not appear in your LSPR table. You coded LSPR_ERROR_ON=N to ignore this problem.

6. The newly updated Resource Utilization table data can be used to include various parts of this information in staging extracts so that resource utilization computed columns for MSU and MIPS can be calculated. Lookups can be done using System, CEC, or CPU Model columns present in the Resource Utilization table. The following table shows the type of columns and the corresponding information for those columns that is available in the Resource Utilization table.

**Note:** The RMF CPU Resource Table consists of 17 columns and a variable number of rows. (In the following example, the table contains sample data for two rows.) In order to present all the columns that are available in the table in a legible format, the table was rotated 90 degrees. Each column was displayed as rows, and each row was displayed as columns.

**Table A2.4 RMF CPU Resource Table: Column Names and Two**

<table>
<thead>
<tr>
<th>Name of the Column in the Resource Utilization Table</th>
<th>Sample Values for First Row of the Table</th>
<th>Sample Values for Second Row of the Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>System ID</td>
<td>DEVA</td>
<td>POA2</td>
</tr>
<tr>
<td>Cec ID (from RMF)</td>
<td>B77A</td>
<td>3A7A</td>
</tr>
<tr>
<td>CPU Model (from RMF)</td>
<td>2094-706</td>
<td>2066-0A2</td>
</tr>
<tr>
<td>Cpu Model Capacity Type (extrapolated from CPU Model ID from RMF)</td>
<td>Full</td>
<td>Sub</td>
</tr>
<tr>
<td>Standard CPU Engines (from RMF)</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>IFA CPU Engines (from RMF)</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
### Name of the Column in the Resource Utilization Table

<table>
<thead>
<tr>
<th>Name of the Column in the Resource Utilization Table</th>
<th>Sample Values for First Row of the Table</th>
<th>Sample Values for Second Row of the Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZIP CPU Engines (from RMF)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total CPU Engines (calculated if full capacity model, else standard CPUs from RMF)</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>CPU Model extrapolated if full capacity model, else CPU model from RMF)</td>
<td>2094-709</td>
<td>2066-0A2</td>
</tr>
<tr>
<td>CPU Model CPUs (from LSPR)</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>CEC Su/Sec (CEC Service constant from RMF)</td>
<td>19536.019536</td>
<td>6165.7032755</td>
</tr>
<tr>
<td>Su/Sec (CPU Conversion constant from RMF)</td>
<td>25559.105431</td>
<td>6341.6567578</td>
</tr>
<tr>
<td>CPU Model MSU Capacity (from RMF)</td>
<td>422.00</td>
<td>44.00</td>
</tr>
<tr>
<td>CPU Model MSU Capacity (from LSPR)</td>
<td>584.00</td>
<td>44.00</td>
</tr>
<tr>
<td>IBM Processor Capacity Index (also known as MIPS from LSPR)</td>
<td>4,366.00</td>
<td>234.00</td>
</tr>
<tr>
<td>Minimum Datetime (from RMF)</td>
<td>01Mar08:00:00:00</td>
<td>01Mar08:00:00:00</td>
</tr>
<tr>
<td>Maximum Datetime (from RMF)</td>
<td>01Mar08:23:45:00</td>
<td>01Mar08:23:30:00</td>
</tr>
<tr>
<td>MSU/MIPS Conversion Factor (calculated)</td>
<td>7.48</td>
<td>5.32</td>
</tr>
</tbody>
</table>

### New MSU and MIPS Fields in the XJOBS Table That Depend on RMF Data

In SAS IT Resource Management 3.2 and later, there are new MSU and MIPS columns in the XJOBS staging table. These columns require Resource Management Facility (RMF) data.
(RMF) interval data to be present in the input System Management Facility (SMF) file. If the SMF data does not contain the RMF 70, 71, 72, 75, and 78 type data records, the following XJOBS MIPS-related columns are set to missing:

- IFAMIPS
- IFAMSU
- MIPSFACT
- SYSMIPS
- SYSMSU
- TOTMIPS
- TOTMSU
- ZIPMIPS
- ZIPMSU

To ensure that these MIPS columns are calculated in the XJOBS table, process the RMF and XJOBS SMF data together in the same staging job. If the SMF records that populate XJOBS were separated from the ones that populate the RMF tables XRMFSYS, XRMFIN, XASM70L, XASMCEL, XRMFWKL, XRMFWKP, and XTY72GO, then concatenate the two files together. This enables the staging job to make the RMF data accessible for the MSU and MIPS fields in the XJOBS table. You do not have to add the RMF tables to the staging job for this technique to work correctly. For more information about these columns, see “Additional Notes about MIPS and MSU Calculations”.

Additional Notes about MIPS and MSU Calculations

The following notes pertain to the calculation of the MIPS and MSU columns.

- When dealing with a full capacity model, any additional specialty CPU engines, such as IFA and ZIP, that have been configured for your system must be included in the calculations. These specialty CPU engines are added to the Total CPU Engines and this new value is stored in the resource table under a column labeled Total CPU Engines (calculated if full capacity model, else standard CPUs from RMF).

  The CPU Model ID value is adjusted to reflect the addition of any specialty engines. For example, suppose there are three additional specialty engines on a full capacity model (2094-706): two engines for IFA and one for ZIP. As a result, the CPU model value is adjusted from 2094-706 to 2094-709 to account for the three additional specialty engines. The latter model ID specification is used to match up to the IBM LSPR information to retrieve the relevant MSU and MIPS ratings. These ratings are then used to calculate the MSU/MIPS conversion factor. This refined methodology for the full capacity CPU model results in a different MsuMipsConversionFactor. The difference is due to using an adjusted CPU model and the LSPR MSU and MIPS ratings that are associated with this adjusted CPU model.

  In our sample, without using an adjusted CPU model, the calculation of the MsuMipsConversionFactor is 7.32. Using an adjusted CPU model for the calculation, the MsuMipsConversionFactor is calculated to be 7.48. This results in higher MIPS amounts for CPU activity on the full capacity models that include additional specialty engines.

- The calculation of MIPS is done in two distinct ways, depending on the SAS IT Resource Management table that is being staged.

  - For systems (SAS IT Resource Management tables XRMFSYS and XRMFIN) and LPARs (SAS IT Resource Management tables XASM70L and XASMCEL),
MSU is calculated using the hardware-based active CPU times from the RMF type 70 records and the hardware service adjustment factor (SUSEC). MIPS are then calculated by multiplying the MSU result by the appropriate MsuMipsConversionFactor for the associated processor type.

- For workloads and workload periods (SAS IT Resource Management tables XRMFWKL, XRMFWKP, XTY72GO) and batch jobs, TSO sessions, and OMVS sessions (XJOBS), SAS IT Resource Management calculates MSU by using the application-based active CPU times from the RMF type 72 records and the software service adjustment factor (CECSUSEC). MIPS are then calculated by multiplying the MSU result by the appropriate MsuMipsConversionFactor for the associated processor type.

Note: For details about the specific calculations, see “MSU and MIPS Calculations”.

- If comparisons are performed between system and LPAR MIPS values that are based on RMF type70 hardware-based active CPU times and other MIPS values, such as workload, workload period, jobs, and so on, that are based on RMF type72 application-based active CPU times, the system-based and LPAR-based MIPS will be larger. The reason that the times are different is because the uncaptured CPU time is not available in the type72 record. The difference in values is typically in the 5-15% range.

SAS Enterprise Guide Projects Using Software Application-based CPU Times for CEC, LPAR, and System Reports

SAS IT Resource Management supplies SAS Enterprise Guide projects that use software application-based active CPU times to calculate MSU and MIPS values for a collection of RMF CEC, LPAR, and System domain categories. These projects are provided for customers who choose to examine the performance and capacity of their CEC, LPAR, and System hardware components by using software application-based calculations. (The primary reason for using these calculations is to match CEC, LPAR, and system measurements against workload, workload period, jobs, and other comparable measurements.)

These supplied projects are delivered with the SAS IT Resource Management. They are installed on each client machine to which SAS Enterprise Guide is deployed during the installation of SAS IT Resource Management. The projects can be accessed by navigating to the location where you installed SAS IT Resource Management. They are typically located at `C:\Program Files\SASHome\SASITResourceManagementSASEnterpriseGuideComponents\`. These projects can be executed to create report definitions for use in SAS IT Resource Management report jobs. You can also create a report definition and select that definition in the Performance Report transformation for inclusion in a report job. For more information, see Chapter 7, “Working with the ITRM Report Definition Task in SAS Enterprise Guide” in the `SAS IT Resource Management 3.8: Reporting Guide`.

MSU and MIPS Calculations

All calculations listed in the following table are calculated from normalized CPU times, as provided by MXG.
<table>
<thead>
<tr>
<th>Domain Category</th>
<th>Staged Table</th>
<th>Computed Column</th>
<th>Column Label</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>XRMFSYS</td>
<td>SYSMSU</td>
<td>SystemCpuMsuUsage</td>
<td>if CPACTTM &gt; 0 thenSYSMSU=CPACTTM*SUSEC/1000000;else SYSMSU=.;</td>
</tr>
<tr>
<td></td>
<td>XRMFINT</td>
<td>SYSMIPS</td>
<td>SystemCpuMipsUsage</td>
<td>if MIPSFACT ^= . and CPACTTM &gt; 0 thenSYSMIPS=(CPACTTM*SUSEC/1000000)*MIPSFACT;else SYSMIPS=.;</td>
</tr>
<tr>
<td>IFAMSU</td>
<td>IfaCpuMsuUsage</td>
<td>IFAMSU</td>
<td>IfaCpuMsuUsage</td>
<td>if IFAACTT &gt; 0 thenIFAMSU=IFAACTT*SUSEC/1000000;else IFAMSU=.;</td>
</tr>
<tr>
<td>IFAMIPS</td>
<td>IfaCpuMipsUsage</td>
<td>IFAMIPS</td>
<td>IfaCpuMipsUsage</td>
<td>if MIPSFACT ^= . and IFAACTT &gt; 0 thenIFAMIPS=(IFAACTT*SUSEC/1000000)*MIPSFACT;else IFAMIPS=.;</td>
</tr>
<tr>
<td>ZIPMSU</td>
<td>ZipCpuMsuUsage</td>
<td>ZipCpuMsuUsage</td>
<td>ZipCpuMsuUsage</td>
<td>if ZIPACTT &gt; 0 thenZIPMSU=ZIPACTT*SUSEC/1000000;else ZIPMSU=.;</td>
</tr>
<tr>
<td>ZIPMIPS</td>
<td>ZipCpuMipsUsage</td>
<td>ZipCpuMipsUsage</td>
<td>ZipCpuMipsUsage</td>
<td>if MIPSFACT ^= . and ZIPACTT &gt; 0 thenZIPMIPS=(ZIPACTT*SUSEC/1000000)*MIPSFACT;else ZIPMIPS=.;</td>
</tr>
<tr>
<td>TOTMSU</td>
<td>AllEngCpuMsuUsage</td>
<td>TOTMSU</td>
<td>AllEngCpuMsuUsage</td>
<td>if CPACTTM &gt; 0 or IFAACTT &gt; 0 or ZIPACTT &gt; 0 thenTOTMSU=(sum(CPACTTM, IFAACTT, ZIPACTT)*SUSEC)/1000000;else TOTMSU=.;</td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>----------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>TOTMIPS</td>
<td>AllEngCpuMipsUsage</td>
<td></td>
<td>if MIPSFACT ^= . then TOTMIPS=(sum(CPACTT, IFAACTTT, ZIPACTT) * SUSEC / 1000000) * MIPSFACT; else TOTMIPS=;</td>
<td></td>
</tr>
<tr>
<td>MSUCAP</td>
<td>SystemMsuCapacity</td>
<td>DURATION * NRCPUS * SUSEC / 1000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIPSCAP</td>
<td>SystemMipsCapacity</td>
<td>if MIPSFACT ^= . then MIPSCAP=FLOOR(MIPSFACT * (DURATION * NRCPUS * SUSEC / 1000000)); else MIPSCAP=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lpar Cecilpar</td>
<td>XASM70L XASMCEL</td>
<td>LparCpMsuUsage</td>
<td>if LCPUPDT &gt; 0 then LPRSYSMSU= LCPUPDT * SUSEC / 1000000; else LPRSYSMSU=;</td>
<td></td>
</tr>
<tr>
<td>LPRSYSMIPS</td>
<td>LparCpMipsUsage</td>
<td>if MIPSFACT ^= . and LCPUPDT &gt; 0 then LPRSYSMIPS= ( LCPUPDT * SUSEC / 1000000) * MIPSFACT; else LPRSYSMIPS=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPRIFAMSU</td>
<td>LparIfaMsuUsage</td>
<td>if IFAACTT &gt; 0 then LPRIFAMSU=IFAACCTT * SUSEC / 1000000; else LPRIFAMSU=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPRIFAMIPS</td>
<td>LparIfaMipsUsage</td>
<td>if MIPSFACT ^= . and IFAACTT &gt; 0 then LPRIFAMIPS=(IFAACCTT* SUSEC / 1000000) * MIPSFACT; else LPRIFAMIPS=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>LPRZIPMSU</td>
<td>LparZipMsuUsage</td>
<td>if ZIPACTT &gt; 0 then LPRZIPMSU=ZIPACTT * SUSEC / 1000000; else LPRZIPMSU=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LPRZIPMIPS</td>
<td>LparZipMipsUsage</td>
<td>if MIPSFACT ^= . and ZIPACTT &gt; 0 then LPRZIPMIPS=(ZIPACTT * SUSEC / 1000000) * MIPSFACT; else LPRZIPMIPS=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LPRTOTMSU</td>
<td>LparAllEngMsuUsage</td>
<td>if LCPUPDT &gt; 0 or IFAACTT &gt; 0 or ZIPACTT &gt; 0 then LPRTOTMSU=(sum(LCPUPDT, IFAACTT, ZIPACTT) * SUSEC) / 1000000; else LPRTOTMSU=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LPRTOTMIPS</td>
<td>LparAllEngMipsUsage</td>
<td>if MIPSFACT ^= . then LPRTOTMIPS= (sum(LCPUPDT, IFAACTT, ZIPACTT) * SUSEC / 1000000) * MIPSFACT; else LPRTOTMIPS=.;</td>
<td></td>
</tr>
<tr>
<td>Workload</td>
<td>XRMFWKL</td>
<td>WKLMSU</td>
<td>WorkloadCpuMsuUsage</td>
<td>Workload XRMFWKL WKLMSU WorkloadCpuMsuUsage if WKLCPU &gt; 0 then WKLMSU=(WKLCPU*CECSUSE) / 1000000; else WKLMSU=.;</td>
</tr>
<tr>
<td></td>
<td>WKLMIPS</td>
<td>WorkloadCpuMipsUsage</td>
<td>if MIPSFACT ^= . and WKLCPU &gt; 0 then WKLMIPS=((WKLCPU*CECSUSE) / 1000000) * MIPSFACT; else WKLMIPS=.;</td>
<td></td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>WKLIFAMSU</td>
<td>WorkloadIfaCpuM</td>
<td>if WKLIFA &gt; 0 then WKLIFAMSU=(WKLIFA*CECSUSE) / 1000000; else WKLIFAMSU=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WKLIFAMIPS</td>
<td>WorkloadIfaCpuMi</td>
<td>if MIPSFACT ^= . and WKLIFA &gt; 0 then WKLIFAMIPS=((WKLIFA*CECSUSE) / 1000000) * MIPSFACT; else WKLIFAMIPS=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WKLZIPMSU</td>
<td>WorkloadZipCpuM</td>
<td>if WKLZIP &gt; 0 then WKLZIPMSU=(WKLZIP*CECSUSE) / 1000000; else WKLZIPMSU=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WKLZIPMIPS</td>
<td>WorkloadZipCpuM</td>
<td>if MIPSFACT ^= . and WKLZIP &gt; 0 then WKLZIPMIPS=((WKLZIP*CECSUSE) / 1000000) * MIPSFACT; else WKLZIPMIPS=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WKLTOTMSU</td>
<td>WorkloadAllEngC</td>
<td>if WKPCPU &gt; 0 or WKPIFA &gt; 0 or WKPZIP &gt; 0 then WKLTOTMSU=(sum(WKPCPU,WKPIFA,WKPZIP) * CECSUSE) / 1000000; else WKLTOTMSU=.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WKLTOTMIPS</td>
<td>WorkloadAllEngC</td>
<td>if MIPSFACT ^= . then WKLTOTMIPS=(sum(WKPCPU,WKPIFA,WKPZIP) * CECSUSE/ 1000000)*MIPSFACT; else WKLTOTMIPS=.;</td>
<td></td>
</tr>
<tr>
<td>Workload Period</td>
<td>XRMFWKP</td>
<td>WKPMSU</td>
<td>if WKPCPU &gt; 0 then WKPMSU=(WKPCPU*CECSUSE) / 1000000; else WKPMSU=.;</td>
<td></td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>----------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>WKPMIPS</td>
<td>WorkloadPeriodCpuMipsUsage</td>
<td>if MIPSFACT ^= . and WKPCPU &gt; 0 then WKPMIPS=((WKPCPU*CECSUSE) / 1000000) * MIPSFACT; else WKPMIPS=.;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WKPIFAMSU</td>
<td>WorkloadPeriodIfaCpuMsuUsage</td>
<td>if WKPIFA &gt; 0 then WKPIFAMSU=(WKPIFA*CECSUSE) / 1000000; else WKPIFAMSU=.;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WKPIFAMIPS</td>
<td>WorkloadPeriodIfaCpuMipsUsage</td>
<td>if MIPSFACT ^= . and WKPIFA &gt; 0 then WKPIFAMIPS=((WKPIFA*CECSUSE) / 1000000) * MIPSFACT; else WKPIFAMIPS=.;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WKPZIPMSU</td>
<td>WorkloadPeriodZipCpuMsuUsage</td>
<td>if WKPZIP &gt; 0 then WKPZIPMSU=(WKPZIP*CECSUSE) / 1000000; else WKPZIPMSU=.;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WKPZIPMIPS</td>
<td>WorkloadPeriodZipCpuMipsUsage</td>
<td>if MIPSFACT ^= . and WKPZIP &gt; 0 then WKPZIPMIPS=((WKPZIP*CECSUSE) / 1000000) * MIPSFACT; else WKPZIPMIPS=.;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WKPTOTMSU</td>
<td>WorkloadPeriodAllEngCpuMsuUsage</td>
<td>if WKPCPU &gt; 0 or WKPIFA &gt; 0 or WKPZIP &gt; 0 then WKPTOTMSU=(sum(WKPCPU,WKPIFA,WKPZIP) * CECSUSE) / 1000000; else WKPTOTMSU=.;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>WKPTOTMIPS</td>
<td>WorkloadPeriodAllEngCpuMipsUsage</td>
<td>if MIPSFACT ^= . then WKPTOTMIPS=(sum(WKPCPU,WKPIFA,WKPZIP) * CECSUSE/1000000)*MIPSFACT; else WKPTOTMIPS=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Mode Period</td>
<td>XTY72GO</td>
<td>PRDMSU</td>
<td>PeriodCpuMsuUsage</td>
<td>if CPUTM &gt; 0 then PRDMSU=CPUTM*CECSUSE/1000000; else PRDMSU=;</td>
</tr>
<tr>
<td>PRDMIPS</td>
<td>PeriodCpuMipsUsage</td>
<td>if MIPSFACT ^= . and CPUTM &gt; 0 then PRDMIPS=(CPUTM*CECSUSE/1000000) * MIPSFACT; else PRDMIPS=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRDIFAMSU</td>
<td>PeriodIfaCpuMsuUsage</td>
<td>if CPIFATM &gt; 0 then PRDIFAMSU=CPIFATM*CECSUSE/1000000; else PRDIFAMSU=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRDIFAMIPS</td>
<td>PeriodIfaCpuMipsUsage</td>
<td>if MIPSFACT ^= . and CPIFATM &gt; 0 then PRDIFAMIPS=(CPIFATM*CECSUSE/1000000) * MIPSFACT; else PRDIFAMIPS=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRDZIPMSU</td>
<td>PeriodZipCpuMsuUsage</td>
<td>if CPZIPTM &gt; 0 then PRDZIPMSU=CPZIPTM*CECSUSE/1000000; else PRDZIPMSU=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRDZIPMIPS</td>
<td>PeriodZipCpuMipsUsage</td>
<td>if MIPSFACT ^= . and CPZIPTM &gt; 0 then PRDZIPMIPS=(CPZIPTM*CECSUSE/1000000) * MIPSFACT; else PRDZIPMIPS=;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>PRDTOTMSU</td>
<td>AllEngCpuTimeMsuUsage</td>
<td>PRDTOTMSU</td>
<td>if CPUTM &gt; 0 or CPIFATM &gt; 0 or CPZIPTM &gt; 0 then PRDTOTMSU=(sum(CPUTM,CPIFATM,CPZIPTM) * CECSUSE) / 1000000; else PRDTOTMSU=.;</td>
<td></td>
</tr>
<tr>
<td>PRDTOTMIPS</td>
<td>AllEngCpuTimeMipsUsage</td>
<td>PRDTOTMIPS</td>
<td>if MIPSFACT ^= . then PRDTOTMIPS=(sum(CPUTM,CPIFATM,CPZIPTM) * CECSUSE/1000000)*MIPSFACT; else PRDTOTMIPS=.;</td>
<td></td>
</tr>
<tr>
<td>Batch Jobs</td>
<td>XJOBS</td>
<td>SYSMSU</td>
<td>SystemCpuMsuUsage</td>
<td>if CPUTM &gt; 0 then SYSMSU=CPUTM *CECSUSE/1000000; else SYSMSU=.;</td>
</tr>
<tr>
<td>TSO</td>
<td></td>
<td>SYSMIPS</td>
<td>SystemCpuMipsUsage</td>
<td>if MIPSFACT ^= . and CPUTM &gt; 0 then SYSMIPS=(CPUTM*CECSUSE/1000000)*MIPSFACT; else SYSMIPS=.;</td>
</tr>
<tr>
<td>OMVS</td>
<td></td>
<td>IFAMSU</td>
<td>IfaCpuMsuUsage</td>
<td>if CPIFATM &gt; 0 then IFAMSU=CPIFATM *CECSUSE/1000000; else IFAMSU=.;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IFAMIPS</td>
<td>IfaCpuMipsUsage</td>
<td>if MIPSFACT ^= . and CPIFATM &gt; 0 then IFAMIPS=(CPIFATM*CECSUSE/1000000)*MIPSFACT; else IFAMIPS=.;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZIPMSU</td>
<td>ZipCpuMsuUsage</td>
<td>if CPZIPTM &gt; 0 then ZIPMSU=CPZIPTM *CECSUSE/1000000; else ZIPMSU=.;</td>
</tr>
<tr>
<td>Domain Category</td>
<td>Staged Table</td>
<td>Computed Column</td>
<td>Column Label</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------</td>
<td>----------------</td>
<td>--------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ZIPMIPS</td>
<td>ZipCpuMipsUsage</td>
<td></td>
<td>if MIPSFACT ^= . and CPZIPTM &gt; 0 then \nZIPMIPS=(CPZIPTM*CECSUSE/1000000)*MIPSFACT; else ZIPMIPS=.;</td>
<td></td>
</tr>
<tr>
<td>TOTMSU</td>
<td>AllEngCpuMsuUsage</td>
<td></td>
<td>if CPUTM &gt; 0 or CPIFATM &gt; 0 or CPZIPTM &gt; 0 then \nTOTMSU=(sum(CPUTM,CPIFATM,CPZIPTM)*CECSUSE)/1000000; else TOTMSU=.;</td>
<td></td>
</tr>
<tr>
<td>TOTMIPS</td>
<td>AllEngCpuMipsUsage</td>
<td></td>
<td>if MIPSFACT ^= . then \nTOTMIPS=(sum(CPUTM,CPIFATM,CPZIPTM)*CECSUSE/1000000)*MIPSFACT; else TOTMIPS=.;</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 3

### Staging Parameters

<table>
<thead>
<tr>
<th>Staging Parameters</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Limit for Data Acquisition Table</td>
<td>478</td>
</tr>
<tr>
<td>Allow Duplicate ID Variables</td>
<td>479</td>
</tr>
<tr>
<td>Choose Access Command</td>
<td>479</td>
</tr>
<tr>
<td>Choose Raw Data Input Type</td>
<td>479</td>
</tr>
<tr>
<td>Class Columns</td>
<td>480</td>
</tr>
<tr>
<td>Consolidation Function (CF)</td>
<td>480</td>
</tr>
<tr>
<td>Default Duration</td>
<td>480</td>
</tr>
<tr>
<td>Delimiter Characters</td>
<td>480</td>
</tr>
<tr>
<td>Delimiter in Raw Data</td>
<td>481</td>
</tr>
<tr>
<td>Delimiter String</td>
<td>481</td>
</tr>
<tr>
<td>Duplicate Checking Options</td>
<td>481</td>
</tr>
<tr>
<td>Enable Duplicate Checking</td>
<td>481</td>
</tr>
<tr>
<td>ENDFILE</td>
<td>482</td>
</tr>
<tr>
<td>FTP</td>
<td>482</td>
</tr>
<tr>
<td>Future Data</td>
<td>482</td>
</tr>
<tr>
<td>How Many Rows of Data Should Be Used as Guessing Rows</td>
<td>483</td>
</tr>
<tr>
<td>IDVAR</td>
<td>483</td>
</tr>
<tr>
<td>Is the Delimiter String Case Sensitive</td>
<td>484</td>
</tr>
<tr>
<td>Is There a Header Row</td>
<td>484</td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>484</td>
</tr>
<tr>
<td>INT</td>
<td>484</td>
</tr>
<tr>
<td>JES</td>
<td>484</td>
</tr>
<tr>
<td>Keep</td>
<td>484</td>
</tr>
<tr>
<td>Library for Temporary Work Space</td>
<td>485</td>
</tr>
<tr>
<td>Machine</td>
<td>485</td>
</tr>
<tr>
<td>Minimum Number of Files to Read on Each Processor</td>
<td>485</td>
</tr>
<tr>
<td>Normalize Datetime</td>
<td>485</td>
</tr>
<tr>
<td>Number of Processors to Use</td>
<td>485</td>
</tr>
<tr>
<td>Presummarization Duration</td>
<td>485</td>
</tr>
<tr>
<td>Raw Data Input Directory</td>
<td>485</td>
</tr>
<tr>
<td>Raw Data Input File</td>
<td>486</td>
</tr>
<tr>
<td>Raw Data Input Library</td>
<td>486</td>
</tr>
<tr>
<td>Report</td>
<td>486</td>
</tr>
<tr>
<td>rrdtool fetch -end option</td>
<td>486</td>
</tr>
<tr>
<td>rrdtool Executable</td>
<td>486</td>
</tr>
<tr>
<td>rrdtool fetch -start option</td>
<td>487</td>
</tr>
<tr>
<td>RSH/SSH Host Command</td>
<td>487</td>
</tr>
<tr>
<td>Site Name</td>
<td>487</td>
</tr>
<tr>
<td>Source</td>
<td>487</td>
</tr>
</tbody>
</table>
Staging Parameters

The following topics describe the various parameters that adapters use to stage the raw data. The appropriate combination of these staging parameters is available from the Adapter Setup wizard. These parameters are also available from the Staging Parameters tab of the Properties dialog box for an adapter or staging transformation. If a parameter includes a browse function, that function might be disabled in some instances. For example, browsing might be disabled when the input data is associated

Temporary Work Space Library ........................................... 487
TIMESTAMP ................................................................. 487
Type of Delimiter ............................................................ 488
Use Intermediate Staging View ......................................... 488
Use snmpwalk to Gather Character Data ............................. 488
What Row Does the Data Start On .................................... 488
What Row Is the Header On .............................................. 489
User-written Staging Parameters ....................................... 489

Staging Parameters for Supported Adapters .......................... 489
Amazon CloudWatch for Staging and Duplicate-Data Checking Parameters .................. 489
ASG TMONC2CIC Staging and Duplicate-Data Checking Parameters .......................... 490
ASG TMONDB2 Staging and Duplicate-Data Checking
  Parameters for V4 and Earlier Versions ............................ 491
ASG TMONDB2 V5 Staging and Duplicate-Data Checking
  Parameters for V5 and Higher Versions ............................ 492
BMC Mainview IMS Staging and Duplicate-Data Checking Parameters ......................... 493
BMC Perf Mgr Staging and Duplicate-Data Checking Parameters .............................. 494
CA TMS Staging and Duplicate-Data Checking Parameters ...................................... 495
CSV Staging and Duplicate-Data Checking Parameters ........................................... 497
DT Perf Sentry Staging and Duplicate-Data Checking Parameters ............................. 498
DT Perf Sentry with MXG Staging and Duplicate-Data Checking Parameters ................. 500
Ganglia Staging and Duplicate-Data Checking Parameters ....................................... 501
HP Perf Agent Staging and Duplicate-Data Checking Parameters .............................. 502
HP Reporter Staging and Duplicate-Data Checking Parameters ................................ 503
IBM DCOLLECT Staging and Duplicate-Data Checking Parameters .......................... 504
IBM EREP Staging and Duplicate-Data Checking Parameters .................................... 506
IBM SMF Staging and Duplicate-Data Checking Parameters ..................................... 507
IBM TPF Staging and Duplicate-Data Checking Parameters ..................................... 509
IBM VMMON Staging and Duplicate-Data Checking Parameters ................................ 510
MS SCOM Staging and Duplicate-Data Checking Parameters .................................... 511
RRDtool Staging and Duplicate-Data Checking Parameters ....................................... 512
SAP ERP Staging and Duplicate-Data Checking Parameters ...................................... 513
SAR Staging and Duplicate-Data Checking Parameters ............................................ 514
SAS Environment Manager (SAS EV) Staging and
  Duplicate-Data Checking Parameters .................................. 515
SNMP Staging and Duplicate-Data Checking Parameters ......................................... 516
VMware Data Acquisition Parameters .................................... 517
VMware vCenter Staging and Duplicate-Data Checking Parameters ............................ 518
Web Log Staging and Duplicate-Data Checking Parameters ...................................... 519

User-Written Staging Parameters ....................................... 520
Parameters on the Staging Option ........................................ 520
Parameters on the Duplicate Checking Option ........................................... 520
Parameters on the User-Written Option .................................... 522
with an application server that resides on either a traditional z/OS operating environment or a zFS file system.

**Age Limit for Data Acquisition Table**

*Age limit for data acquisition table (in days)* specifies the number of days that data is kept in the data acquisition table that populates the staged tables.

This parameter is relevant only to the VMware Data Acquisition. This is because other staging transformations purge the existing data of their corresponding staged tables and replace it with new data on execution of the staging job. However, the VMware Data Acquisition staging transformation populates staged tables that are not purged on execution of the staging job. This parameter enables you to specify an age limit for the data in this table, after which the data is purged when the staging job executes. Thus, the table does not grow indefinitely.

**Allow Duplicate ID Variables**

*Allow duplicate ID variables* specifies whether duplicate ID variables are permitted when transposing data for the adapter. The value for this parameter can be **Y** (yes) or **N** (no). **N** is the default value.

**Choose Access Command**

*Choose access command* specifies the type of raw data such as NNM, NetView, or RRDtool. The following two options for this parameter also govern other staging parameters that are available for configuration:

- **HP NNM / Netview**, the default value, indicates that the raw data is from HP NNM or NetView. If you select this value, then the corresponding field **snmpColDump executable** appears. You can then specify the location path and command for snmpColDump. The **snmpColDump executable** parameter does not have a default.

  * **Note:** If you select **HP NNM / Netview**, then you must have installed either of those products on the server where the staging job is running either interactively or in batch mode.

- **RRDtool** indicates that the raw data is stored in a round-robin database (RRD) that is managed by RRDtool. If you select this value, then the following fields appear:

  - **rrdtool executable** appears and enables you to specify the location path and command for RRDtool. The **rrdtool executable** parameter does not have a default.

  - **Number of days to load** specifies the number of days of raw data that you want to backload into the staged table. This field accepts only integers from one to 365. The default value is 2.

**Choose Raw Data Input Type**

*Choose raw data input type* specifies whether the raw data is a file or directory that is available from the client network or if the raw data input is available using an FTP access method. The following options for this parameter also govern several of the other staging parameters that are available for configuration. The options that are available for selection vary based on the adapter.
Appendix 3  •  Staging Parameters

- **File** indicates that the raw data input for the adapter is a file. If you select this value, then the corresponding field **Raw data input file or directory** appears. You can then specify the full pathname of the raw data file or the directory. You can enter the path directly or browse to locate the path and enter it automatically. This parameter does not have a default value.

- **File or directory** indicates that the raw data input for the adapter is a file or directory. If you select this value, then the corresponding field **Raw data input file or directory** appears. You can then specify the full pathname of the raw data file or the directory. You can enter the path directly or browse to locate the path and enter it automatically. This parameter does not have a default value.

- **FTP** indicates that the raw data input for the adapter is available using the FTP access method. For more information about additional parameters that are required if you select the FTP access method, see “FTP” on page 482.

**Class Columns**

**Class columns** specifies the list of additional class columns that you want to use when staging the data. If any of these columns are computed columns, they must be based on the filename or datetime columns. This parameter requires a space-delimited list of class columns. This parameter is relevant only to the RRDtool adapter.

**Consolidation Function (CF)**

**Consolidation Function (CF)** specifies the consolidation function values that should be retrieved from the round-robin database (RRD). Select the function whose data you want to fetch from the drop-down menu. You can also enter a value or leave the field blank. If the value is blank, the FETCH command retrieves all the consolidation functions that are in the round-robin database. This parameter is relevant only to the RRDtool adapter.

**Default Duration**

**Default duration** specifies the value (in seconds) for the duration of the intervals if the input data does not contain an INTERVAL variable. If the input data does not contain an INTERVAL variable and a value for the default duration is not specified, then the interval duration defaults to 3600 seconds, or one hour. This parameter is relevant only to the HP Reporter adapter.

This value must be numeric. If specified, the integer value must be greater than or equal to 1 and less than or equal to 2,147,483,647.

**Delimiter Characters**

**Delimiter characters** specifies one or more characters that are used as delimiters in the raw input data. If you enter several characters (for example, !#*), then each of these characters is treated as a delimiter in your data. A value is not required for this parameter. This parameter is relevant only to the CSV adapter.

*Note:* The selected characters must not be separated from each other by spaces or any other character.
**Delimiter in Raw Data**

*Delimiter in raw data* specifies the delimiter (*Space, Comma, or Tab*) that is used in the raw input data. The values that are available for this parameter vary based on the adapter.

**Delimiter String**

*Delimiter string* specifies a string of characters that is used as the delimiter in the raw input data. A value is not required for this parameter. This parameter is relevant only to the CSV adapter.

**Duplicate Checking Options**

*Duplicate checking options* specifies whether to check for duplicate data and indicates what to do when duplicate data is encountered.

*Note:* Duplicate checking is automatically enabled for the adapters that use a database as a raw data source (such as HP Reporter, SAP ERP, SAS EV, MS SCOM, and VMware). This parameter is not available for configuration with these staging transformations. For more information about how to override the default value for duplicate checking with these adapters, see “Example 3: Using Macro Variables to Subset Data for HP Reporter, MS SCOM, SAS EV, and VMware Adapters” on page 544.

Here are the values that are available for this parameter:

- **Discard** removes duplicates. This is the default value for most adapters.

- **Force** loads data regardless of whether duplicates are found.

- **Terminate** ends the job if duplicates are found.

**CAUTION:**

Although the job terminates, the resulting staged table might contain data. However, termination of the job indicates an error in processing, and any data in the resulting staged table might be invalid.

For more information about duplicate data checking, see “Duplicate-Data Checking Overview” on page 537.

*Note:* If you update the source code of a job and modify the mode for duplicate checking, then you can save the functionality of the new source code to the local file system. However, SAS Data Integration Studio preserves the original source code. The new value of the mode for duplicate checking is not updated in the repository, and the new value is not reflected in the user interface.

**Enable Duplicate Checking**

*Enable Duplicate Checking* specifies whether to perform duplicate checking of the data. If this parameter is set to *Yes*, additional duplicate checking parameters appear and are enabled for specification. These parameters are INT, Keep, and report. If this parameter is set to *No*, no other duplicate checking parameters appear.
**ENDFILE**

ENDFILE specifies the name of the SAS variable that is used as the END= keyword for the SAS INFILE statement that reads the raw data.

**FTP**

**Overview**

If you select FTP for the Choose raw data input type parameter, then additional parameters appear on the parameters page to facilitate the FTP process. The following topics describe these additional parameters that are available for configuration:

**Host**

Host specifies the name of the remote host. This parameter does not have a default value.

**Port**

Port specifies the FTP port number. The default value is 21.

**User**

User specifies the user ID for the FTP server. This field accepts alphanumeric characters. This parameter does not have a default value.

**Password**

Password specifies the password of the given user ID for the FTP server. This parameter does not have a default.

**CAUTION:**

The Adapter Setup wizard generates a job log that displays all information that you specify in the wizard. The log includes any passwords used for accessing FTP data. If you have concerns about this password showing in the job log, then you can set up a user ID that you use only for accessing the files via FTP.

**External File Name**

External file name specifies the filename of the raw data. The maximum number of characters in this field (including the dots in a z/OS filename, if applicable) is 44. This parameter does not have a default value.

**Tape**

Tape specifies whether the data file is on tape. The default value is No.

**RCMD**

RCMD specifies the FTP SITE or command that is sent to the FTP server to provide services that are system-specific or essential to transfer files but not common enough to be included in the protocol. The default value is SITE RDW.

**Debug**

Debug specifies whether to write to the SAS log any messages that are sent to and from the FTP server. The default value is No.
**Future Data**

**Future data** specifies whether to check for future data and indicates what to do when it is encountered. This parameter specifies the FUTURE parameter in the RMFUTURE macro.

This parameter controls the processing of incoming data that has a datetime variable that is greater than 48 hours in the future. (That is, the datetime variable is more than 48 hours after the current time on the system where data is being staged for processing into the IT data mart.) The 48-hour buffer provides for different time zones, daylight saving time, Greenwich Mean Time, and so on.

If future data is encountered, a note is written to the SAS log. This note provides the future data option that is selected, shows the datetime that was encountered. It also explains the status of the future data, such as whether it was added to the IT data mart or if the job was terminated.

Here are the values that are available for this parameter:

**Accept**
- specifies that incoming data is staged for processing and is processed into the IT data mart. If any of the data has a datetime value of 48 hours or more in the future, then a note that future data was encountered is written to the SAS log. This value enables an IT data mart to accept future data. For example, you might want to use this setting to perform end-of-year testing with a test IT data mart.

*Note:* Age limits take effect from the most recent data. Therefore, dates in the future might cause at least some of the existing data to be aged out of the IT data mart.

**Discard**
- specifies that data with a datetime value of 48 hours or more in the future is not staged for processing and is not processed into the IT data mart. This value is the default. This value prevents future data from being processed into the IT data mart. Future data might cause existing data to be aged out (the existing data would appear to be older than it is, in comparison with the future data).

**Terminate**
- specifies that if any incoming data has a datetime value of 48 hours or more in the future, then staging of the data stops, an error message is written to the SAS log. In addition, the job terminates. This value prevents future data from being processed into the IT data mart, which might cause existing data to be aged out. (The existing data would appear to be older than it is, in comparison with the future data.) This value stops processing and thus calls more attention to the future data than the **Discard** value.

**CAUTION:**
- Although the job terminates, the resulting staged table might contain data. However, termination of the job indicates an error in processing, and any data in the resulting staged table might be invalid.

**How Many Rows of Data Should Be Used as Guessing Rows**

**How many rows of data should be used as guessing rows** specifies the number of rows to be read from the raw data in order to determine the type and length of each column. This parameter is relevant only to the CSV adapter.
IDVAR

IDVAR specifies the name of the SAS variable that identifies the system or machine that generated the input data. This value can be used as class variable for duplicate checking.

Note: IF the value is not a valid column in the staged table, the staging job will fail.

Is the Delimiter String Case Sensitive

Is the delimiter string case sensitive specifies whether the delimiter that is used in the raw input data must be delimited exactly as specified in the Delimiter string parameter or if the case of the string in the raw data does not matter. This parameter is relevant only to the CSV adapter. It is available only if you have set the Type of Delimiter to Delimiter string.

Is There a Header Row

Is there a header row specifies whether a header row that contains column headings is in the raw input data. If you specify Yes, the What row is the header on field is enabled. If you specify No, the What row is the header on field is not enabled and the columns are named Column1 to ColumnN. This parameter is relevant only to the CSV adapter.

Input File Parameters

Input File Parameters specifies the record format and logical record length of the input file. This parameter is relevant only to the MXG adapters.

INT

INT specifies the maximum time gap (or interval) that is to be allowed between the timestamps on any two consecutive records from the same system or machine. If the interval between the timestamp values exceeds the value of this parameter, then an observation with the new time range is created in the control data set. This is referred to as a gap in the data.

The value for this parameter must be provided in the format $hh:mm$, where $hh$ represents hours and $mm$ represents minutes. For example, to specify an interval of 14 minutes, use INT=0:14. To specify an interval of 1 hour and 29 minutes, use INT=1:29.

Note: If this time is not a valid time value, the staging job will fail.

JES

JES specifies the version (JES2 or JES3) of the z/OS job entry subsystem that is in use by the system where the input data was recorded.

Keep

KEEP specifies the number of weeks for which control data will be kept. Because this value represents the number of Sundays between two dates, a value of 2 results in a maximum retention period of 20 days. This value must be an integer.
Library for Temporary Work Space

Library for temporary work space specifies the table to use if Temporary workspace library is set to Other Library. Click Browse to locate and select a library that you have already defined.

Machine

Machine specifies the name of the machine that generated the raw data. This parameter is relevant only to the Web Log adapter.

The Web Log data might already contain a value for machine name. If so, then the value in the raw data is used with the staged table. In this case, you do not need to specify a value for this parameter.

If the data from the Web Log adapter does not already specify a machine name, then you can use this parameter to specify a machine name. In this case, that value is then associated with the staged table. This parameter does not have a default value.

Minimum Number of Files to Read on Each Processor

Minimum number of files to read on each processor specifies the minimum number of files to read in each MPConnect session. This parameter is relevant only to the SAR adapter.

Normalize Datetime

Normalize datetime specifies how to save the datetime stamps in the data. This parameter requires a value. If this parameter is set to Yes, the datetime stamps are adjusted to an even number, which enables a more efficient combination of data from multiple round-robin databases. If this parameter is set to No, the exact datetime values are saved in the data. This parameter is relevant only to the RRDtool and Ganglia adapters.

Number of Processors to Use

Number of processors to use specifies the number of processors that can be used for the MPConnect parallel processing. This parameter is relevant only to the SAR adapter.

- If set to 0, all processors on the machine are used to stage the data.
- If set to 1, MPConnect is not used to stage the data and the staging code is run on a single processor.
- If set to more processors than are available on the machine, then the staging code uses the number of processors that are available.

Tip For best performance, set this option to a number less than the total number of processors that are available on the machine.

Presummarization Duration

Presummarization duration specifies the duration, in seconds, of the intervals into which you want to summarize the raw data before it is staged. For example, if you enter
then the raw data is summarized in intervals of one hour. If specified, the value must be a positive integer less than or equal to 86,400, which is the number of seconds in a day.

**Raw Data Input Directory**

**Raw data input directory** specifies the full pathname of the directory for the raw data. You can enter the path directly or browse to locate and select it.

**Raw Data Input File**

**Raw data input file** specifies the full pathname of the raw data file for the adapter. You can enter the path directly or browsing to locate and select it.

**Raw Data Input Library**

**Raw data input library** includes two fields (Library and Libref) that specify the SAS library and corresponding libref for the appropriate adapter database. You can enter the library path or browse to locate and select it.

*Note:* For the HP Reporter adapter, this parameter supports only libraries with engine types of ODBC, OLE DB, and Oracle. For the SAP ERP and SAS EV adapters, this parameter supports only libraries with engine types of SAS or BASE.

**Report**

**REPORT value for %RMDUPCHK macro** specifies whether to display the duplicate-data checking messages in the SAS log or to save the messages in an audit table. If set to **Yes**, this parameter causes all the messages from duplicate-data checking to appear in the SAS log. If set to **No**, the duplicate-data checking messages are saved in an audit data table that is stored in the staging library. The name of the audit table is **source AUDIT** (where source is the 3-character data source code).

*Note:* If you are monitoring very high numbers of resources, setting this option to **NO** can be beneficial. Eliminating the report reduces CPU consumption, shortens elapsed time, and makes the SAS log more manageable.

**rrdtool fetch -end option**

**rrdtool fetch -end option** specifies the ending point for the data that is retrieved from the round-robin database. A value for this parameter is not required. If this value is blank, the data from the start time to the current time is retrieved. This parameter is relevant only to the RRDtool and Ganglia adapters.

*Note:* For information about the formats that are valid for this parameter, see [http://oss.oetiker.ch/rrdtool//doc/rrdfetch.en.html](http://oss.oetiker.ch/rrdtool//doc/rrdfetch.en.html).

**rrdtool Executable**

**rrdtool executable** specifies the location of the executable for the RRDtool adapter. You can enter the path to the executable or browse to locate and select it. This parameter requires a value. This parameter is relevant only to the RRDtool and Ganglia adapters.
**rrdtool fetch -start option**

*rrdtool fetch -start option* specifies the starting point for the data that is retrieved from the round-robin database. A value for this parameter is not required. This parameter is relevant only to the RRDtool and Ganglia adapters.

*Note:* For information about the formats that are valid for this parameter, see [http://oss.oetiker.ch/rrdtool/doc/rrdfetch.en.html](http://oss.oetiker.ch/rrdtool/doc/rrdfetch.en.html).

**RSH/SSH Host Command**

*RSH/SSH host command* specifies the RSH version or the SSH version of the command and the name of the host for running the NNM snmpColDump command or the command. The command in this field is used at the beginning of the rrdtool, , or commands. This field can be left blank if an RSH command is not required to run the or command. This parameter is relevant only to the Ganglia, RRDtool, and SNMP adapters.

**Site Name**

*Site name*, relevant to the Web Log adapter, specifies the name of the website that generated the raw data. If the Web Log data already contains a website value, then the value in the raw data is used with the staged table and you do not need to specify a value for this parameter. If the Web Log data does not already specify a website, then you can use this parameter to specify a website value. That value is then associated with the staged table. This parameter does not have a default value.

**Source**

*SOURCE* specifies the data source for this adapter.

**Temporary Work Space Library**

*Temporary work space library* specifies how the MPConnect process defines a library for temporary files. This parameter is relevant only to the SAR adapter.

The choices are:

- WORK Library (use the standard SAS work library)
- Staging Library (use the staging library to temporarily store files)
- Other Library (use another library that the user defines to point to another location).

*Note:* You must predefine this library in metadata using the New Library wizard. If you choose this option, then the *Library for temporary work space* option appears.

**TIMESTAMP**

*TIMESTAMP* specifies the name of the SAS variable that contains the datetime stamp that uniquely identifies the time of the event or interval that is being recorded.
**Type ofDelimiter**

Type of delimiter specifies the type of delimiter to use in the raw input data. The type can either be a list of single-character delimiters or a character string. Select the type of delimiter from the drop-down list. This parameter is relevant only to the CSV adapter.

If you select **List of delimiter characters**, the Delimiter characters field is enabled. The Delimiter string and Is the delimiter string case sensitive? fields are not enabled.

If you select **Delimiter string**, the Delimiter string and Is the delimiter string case sensitive? fields are enabled. The Delimiter characters field is not enabled.

**Use Intermediate Staging View**

Use intermediate staging view specifies whether to use the temporary view form when instantiating staged tables. Enter the staged table name or leave this field blank.

This optional parameter can contain the SAS data set name of a staged table or a macro variable that resolves to a SAS data set name. If not specified, this parameter defaults to a blank, which implies that you do not want presummarization.

**Use snmpwalk to Gather Character Data**

**Overview**

Use snmpwalk to gather character data specifies whether to use the command to capture data during job execution. The following values are available:

- **No** does not use the command.
- **Yes** uses the command. If you select this value, then additional parameters appear. The following subtopics describe each of these additional parameters.

This parameter and others associated with the command are relevant only to the SNMP adapter.

**snmpwalk Executable**

snmpwalk Executable specifies the location and command for snmpwalk. This parameter does not have a default value.

**HostFile for snmpwalk**

HostFile for snmpwalk indicates the location of the snmphost file that lists the hosts from which you want to get data. This parameter does not have a default.

**Community value for snmpwalk**

Community value for snmpwalk specifies the community name that is required to run the command. The default value is public.

**What Row Does the Data Start On**

What row does the data start on specifies the number of the row where the data in the raw data file starts. A value for this parameter is required. This parameter is relevant only to the CSV adapter.
**What Row Is the Header On**

*What row is the header on* specifies the number of the row that contains the headers. This parameter is relevant only to the CSV adapter.

**User-written Staging Parameters**

For a detailed description of the staging parameters for the User-written Staging transformation, see “Staging Parameters Tab” on page 362.

---

**Staging Parameters for Supported Adapters**

The following tables show the staging parameters for each adapter that SAS IT Resource Management supports. These staging parameters are available from the Adapter Setup wizard. They are also available from the Staging Parameters tab of the Properties dialog box for an adapter or staging transformation.

**Amazon CloudWatch for Staging and Duplicate-Data Checking Parameters**

*Table A3.1  Staging Parameters for the Amazon CloudWatch Adapter*

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input directory</td>
<td>any valid directory or folder</td>
<td>none</td>
<td></td>
</tr>
</tbody>
</table>

*Table A3.2  Duplicate-Data Checking Parameters for the Amazon CloudWatch Adapter*

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard, Force, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
# ASG TMONC2CIC Staging and Duplicate-Data Checking Parameters

## Table A3.3  Staging Parameters for the ASG TMONC2CIC Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file</td>
<td>any valid file</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370VBS and LRECL=32760</td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Table A3.4  Duplicate-Data Checking Parameters for the ASG TMONC2CIC Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### ASG TMONDB2 Staging and Duplicate-Data Checking Parameters for V4 and Earlier Versions

#### Table A3.5  Staging Parameters for the ASG TMONDB2 Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370VBS and LRECL=32760</td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Table A3.6  Duplicate-Data Checking Parameters for the ASG TMONDB2 Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.7  Staging Parameters for the ASG TMONDB2 V5 Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370VBS and LRECL=32760</td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept, Discard, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
</tbody>
</table>

### Table A3.8  Duplicate-Data Checking Parameters for the ASG TMONDB2 V5 Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard, Force, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
### BMC Mainview IMS Staging and Duplicate-Data Checking Parameters

**Table A3.9**  Staging Parameters for the BMC Mainview IMS Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File (default)</td>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tape</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Debug</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370V BS and LRECL=32760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td>Terminate</td>
<td>Discard</td>
</tr>
</tbody>
</table>

**Table A3.10**  Duplicate-Data Checking Parameters for the BMC Mainview IMS Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### BMC Perf Mgr Staging and Duplicate-Data Checking Parameters

#### Table A3.11  Staging Parameters for the BMC Perf Mgr Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allow duplicate ID variables</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370VBS and LRECL=32760</td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Table A3.12 Duplicate-Data Checking Parameters for the BMC Perf Mgr Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CA TMS Staging and Duplicate-Data Checking Parameters

**Table A3.13  Staging Parameters for the CA TMS Adapter**

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File (default)</td>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Yes No</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
<td></td>
</tr>
<tr>
<td>Debug</td>
<td>Yes No</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Parameters Supported for This Adapter</td>
<td>Values for Suboptions</td>
<td>Default Values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>values for RECFM and</td>
<td>RECFM=S370V B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRECL parameters</td>
<td>LRECL=16384</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table A3.14**  *Duplicate-Data Checking Parameters for the CA TMS Adapter*

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format (hh:mm), where (hh) represents hours and (mm) represents minutes</td>
<td>25:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CSV Staging and Duplicate-Data Checking Parameters

### Table A3.15  Staging Parameters for the CSV Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td>The CSV adapter does not support non-ASCII characters in the heading columns. For more information, see “Accessing CSV Files That Contain Data Encoded in UTF-8” on page 414.</td>
</tr>
<tr>
<td>Type of delimiter</td>
<td>list of delimiter characters</td>
<td>list of delimiter characters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>delimiter string</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delimiter characters</td>
<td>any characters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delimiter string</td>
<td>any characters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the delimiter string case sensitive?</td>
<td>Yes</td>
<td></td>
<td>Available only if <strong>Type of delimiter</strong> is Delimiter string.</td>
</tr>
<tr>
<td>Is there a header row?</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What row is the header on?</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What row does the data start on?</td>
<td>any integer</td>
<td>any integer</td>
<td></td>
</tr>
<tr>
<td>How many rows of data should be used as guessing rows?</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.16  Duplicate-Data Checking Parameters for the CSV Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard, Force, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td>IDVAR</td>
<td>SAS variable</td>
<td>FILENAME</td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:15</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

### DT Perf Sentry Staging and Duplicate-Data Checking Parameters

### Table A3.17  Staging Parameters for the DT Perf Sentry Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delimiter in raw data</td>
<td>Comma, Tab</td>
<td>Comma</td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept, Discard, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
</tbody>
</table>
**Table A3.18  Duplicate-Data Checking Parameters for the DT Perf Sentry Adapter**

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:18</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DT Perf Sentry with MXG Staging and Duplicate-Data Checking Parameters

Table A3.19  Staging Parameters for the DT Perf Sentry with MXG Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File (default)</td>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
<td></td>
</tr>
<tr>
<td>Debug</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=V and LRECL=32756</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td></td>
<td></td>
<td>Discard</td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A3.20  Duplicate-Data Checking Parameters for the DT Perf Sentry with MXG Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Ganglia Staging and Duplicate-Data Checking Parameters

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate checking options</td>
<td>Discard, Force, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>01:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

**Table A3.21  Staging Parameters for the Ganglia Adapter**

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSH/SSH host command</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rrdtool executable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rrdtool fetch -start option</td>
<td>e-2days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rrdtool fetch -end option</td>
<td>time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consolidation Function (CF)</td>
<td>any consolidation function</td>
<td>AVERAGE</td>
<td></td>
</tr>
<tr>
<td>Normalize datetime</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept, Discard, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
</tbody>
</table>
**Table A3.22** Duplicate-Data Checking Parameters for the Ganglia Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDVAR</td>
<td>SAS variable</td>
<td>FILENAME</td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>01:15</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HP Perf Agent Staging and Duplicate-Data Checking Parameters**

**Table A3.23** Staging Parameters for the HP Perf Agent Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Table A3.24**  Duplicate-Data Checking Parameters for the HP Perf Agent Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format $hh:mm$, where $hh$ represents hours and $mm$ represents minutes</td>
<td>01:05</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HP Reporter Staging and Duplicate-Data Checking Parameters**

**Table A3.25**  Staging Parameters for the HP Reporter Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input library: Library and Libref</td>
<td>any valid library and libref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default duration</td>
<td>0 or greater</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Table A3.26  Duplicate-Data Checking Parameters for the HP Reporter Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:05</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IBM DCOLLECT Staging and Duplicate-Data Checking Parameters

Table A3.27  Staging Parameters for the IBM DCOLLECT Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File (default)</td>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Debug</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370VB and LRECL=16384</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.28  Duplicate-Data Checking Parameters for the IBM DCOLLECT Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Force</td>
<td>Terminate</td>
<td>Discard</td>
</tr>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>26:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
# IBM EREP Staging and Duplicate-Data Checking Parameters

## Table A3.29  Staging Parameters for the IBM EREP Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File (default)</td>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Debug</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

**Input File Parameters**

| values for RECFM and LRECL parameters | RECFM=S370V B and LRECL=16384 | |

**Future data**

| Accept | Discard | Terminate | |
|--------|---------|-----------|

| Default Values | |
|----------------||

## Table A3.30  Duplicate-Data Checking Parameters for the IBM EREP Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Duplicate checking options**

| Discard | Force | Terminate | |
|---------|-------|-----------|

<table>
<thead>
<tr>
<th>Duplicate</th>
<th>Discard</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
**IBM SMF Staging and Duplicate-Data Checking Parameters**

*Table A3.31  Staging Parameters for the IBM SMF Adapter*

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File or directory (default)</td>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Debug</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370 VBS and LRECL=32760</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.32  Duplicate-Data Checking Parameters for the IBM SMF Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>00:29</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## IBM TPF Staging and Duplicate-Data Checking Parameters

### Table A3.33  Staging Parameters for the IBM TPF Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input type</td>
<td>File (default)</td>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Host</td>
<td>any valid host</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>any valid port</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>any valid user</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>any valid password</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External file name</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tape</td>
<td>Yes No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCMD</td>
<td>any valid site</td>
<td>SITE RDW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Debug</td>
<td>Yes No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Input File Parameters</td>
<td>values for RECFM and LRECL parameters</td>
<td>RECFM=S370V BS and LRECL=32760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td>Terminate</td>
<td>Discard</td>
</tr>
</tbody>
</table>
### IBM VMMON Staging and Duplicate-Data Checking Parameters

*Table A3.35  Staging Parameters for the IBM VMMON Adapter*

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>time in the format <em>hh:mm</em>, where <em>hh</em> represents hours and <em>mm</em> represents minutes</td>
<td>01:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Input File Parameters

<table>
<thead>
<tr>
<th>Values for RECFM and LRECL parameters</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECFM=F and LRECL=4096</td>
<td>No</td>
</tr>
</tbody>
</table>
### Table A3.36  Duplicate-Data Checking Parameters for the IBM VMMON Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>26:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MS SCOM Staging and Duplicate-Data Checking Parameters

### Table A3.37  Staging Parameters for the MS SCOM Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input library: Library and Libref</td>
<td>any valid library and libref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.38  Duplicate-Data Checking Parameters for the MS SCOM Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>time in the format ( hh:mm ), where ( hh ) represents hours and ( mm ) represents minutes</td>
<td>01:05</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### RRDtool Staging and Duplicate-Data Checking Parameters

### Table A3.39  Staging Parameters for the RRDtool Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSH/SSH host command</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rrdtool executable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rrdtool fetch -start option</td>
<td></td>
<td>e-2days</td>
<td></td>
</tr>
<tr>
<td>rrdtool fetch -end option</td>
<td>time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consolidation Function (CF)</td>
<td>any consolidation function</td>
<td>AVERAGE</td>
<td></td>
</tr>
<tr>
<td>Class columns</td>
<td>any class columns</td>
<td>filename datetime</td>
<td></td>
</tr>
<tr>
<td>Normalize datetime</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.40 Duplicate-Data Checking Parameters for the RRDtool Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDVAR</td>
<td>SAS variable</td>
<td>FILENAME</td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>01:15</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SAP ERP Staging and Duplicate-Data Checking Parameters

### Table A3.41 Staging Parameters for the SAP ERP Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input library: Library and Libref</td>
<td>any valid library and libref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presummarization duration</td>
<td>any integer greater than or equal to 1 and less than or equal to 2,147,483,647</td>
<td>3600</td>
<td></td>
</tr>
</tbody>
</table>
### Duplicate-Data Checking Parameters for the SAP ERP Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>00:20</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes, No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

### SAR Staging and Duplicate-Data Checking Parameters

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of processors to use</td>
<td>any positive number</td>
<td>0, which means that all available processors are used</td>
<td>If 1, then MPConnect is not used and the staging code is run on a single processor.</td>
</tr>
<tr>
<td>Minimum number of files to read on each processor</td>
<td>any positive number</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Temporary work space library</td>
<td>WORK library, Staging library, Other library</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library for temporary work space</td>
<td>any valid library</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept, Discard, Terminate</td>
<td>Discard</td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.44  Duplicate-Data Checking Parameters for the SAR Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format <code>hh:mm</code>, where <code>hh</code> represents hours and <code>mm</code> represents minutes</td>
<td>01:15</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SAS Environment Manager (SAS EV) Staging and Duplicate-Data Checking Parameters

### Table A3.45  Staging Parameters for the SAS Environment Manager (SAS EV) Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input library: Library and Libref</td>
<td>any valid library and libref of APM and ACM data sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.46  Duplicate-Data Checking Parameters for the SAS Environment Manager (SAS EV) Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>time in the format ( hh:mm ), where ( hh ) represents hours and ( mm ) represents minutes</td>
<td>0:29</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SNMP Staging and Duplicate-Data Checking Parameters

### Table A3.47  Staging Parameters for the SNMP Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Suboptions</th>
<th>Values for Suboptions</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose raw data input directory</td>
<td>any valid directory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSH/SSH host command</td>
<td>any valid command</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use snmpwalk to gather character data</td>
<td>Yes</td>
<td>snmpwalk</td>
<td>any valid executable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>executable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HostFile</td>
<td>any valid file</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>for snmpwalk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community</td>
<td>any valid community</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>value for</td>
<td>name</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>snmpwalk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No (default)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose access command</td>
<td>HP NNM/Netview</td>
<td>snmpColDUmp</td>
<td>any valid executable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(default)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RRDtool</td>
<td>RRDtool</td>
<td>any valid executable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>executable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of</td>
<td>a number from 1 to 365</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>days to load</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Duplicate-Data Checking Parameters for the SNMP Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>01:03</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VMware Data Acquisition Parameters**

### Staging Parameters for the VMware Data Acquisition Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input library: Library and Libref</td>
<td>any valid library and libref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age limit for data acquisition table (in days)</td>
<td>a positive integer</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
Note: The VMware Data Acquisition adapter does not support duplicate-data checking parameters.

**VMware vCenter Staging and Duplicate-Data Checking Parameters**

**Table A3.50**  Staging Parameters for the VMware vCenter Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input library: Library and Libref</td>
<td>any valid library and libref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table A3.51**  Duplicate-Data Checking Parameters for the VMware vCenter Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>00:18</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Web Log Staging and Duplicate-Data Checking Parameters

## Table A3.52  Staging Parameters for the Web Log Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file</td>
<td>any valid file</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delimiter in raw data</td>
<td>Space</td>
<td>Space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comma</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Accept</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine</td>
<td>any valid machine name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site name</td>
<td>any valid site name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presummarization duration</td>
<td>any integer greater than or equal to 1 and less than or equal to 2,147,483,647</td>
<td>3600</td>
<td></td>
</tr>
</tbody>
</table>

## Table A3.53  Duplicate-Data Checking Parameters for the Web Log Adapter

<table>
<thead>
<tr>
<th>Parameters Supported for This Adapter</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>time in the format hh:mm, where hh represents hours and mm represents minutes</td>
<td>08:00</td>
<td></td>
</tr>
<tr>
<td>KEEP</td>
<td>any integer</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Parameters Supported for This Adapter</td>
<td>Values</td>
<td>Default Value</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------</td>
<td>--------------</td>
<td>-------</td>
</tr>
<tr>
<td>REPORT</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### User-Written Staging Parameters

**Parameters on the Staging Option**

The following table shows the parameters that are available from the Staging option of the Staging Parameters tab in the Properties dialog box of the staging transformation.

Table A3.54  Staging Parameters for User-written Staging Code

<table>
<thead>
<tr>
<th>Staging Parameters Supported</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data input file or directory</td>
<td>any valid file or directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future data</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameters on the Duplicate Checking Option**

The following table shows the parameters that are available from the Duplicate Checking option of the Staging Parameters tab in the Properties dialog box of the staging transformation.

Table A3.55  Duplicate-Data Checking Parameters for User-Written Staging Code

<table>
<thead>
<tr>
<th>Staging Parameters Supported</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable duplicate checking</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicate checking options</td>
<td>Discard</td>
<td>Discard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staging Parameters Supported</td>
<td>Values</td>
<td>Default Value</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IDVAR variable for %RMDUPCHK macro</td>
<td>name of the SAS variable that identifies the system of machine that generated the input data</td>
<td>MACHINE</td>
<td>If the interval between the timestamp values exceeds the value of this parameter, then an observation with the new time range is created in the control data set. This is referred to as a gap in the data. The value for this parameter must be provided in the format <strong>hh:mm</strong>, where <em>hh</em> represents hours and <em>mm</em> represents minutes. For example, to specify an interval of 14 minutes, use INT=0:14. To specify an interval of 1 hour and 29 minutes, use INT=1:29.</td>
</tr>
<tr>
<td>TIMESTMP variable for %RMDUPCHK macro</td>
<td>name of the SAS variable that contains the datetime stamp that uniquely identifies the time of the event or interval that is being recorded</td>
<td>DATETIME</td>
<td></td>
</tr>
<tr>
<td>ENDFILE variable for %RMDUPCHK macro</td>
<td>name of the SAS variable that is used as the END= keyword for the SAS INFILE statement that reads the raw data file</td>
<td>_eof</td>
<td></td>
</tr>
<tr>
<td>INT variable for %RMDUPCHK macro</td>
<td>maximum time gap (or interval) that is to be allowed between the timestamps on any two consecutive records from the same system or machine.</td>
<td>00:29</td>
<td></td>
</tr>
</tbody>
</table>
Parameters on the User-Written Option

The following table shows these parameters that are available from the User-Written option of the Staging Parameters tab in the Properties dialog box of the staging transformation. For a detailed description of the staging parameters specific to the User-written Staging transformation, see “Staging Parameters Tab” on page 362.

Table A3.56 User-Written Parameters for User-Written Staging Code

<table>
<thead>
<tr>
<th>User-Written Parameters Supported</th>
<th>Values</th>
<th>Default Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>User-written code directory path and file specification</td>
<td>directory path and file specification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generate a macro variable with input table name</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Generate macro variables with target table names</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Generate a macro with target table options</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Generate Tabinfo and Varinfo tables</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Generate a macro to create target table ATTRIB statements</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Generate a macro to create computed columns</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>User-Written Parameters Supported</td>
<td>Values</td>
<td>Default Value</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------</td>
<td>---------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| Generate a macro to create column lists | Yes  
No | Yes | |
| Generate a macro to assign columns to missing | Yes  
No | Yes | |
Appendix 4
Jobs That the Adapter Setup and the Add Domain Category Wizards Create

The following table lists the domain categories that the Adapter Setup and Add Domain Category wizards enable you to select for each adapter. This table also shows whether the wizard generates aggregation jobs, information map jobs, reporting jobs, and exception jobs for the domain category. The default name of each job contains the name of the adapter and the domain category that you specify with the Adapter Setup or Add Domain Category wizard.

Table A4.1 Adapter Domain Categories and Associated Jobs

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</th>
<th>Aggregation and Information Map Jobs</th>
<th>Reporting Jobs</th>
<th>Exception Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon CloudWatch</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ASG TMON2CIC</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ASG TMONDB2</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ASG TMONDB2 V5</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>BMC Mainview IMS</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>BMC Perf Mgr</td>
<td>CacheWindows includes Patrol Cache performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>CpuUnix includes global CPU performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>CpuWindows includes global CPU performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>DiskUnix includes disk performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>FilesystemUnix includes file system performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>KernelUnix includes system kernel performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>LogicalDiskWindows includes logical disk performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>MemoryUnix includes memory and paging performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>MemoryWindows includes memory and paging performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>NetworkUnix includes network performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>NetworkWindows includes network performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>PagingFileWindows includes paging file performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>PhysicalDiskWindows includes physical disk performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>ProcessUnix includes process performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>CA TMS</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>CSV (Comma Separated Values)</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>DT Perf Sentry</td>
<td><strong>Exchange InfoStore</strong> includes storage measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Exchange InfoStoreMailbox</strong> includes mailbox storage measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Exchange InfoStorePrivate</strong> includes private storage measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Exchange InfoStorePublic</strong> includes public storage measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Exchange MailServer</strong> includes mail server measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server Disk</strong> includes disk performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Server Network</strong> includes network performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server PagingFile</strong> includes paging file performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server PhysicalFile</strong> includes physical disk performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server ProcessorCpu</strong> includes processor CPU performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server System</strong> includes system performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DT Perf Sentry with MXG</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ganglia</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>HP Perf Agent</td>
<td><strong>Disk Unix</strong> includes disk performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Disk Windows</strong> includes disk performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>LogicalSystem Unix</strong> includes logical system performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Network Unix</strong> includes network performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Network Windows</strong> includes network performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>ProcessorCpu Unix</strong> includes processor CPU performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>ProcessorCpu Windows</strong> includes processor CPU performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>System Unix</strong> includes system performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>System Windows</strong> includes system performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Jobs That the Adapter Setup and the Add Domain Category Wizards Create

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</th>
<th>Aggregation and Information Map Jobs</th>
<th>Reporting Jobs</th>
<th>Exception Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP Reporter</td>
<td><strong>Disk Unix</strong> includes disk performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Disk Windows</strong> includes disk performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>LogicalSystem Unix</strong> includes logical system performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Network Unix</strong> includes network performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Network Windows</strong> includes network performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>ProcessorCpu Unix</strong> includes processor CPU performance measures for UNIX.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>ProcessorCpu Windows</strong> includes processor CPU performance measures for Windows.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>System Unix</strong> includes system performance measures for UNIX.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>System Windows</strong> includes system performance measures for Windows.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IBM DCOLLECT</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBM EREP</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>IBM SMF</td>
<td><strong>CICS</strong> includes CICS hourly summarized transaction activity and response time performance for ApplicationId and ApplicationIdTransactionId domain subcategories.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>CICS</strong> for ApplicationId and ApplicationIdTransactionId domain subcategories</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>DB2 Batch</strong> includes DB2 Batch environment activity and performance.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>DB2 Cics</strong> includes DB2 CICS environment activity and performance.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>DB2 Ddf</strong> includes DB2 DDF environment activity and performance.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>DB2 Global</strong> includes DB2 global activity and performance.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>JOBS</strong> includes batch job activity and performance.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>OMVS</strong> includes OMVS activity and performance.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>RMF CецLpar</strong> includes RMF LPAR performance by CEC.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>RMF Device</strong> includes RMF device performance.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>RMF GoalModeService</strong> includes RMF workload period performance such as CPU, memory, I/O, service, response time, and delay.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>RMF Lpar</strong> includes RMF LPAR performance by system.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>RMF PagingAndSwapping</strong> includes legacy RMF system performance including memory, paging, and swapping.</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>RMF PagingFile</strong> includes RMF Paging file performance.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
## Jobs That the Adapter Setup and the Add Domain Category Wizards Create

<table>
<thead>
<tr>
<th>Adapter</th>
<th>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</th>
<th>Aggregation and Information Map Jobs</th>
<th>Reporting Jobs</th>
<th>Exception Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM TPF</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>IBM VMMON</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>MS SCOM</td>
<td><strong>Server Disk</strong> includes disk performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Server Network</strong> includes network performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server Paging File</strong> includes paging file performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server PhysicalDisk</strong> includes performance measures for the physical disk on the Windows server.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server ProcessorCpu</strong> includes processor CPU performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server System</strong> includes system performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RRDtool</td>
<td>None</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>SAP ERP</td>
<td><strong>Batch</strong> includes SAP batch job activity and performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Host</strong> includes SAP hourly application server activity and performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>System</strong> includes SAP hourly system activity and performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>SystemHostTask</strong> includes SAP hourly system, application server, and task type activity and performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Task</strong> includes SAP hourly task type and elapsed time goal activity and performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Transaction</strong> includes SAP hourly transaction activity and performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Workload</strong> includes SAP workload activity and performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SAR</td>
<td><strong>Disk</strong> includes disk performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Network</strong> includes network performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>ProcessorCpu</strong> includes processor CPU performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>System</strong> includes system performance measures.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>SAS EV (ACM Domain Categories)</td>
<td><strong>App Server Activity</strong> includes information about SAS App Servers Resources Data</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Events</strong> includes information about events</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Logical Server Activity</strong> includes information about SAS Logical Servers Resources Data</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Metadata Server Activity</strong> includes information about Metadata servers.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Objectspawners Activity</strong> includes information about SAS Objectspawners Metric Data</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Platform</strong> includes information about the physical or virtual device.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Resource Inventory</strong> includes information about the resources.</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server Disk</strong> includes disk performance measures.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server Network</strong> includes network performance measures.</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Web Applications Activity</strong> includes information about web applications activity by machine, site name, status, and URL.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>SAS EV (APM Domain Categories)</td>
<td><strong>APM Artifacts Data Usage Activity</strong> includes information about data usage artifacts.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>APM Metadata Events</strong> includes information about metadata events.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>APM Metadata Server Activity</strong> includes information about metadata server activity.</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>APM SAS Application Servers Activity</strong> includes information about the activity of SAS Application Servers.</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SNMP</td>
<td><strong>ICMP</strong> includes SNMP MIB2 ICMP data.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>IF</strong> includes SNMP MIB2 interface data.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>IPDevice</strong> includes SNMP MIB2 IP device data.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>System</strong> includes SNMP MIB2 system data.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>TCP</strong> includes SNMP MIB2 TCP data.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>UDP</strong> includes SNMP MIB2 UDP data.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>VMware vCenter</td>
<td><strong>Cluster System</strong> includes measures for VMware cluster system activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Cluster Storage</strong> includes measures for VMware cluster storage activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Guest Disk</strong> includes measures for VMware guest disk activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Guest Network</strong> includes measures for VMware guest network activity.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Guest Storage</strong> includes measures for VMware guest storage activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Guest System</strong> includes measures for VMware guest system activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Host Disk</strong> includes measures for VMware Host disk activity.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Host Network</strong> includes measures for VMware host network activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Host Storage</strong> includes measures for VMware host storage activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td><strong>Host System</strong> includes measures for VMware host system activity.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Adapter</td>
<td>Domain Categories and Descriptions in the Adapter Setup or Add Domain Category Wizard</td>
<td>Aggregation and Information Map Jobs</td>
<td>Reporting Jobs</td>
<td>Exception Jobs</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Web Log</td>
<td><strong>Browser Activity</strong> includes browser information about visiting clients by machine and browser name.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Server Activity</strong> includes information about website activity and status codes by machine and site name.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Visitor Organization Activity</strong> includes information about website visitors by country, state, domain, host, machine, organization, and organization type.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td><strong>Web Page Activity</strong> includes information about web page activity by machine, site name, status, and URL.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

For more information about the performance areas and staged tables that each domain category includes for reporting and analysis, see “Overview of the SAS IT Resource Management Data Model” on page 548.
Duplicate-Data Checking Overview

SAS IT Resource Management provides the ability to control whether duplicate data is processed into the IT data mart.

Duplicate data is defined as data whose datetime stamp is within a range of data that has already been processed into the IT data mart for that machine or system. Starting with SAS IT Resource Management 3.3, duplicate-data checking can be implemented through parameters that are set interactively on the SAS IT Resource Management client. These parameters set up and call the macros that manage the duplicate-data checking process. For information about implementing duplicate-data checking from a staging transformation, see “How to Implement Duplicate-Data Checking from a Staging Transformation” on page 541.
How Is Data Checked for Duplicates?

Four macros control the process of duplicate-data checking:

- `%RMDUPINT` loads macro definitions that are used by the other duplicate-data checking macros.

- `%RMDUPDSN` generates the name (WORK._DUPCNTL) of the temporary SAS data set that will contain datetime ranges for the data that is being processed into the active IT data mart. It also generates the name of the `sourceAUDIT` data set for duplicate checking.

- `%RMDUPCHK` checks for duplicate data by examining timestamps on data being read by the staging code. This macro also writes to the temporary control data set.

- `%RMDUPUPD` updates the permanent control data sets with information from a temporary control data set through the intermediate control data sets.

For more information about these duplicate-data checking macros, see “Introduction to the Macros in SAS IT Resource Management” on page 583.

Each of the duplicate-data checking macros performs a specific task. Together, these macros set up and manage duplicate-data checking. The macros are designed to check your data and to prevent duplicate data from being processed into the IT data mart. However, sometimes it is necessary to process data in a datetime range for which a machine's or system's data was already processed. For example, you might need to process data into a table that you did not use earlier or that you accidentally deleted. You can specify that the data is acceptable even though it appears to be duplicate data. As raw data is being read, one of the macros that perform duplicate-data checking reviews the datetime information in each record. The datetime information is stored in a SAS data set called a temporary control data set. Later, by using intermediate control data sets, another macro merges the information in the temporary control data set into one or more SAS data sets. These data sets are called permanent control data sets.

When additional data is processed into the IT data mart, the timestamps of the incoming data are compared with the datetime information in the permanent control data sets. The comparison is performed in order to determine whether the new data has already been processed. If it has, the duplicate data is handled in the way that you specify.

A duplicate-data report is printed in the SAS log after the data is read. The report describes how many records were read for each machine or system and how many duplicates were found, if any. (If you specified `Report = No` on the Duplicate Checking page of the Staging Parameters tab of the staging transformation, this information is written to the `sourceAUDIT` file.)

Note: The first time you run a job with duplicate-data checking enabled, the permanent control data sets have not been built, so the macro `%RMDUPCHK` cannot check the input records. Your data is not checked or rejected for duplicates, but the permanent control data sets are created and the datetime information for this data is saved to them. Data is checked only on the datetime, although SMF data is also checked for the system name. (For example, if you try to add a new record type, you might already have read other record types from that adapter for that time period. In that case, the records are not kept.) The duplicate-data report contains only a limited amount of information about your data.
Control Data Sets for Duplicate-Data Checking

Types of Control Data Sets

Control data sets (temporary, intermediate, and permanent) are the basis on which duplicate data is rejected. The following section describes how the control data sets are created, used, updated, and stored.

- Temporary control data sets

When input data is processed, the %RMDUPCHK macro creates a temporary control data set, WORK._DUPCNTL, which stores information about the raw data from one or more adapters. Specifically, for each machine or system that generated data, the temporary control data set stores the datetime ranges and record counts in the raw data. In some cases, raw data from more than one data source might be processed in the same job. If so, information is appended to the temporary control data set with each execution of the %RMDUPCHK macro.

Note: For the SMF adapter, record types 2 and 3 are not counted by the duplicate data checking process. Therefore, the “SAS IT Resource Management Input Data Duplication Check Report” might display different record counts from those that are displayed by SAS.

- Intermediate control data sets

When all the input data has been read and stored in the temporary control data set, the %RMDUPUPD macro writes the data from the temporary control data set, WORK._DUPCNTL, to separate intermediate data sets, which are located in the staging library for that staging job.

Note: The first time a staging table is added to a staging transformation, a library is created. This library contains the control data information for all the staged tables that are created by that staging transformation. It is called adapter-nameStaging nnnn, where nnnn is a random number that ensures that the library name is unique within the IT data mart. For example, a library name might be DT Perf Sentry Staging 8926. (This library also contains other types of data.) If all the staged tables that are created by that staging transformation are subsequently deleted, and one or more new staged tables are added to the transformation, then a new library is created for the new staged tables. The first library that was created (for the original staged tables) is not used again. It is not automatically deleted, but you can delete it.

If the data set exists, then the data set is used and the new data overwrites the old data. Otherwise, the data set is created and the new data is written to that data set.

- Permanent control data sets

The data in the intermediate control data sets is then merged by %RMDUPUPD into the corresponding permanent control data sets. These permanent control data sets are named sourceCNTRL in the staging library for that staging job. The permanent control data sets are stored and maintained in the staging library. One permanent control data set, named sourceCNTRL, can exist for each adapter. Each data set contains information about that adapter’s machines or systems, datetime ranges, and record counts.

If a sourceCNTRL data set exists, the new data is merged into it. Otherwise, the data set is created and the new data is written to that data set.
The permanent source AUDIT data set contains one observation for each ID column (such as MACHINE) and the number of new and potentially duplicate records that were processed.

**Content of Permanent Control Data Sets**

The content of the permanent control data sets is based on intervals and ranges in your data. The INT= parameter flags datetime gaps. When you specify the INT= parameter in %RMDUPCHK, you define the maximum gap allowable between records in the same range. If the gap between datetimes for two consecutive records exceeds this value, then a new range is created.

A range is deleted when the end-of-range datetime value is older than the number of weeks that are specified in the KEEP= parameter in %RMDUPCHK. However, if your data is continuous, then you have only one range. Your control information is never deleted because the end-of-range datetime value is constantly extended by new datetime information.

Here are the ways that ranges are used with continuous and non-continuous data:

- If your data is continuous and does not have any datetime gaps that exceed the value of the INT= parameter, then your data always updates the same range. In this case, the permanent control data set contains one range for each unique value of the variable that is specified by the IDVAR= parameter. The values of that variable are typically the machine or system names from which the raw data originated. (Only the CSV, RRDtool, and user-written adapters require you to enter this parameter.)

- If your data is not continuous, then the permanent control data set contains multiple ranges for each unique value of the variable that is specified by the IDVAR= parameter. Each range is prefixed with a value of the variable that is specified by the IDVAR= parameter.

*Note:* For the HP Reporter and VMware adapters, one set of control data sets is created for each table by default. You can create just one set of control data sets for these adapters. To do so, specify a three-character identifier in the SOURCE= parameter of the %RMDUPCHK macro. SAS IT Resource Management then prefixes that identifier to the control data set.

---

**Working with Duplicate-Data Checking Macros**

**About Working with Duplicate-Data Checking Macros**

If you are using a test environment and staging new data for a new data source for the first time, you might not want to implement duplicate-data checking macros. To do so, on the Duplicate Checking page of the Staging Parameters tab of the staging transformation, set the Enable duplicate checking field to No. This setting provides more flexibility as you process different types of sample files. Once you are satisfied with the results of your tests, you can purge the IT data mart. You can then choose whether to implement duplicate-data checking by specifying parameters in the staging transformation.

*Note:* If you edit the generated source code to modify the mode for duplicate-data checking, then your changes to the code are lost if the job is regenerated or redeployed. Although you can save the functionality of the source code to the local
file system, the original source code is preserved. In addition, the mode for
duplicate-data checking is not updated in the SAS Metadata Repository entries.

How to Implement Duplicate-Data Checking from
a Staging Transformation

To implement duplicate-data checking, perform the following steps:

1. Right-click the staging transformation and select Properties.
2. On the Properties dialog box, select the Staging Parameters tab.
3. On the Duplicate Checking page, ensure that the Enable duplicate checking field is set to Yes. This setting enables you to specify the parameters that govern the duplicate-data checking process.

Note: The SNMP adapter requires that duplicate checking be turned on. This setting is necessary because neither method of gathering raw data for SNMP (HPNNM and rrdtool) can ensure that only the most recent raw data is saved. Therefore, invoking the duplicate-data checking code of SAS IT Resource Management is the only way to determine what is new data and what is duplicate data.

If you do not want to implement duplicate-data checking, set the Enable duplicate checking field to No. This setting makes the duplicate-data checking parameters unavailable.

4. Specify the following parameters:
   - **Duplicate checking option**
     specifies how duplicate data is handled. Select one of the following options:

     TERMINATE
     stops processing if duplicate data is encountered.

     DISCARD
     continues processing while rejecting duplicate data if it is encountered. This is the default value for this parameter.

     Note: For best results, the value for the Duplicate checking option parameter for the SNMP adapter should always be set to Discard.

     FORCE
     continues processing and accepts duplicate data if it is encountered.

     Note: Duplicate-data checking macros are designed to prevent the same data from being processed into the IT data mart twice. However, sometimes you might need to backload data. Backloading data means to process data that is in a datetime range for which the permanent control data sets have already recorded machine or system data. (For example, you might need to process data into one or more tables that you did not use earlier or into one or more tables that you accidentally purged or deleted.) Make sure you restore the Duplicate checking option setting to its original value after you finish the backloading task.

   - **IDVAR**
     identifies the SAS variable that is used to denote the origin of each incoming record.
Note: This parameter is visible only for the CSV, RRDtool, and user-written adapters.

- **INT**
  specifies the maximum time gap (or interval) that is allowed between the timestamps on any two consecutive records from the same system or machine. If the interval between the timestamp values exceeds the value of this parameter, then an observation with the new time range is created in the control data set. This is referred to as a gap in the data.

  The value for this parameter must be provided in the format **hh:mm**, where **hh** represents hours and **mm** represents minutes. For example, to specify an interval of 14 minutes, use **INT=0:14**. To specify an interval of 1 hour and 29 minutes, use **INT=1:29**.

- **Keep**
  specifies the number of weeks for which control data are kept. Because this value represents the number of Sundays between two dates, a value of 2 results in a maximum retention period of 20 days. This value must be an integer.

- **Report**
  The **REPORT** parameter specifies whether to display the duplicate-data checking messages in the SAS log or to save the messages in an audit table. If set to **Yes**, this parameter displays all the messages from duplicate-data checking in the SAS log. If set to **No**, the duplicate-data checking messages are saved in an audit data table that is stored in the staging library. The name of the audit table is **sourceAUDIT** (where **source** is the 3-character data source code).

  Note: If you are monitoring very high numbers of resources, setting this option to **No** can be beneficial. Eliminating the report reduces CPU consumption, shortens elapsed time, and makes the SAS log more manageable.

Note: Prior to SAS IT Resource Management 3.3, you were required to create catalog entries or files in the MXG source library of your operating system in order to handle duplicate-data checking. Although these members or files are no longer necessary, if they exist, SAS IT Resource Management continues to honor them. However, it is preferable to manage duplicate-data checking by specifying the appropriate values on the staging transformation.

---

**Additional Details for the MS SCOM and HP Reporter Database Adapters**

The staging code for the MS SCOM and HP Reporter adapters is designed to read in only those rows in the input database that were not previously staged. Even though the staged table is overwritten each time a staging job is executed, a record is kept of the data that was read. This ensures that only new data is read when the staging job is run.

The duplicate-data control data sets determine the raw data observations that should be staged. If the duplicate-data control data sets do not exist when the staging job is executed, then all of the data in the input database is staged.

The staging code for the MS SCOM and HP Reporter adapters always uses the duplicate-data control data sets so that only new data is staged. Therefore, the duplicate-data checking option is always activated by default for these adapters. All subsequent
staging jobs that specify that adapter's staging library location use that library's control data sets. These duplicate-data control data sets subset the data for these adapters as data is extracted from raw data tables.

Note: You can temporarily turn off the duplicate-data checking option by modifying the generated SAS code. For an example, see “Example 3: Using Macro Variables to Subset Data for HP Reporter, MS SCOM, SAS EV, and VMware Adapters” on page 544.

Duplicate-Data Checking for User-Written Staging Code

If you are working with user-written staging code, you need to place the calls to the %RMDUPINT, %RMDUPDSN, %RMDUPCHK, and %RMUPUPD macros in the staging code. For information about how to implement duplicate checking of your data, see “Duplicate Checking” on page 341.

Examples

Example 1: Processing Data in a DATETIME Range for Which a DATETIME and IDVAR Was Already Processed

This example describes how to process data into a table that was not used earlier or that is in a table that was accidentally deleted.

To process data in a datetime range for which a particular DATETIME and IDVAR variable was already processed, select a value of FORCE for the Duplicate checking options parameter. (That parameter is located on the Duplicate Checking page of the Staging Parameters tab of the staging transformation.) The parameter specifies that the data is accepted, even though it appears to be duplicate data.

Example 2: Processing Data for Two IBM SMF Files

This example describes how to process data for two separate IBM SMF files. In this example, a site has two separate IBM SMF contiguous data sets for the same IDVAR variable. It attempts to stage them into a supplied SAS IT Resource Management table. The first IBM SMF input file covers a datetime stamp range from 9:00 a.m. to 10:00 a.m.; the second contains a range from 10:00 a.m. to 11:00 a.m.

In addition, the following conditions apply to this example:

- The Duplicate checking option parameter is set to DISCARD for both jobs.
- The records that describe the last IBM SMF interval are split across the two SMF data sets.
- Both of these IBM SMF files are processed for the same IT data mart.
- A 15-minute IBM SMF interval is being used—for example, an interval that starts at 9:45 a.m. and ends at 9:59:59 a.m. The RMF 70-79 records that describe all the statistics in this same interval are partially written in the first data set. When the
SYS1.MAN1 data set is full, the RMF 70-79 records that start at 9:59:59 a.m. are written in the SYS1.MAN2 data set.

- Each time an IBM SMF file is read, the data is processed into SAS IT Resource Management and aggregated.

There are two methods that you can use to process this data:

- Load all IBM SMF data into a single job, concatenating the two IBM SMF data sets. This is the preferred method because no data is lost.
- Load IBM SMF data in two unique JCL steps or batch jobs. Each job should read one IBM SMF file at a time.

*Note:* In each method, the first IBM SMF data set is loaded into the IT data mart. The duplicate-data checking macros mark the data as correctly loaded from 9:45:00 a.m. to 9:59:59 a.m. However, the second method processes the SMF data files individually. Those records that match the DATETIME and IDVAR parameters that range from 9:45:00 a.m. to 9:59:59 a.m. are considered duplicates and are discarded.

### Example 3: Using Macro Variables to Subset Data for HP Reporter, MS SCOM, SAS EV, and VMware Adapters

Duplicate-data checking is always enabled for the HP Reporter, MS SCOM, and VMware adapters. Therefore, the staging transformations for those adapters do not provide a parameter for duplicate-data checking. However, you might want to override the default action that is specified by the duplicate-data checking parameter.

SAS IT Resource Management provides two macro variables that enable you to subset data for these adapters: ITRM_LoadFromDate and ITRM_LoadToDate. These macro variables enable you to override the default action of subsetting the incoming data that is based on the duplicate-data control data sets.

The ITRM_LoadFromDate and ITRM_LoadToDate macro variables can be used in the following situations:

- to backload data into tables that are added to a staging job after it has already run once against a given set of data
- to specify a datetime range to use during staging to extract only the data from the input database whose datetime stamps fall within the specified range.

*Note:* When the ITRM_LoadFromDate and ITRM_LoadToDate macro variables are set, the duplicate-data checking code is still executed. SAS IT Resource Management discards any data that is detected as duplicates.

The following code sets the ITRM_LoadFromDate and ITRM_LoadToDate macro variables to valid start and end datetime values. These values are used to subset the data from the database instead of the ranges in the duplicate-data control data sets. This code should be added to the generated code or to the deployed job code for the staging job:

```plaintext
%let ITRM_LoadFromDate=14FEB2010:00:00:00;
%let ITRM_LoadToDate=15FEB2010:23:59:00;
```

*Note:* When these macro variables are used with the VMware adapter, you must specify the values for these macro variables in Coordinated Universal Time (UTC). (UTC time is the same as Greenwich Mean Time (GMT).)

*Note:* The SAP ERP and SAS EV adapters do not support using macro variables to backload or subset data based on specific datetime ranges. These adapters can...
process new data only by using duplicate-data control data sets. If you want to backload data, you must delete the duplicate-data control tables. The staging job can then process all the data that is available in the database or in the raw data tables.

The following list explains when the data is subset:

- For the HP Reporter adapter, the data is subset as it is extracted from the raw data tables.
- For the MS SCOM adapter, the data is subset while extracting from the database.
- For the SAS EV adapter, the data is subset after it is initially extracted from the raw data tables.
- For the VMware adapter, the data is subset after it is initially extracted from the raw data tables.

For information about backloading, see “How to Backload Raw Data” on page 643.

**Example 4: Using Macro Variables to Process Observations with Equal Timestamps**

The duplicate checking process discards an observation whose timestamp value is less than or equal to the upper limit of a datetime range. However, in some cases, SMF records with exactly the same datetime stamp are split across tapes. In these circumstances, the first few records of the second tape would be discarded. The records are discarded because they match the criteria of being less than or equal to the upper limit of an existing datetime range.

You can prevent these records from being discarded by specifying the following two macro variables:

- **CPDUP_ALLOW_EQ**

  When set to **Yes**, this macro variable specifies whether observations with equal timestamp values can be processed when they are the first records processed for the value that is specified in the IDV AR parameter. The default value for this macro variable is **No**.

- **CPDUP_ALLOW_MSG**

  This macro variable specifies whether messages should be produced when both of the following conditions are met:
  - **CPDUP_ALLOW_EQ** is set to **Yes**.
  - observations with equal timestamps are encountered.

The default value for this macro variable is **No**.

The following text shows the format of the messages that are produced:

```
Potential duplicate has been processed _n_=<observation number>
   system=<system name>
   smftime=<SMF timestamp>
```

To set these macro variables, add the following statements to the beginning of the batch job:

```plaintext
%let CPDUP_ALLOW_EQ=YES;
%let CPDUP_ALLOW_MSG=YES;
```
The following text is an example of the messages that might be produced:

*Note:* If the macro variables are not specified in the batch job, their absence is interpreted as **No**.
## Overview of the SAS IT Resource Management Data Model

- About the SAS IT Resource Management Data Model
- Features of the SAS IT Resource Management Data Model
- Data Model Staging and Aggregation General Concepts
- Data Model Aggregation Table Groups and Time Periods
- Data Model Aggregation Key and Ranked Metrics

## Data Model Adapter and Domain Category Specifications

- BMC Perf Mgr Adapter - BMC Perf Mgr Domain Category
- DT Perf Sentry Adapter - DT Perf Sentry Server-Based Domain Categories
- DT Perf Sentry Adapter - DT Perf Sentry Exchange Domain Category
- HP Perf Agent and HP Reporter Adapters
- MS System Center Operations Manager - MS SCOM Server-Based Domain Categories
- SAPR3 Adapter - Systems, Machines, Tasks, and Transactions
- SAPR3 Adapter - SAPBTCH (Batch Job) and SAPWKLD (Workload)
- SAR Adapter - SAR Domain Category
- SAS Environment Manager Adapter - Agent-Collected Metrics (ACM) Data Source Domain Categories
- SAS Environment Manager Adapter - Audit, Performance, and Measurement (APM) Data Source Domain Categories
- SMF Adapter - RMF Domain Category
- SMF Adapter - Jobs, TSO, and OMVS Domain Categories
- SMF Adapter - CICS Domain Category
- SMF Adapter - DB2 Domain Category
- SNMP Adapter - Network Activity, Device and Interface Data, and System Data
- VMware Adapter - Cluster, Guest, and Host Domain Categories
- Web Log Adapter - All Domain Categories

## What Are Key Metrics?

- Key Metrics for the Server Performance Domain Category

## Detail Aggregation Template Tables for Amazon CloudWatch and Ganglia Adapters, and for Selected IBM SMF Staged Tables

- About the Detail Aggregation Template Tables for Amazon CloudWatch and Ganglia Adapters, and for Selected IBM SMF Staged Tables
Overview of the SAS IT Resource Management Data Model

About the SAS IT Resource Management Data Model

The data model that is supplied for those adapters that are supported by SAS IT Resource Management provides a rich set of measures. The data model is fully documented on the product documentation page: http://support.sas.com/documentation/onlinedoc/itsv/zipfiles/HTMLDoc_3.8/DataModel.html. At this site, the SAS IT Resource Management data model can be interactively navigated, including all of the staged and aggregation (domain category) tables. For each staged table, data and computed columns along with the attributes of each can be reviewed. For each aggregation table, the staged data from which the aggregation was created; the properties of the aggregation; and the attributes of each of the class, ID, statistic, rank, and computed columns can be reviewed.

Reports that are built with this data model are supplied with the solution. Samples of reports are located here: http://support.sas.com/documentation/onlinedoc/itsv/zipfiles/HTMLDoc/Reports.html.

TIP When designing a user-written adapter, you should review and follow the column labeling scheme of the supplied data model as closely as possible. This practice enables you to copy and reuse those reports in support of your user-written data source. For more information about this topic, see “User-Written Staging Transformations” on page 333.

The data model supports a number of data sources from computer system hardware, operating system software, networks, web servers, databases, and applications on z/OS, Windows, and UNIX platforms. Distinct data sources are characterized as adapters in SAS IT Resource Management terminology.

Features of the SAS IT Resource Management Data Model

The following characteristics are available from the SAS IT Resource Management data model for all of the supported adapters:

- Column labeling is standardized to make the data model meaningful and consistent across adapters in SAS IT Resource Management objects, including template tables, staged tables, aggregation tables, and information maps. Labels are coded for easier viewing and to shorten total label length, making them easier to understand. In most cases, columns with similar meaning in different adapters are named with a similar label in order to promote more consistency in classification and metric names across adapters. In most labels, the name incorporates the respective domain category.

- A significant number of computed columns are added to the data model. Computations for computed columns are often simply represented as an RVALUE expression. However, there are some computed columns that include multiple SAS statements in the expression. In addition to these supplied computed columns, users can extend the function of the data model by adding their own computed columns.

- Supplied computed columns include the following areas of functionality:
  - standard date and time derivations that are based on the source datetime found in the raw data.
normalized columns that convert lowest common denominator units into industry standard data representations. These normalizations include the following conversions:

- bytes to kilobytes, megabytes, and gigabytes
- seconds to milliseconds
- bits to megabits
- service units to MSU (millions of service units)
- percentages between 0 and 1 to percentages between 0 and 100
- generation of a total value from several disparate parts—for example, input + output, read + write, received + sent, and so on.
- generation of a column that contains a value that is the opposite of an already existing column. This conversion highlights the variance in the usage of a resource in contrast to the availability of the same resource.
- generation of event counters to count individual events and enable them to be easily summarized when aggregating the data.
- generation of new classification columns when an individual instance of a performance metric needs to be separated from the global instance. This enables the global and individual instances to be aggregated separately.
- conversion of raw counts to rate-based values.
- calculation of buckets for counts and percentages that are associated with ranges of response time.
  
Formulas are also available in the data model. In SAS IT Resource Management, formulas are reusable shared expressions for use with computed columns. Supplied SAS IT Resource Management formulas are frequently used to set the values for date-based and time-based computed columns that are included in the data model.

The most suitable national language support (NLS) format is used for many supplied columns in the data model. Therefore, a large percentage of columns is ready for formatting in multiple languages. However, some time-based columns that focus on accumulations of time and other columns already using specialized formats have not been converted to NLS. The reason for this is that there is currently not an acceptable equivalent NLS format.

### Data Model Staging and Aggregation General Concepts

The process of staging data is required in order to prepare raw data and to create data extracts in SAS data set format. Staging is an intermediate step that is performed before the creation of aggregations in the SAS IT Resource Management data model. (Existing staged data is overwritten for each new iteration of the staging process.) The SAS IT Resource Management data model is based on aggregations. Aggregations are created to provide report-ready data that can be easily read into an information map. An information map is a map that enables the aggregated data to be available for several SAS reporting clients, including SAS Enterprise Guide, SAS Web Report Studio, and SAS OLAP Cube Studio.

**Note:** The following information describes the aggregations that are generated by means of the Adapter Setup wizard. The information does not necessarily apply to all aggregations in general.
Aggregated data tables in the SAS IT Resource Management data model have the following structures and the properties that are associated with them:

- The name of the aggregation table consists of a concatenation of a time period and a descriptive string. The descriptive string represents a domain category in a mixed-case format that uses uppercase letters to signify the beginning of a new word. For example, the name of an aggregation table might be one of the following: DayHourCpu or MonthJobSummary.
- The aggregation table has an aging limit that is specified in days.
- The time period for aggregated data is represented by one or more columns in the classification list.
- The aggregated data contains one or more classification columns. Some of these columns are time-based and other columns are not based on time.
- The aggregated data might contain one or more ID columns.
- The aggregated data contains one or more statistics. Statistics can be weighted or unweighted, depending on the nature of the performance metric. Weighting is typically by duration of time or by a counter that indicates a number of events. Weighting columns are explicitly specified in SAS IT Resource Management.
- The aggregated data can contain one or more ranked metrics. Each ranked metric can be based on a class or ID variable or on a statistic.
- The aggregated data can contain one or more computed columns. These columns can use any aggregated data as sources for their calculations.
- Filters can be used both to keep only appropriate data, and to reduce the volume of the aggregation table's output data.

**Data Model Aggregation Table Groups and Time Periods**

Aggregation tables in the data model are grouped into aggregation table groups. Multiple aggregation table groups can be defined within an adapter's domain category. An aggregation table group is a set of aggregation tables that contain a set of classification columns that are identical, except for the time period classification columns. The time periods vary among the aggregation tables in the aggregation table group.

For example, in an aggregation table group that is based on Memory, the aggregation tables are named DayMemory, DayHourMemory, DayShiftMemory, MonthMemory, MonthHourMemory, MonthShiftMemory, and XMinMemory. (XMinMemory signifies aggregation tables that are based on sub-hourly memory activity). Typical time periods that can be represented in an aggregation table are datetime, hour, shift, day, week, and month. An aggregation table can focus on a single time period, such as datetime, day, week, or month. Alternatively, it can include multiple time periods such as day and hour or day and shift. An aggregation table that uses the datetime period typically focuses on time intervals that are less than a full hour. Aggregation tables that focus on day, week, month, hour, and shift time periods work with time periods of an hour or more.

**Data Model Aggregation Key and Ranked Metrics**

The SAS IT Resource Management data model provides metrics that are identified as key or ranked metrics. Key and ranked metrics are primarily the same metrics within the adapters, but they are handled differently depending on the type of aggregation that they are used in.
• Key metrics are metrics that are written to a key metrics aggregation table. A key metrics aggregation table usually includes the term “KeyMetrics” in its name (for example, KeyMetricsMemory). The intent of the key metrics aggregation table is to keep a limited set of important performance metrics for a long period of time. This tactic facilitates better capacity planning and forecast reporting. Wherever appropriate, key metrics are standardized across adapters. Key metrics are not ranked. Only one statistic is specified for a key metric in a key metrics aggregation table. For specific information about the key and ranked metrics for an adapter and domain category, see “What Are Key Metrics?” on page 562.

Note: For some adapter and domain combinations the key metrics also provide the ability to filter on the top or bottom rated resource values within a set of classification values. These adapter and domain combinations include the SMF adapter and the RMF, CICS, DB2, Jobs, TSO, and OMVS domain categories, among others. The latter ranking filters are very useful to limit the number of reports that are created to those classifications with the greatest or least resource utilization.

• Ranked metrics are metrics within an aggregation table for which ranking is done. Metrics can be ranked in any aggregation tables. Ranked metrics are based on statistics. Typically, only the most meaningful statistic is ranked.

• Both metrics and date classifications can be ranked using either ascending or descending criteria that is based on a list of classifications that are specified for the ranking of the available data.

There are several distinct types of aggregation processing strategies that are available for the supported adapters and domain categories in the data model. Each SAS IT Resource Management supplied adapter can have one or more domain categories that are associated with it. Domain categories have been created that enable users to group source data that should be staged and aggregated together for reporting purposes.

Data Model Adapter and Domain Category Specifications

BMC Perf Mgr Adapter - BMC Perf Mgr Domain Category

About the BMC Perf Mgr Adapter - BMC Perf Mgr Domain Category
The domain categories for this adapter use the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables. Filters that query the CPU instance are used to divide aggregation tables that contain global CPU measurements from those that contain individual CPU processor measurements.

Focus of Report-Ready Data for the BMC Perf Mgr Adapter
Report-ready data for this adapter focuses primarily on the following areas:

• utilization of CPU, memory, queuing, cache, paging, and swapping on the global server level
About the DT Perf Sentry Adapter - DT Perf Sentry Server-Based Domain Categories

The domain categories for this adapter represent a subset of data collected by Performance Sentry software that is available from Demand Technology Software. They focus on server-level activity and performance on the Windows platform. These adapter and domain category combinations use the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables.

Focus of Report-Ready Data for the DT Perf Sentry Adapter - DT Perf Sentry Server-Based Domain Categories

Report-ready data for these adapter and domain combinations focuses primarily on the following areas:

- utilization of CPU, memory, queuing, cache, and paging on the global server level
- utilization of CPU for individual CPU processors
- utilization, response times, transfer rates, and wait and queuing for logical and physical disks
- packet and data volume transfer activity, utilization, and queuing for network interfaces

About the DT Perf Sentry Adapter - DT Perf Sentry Exchange Domain Category

The domain categories for this adapter represent a subset of data that is collected by Performance Sentry software. This data focuses on Microsoft Exchange server activity and performance on the Windows platform. This adapter and domain category combination uses the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables.
Focus of Report-Ready Data for the DT Perf Sentry Adapter - DT Perf Sentry Exchange Domain Category

Report-ready data for this adapter and domain combination focuses primarily on the following areas:

• Remote Procedure Call (RPC) response times, transfer rates, and request and operation rates at the global Exchange server level
• total and active user counts at the global Exchange server level
• virtual memory utilization at the global Exchange server level
• delivered, sent, and submitted messages and receive and send queue lengths for mailboxes and public and private information stores
• message rates, data transfer rates, and queue lengths for Exchange mail servers

HP Perf Agent and HP Reporter Adapters

About the HP Perf Agent and HP Reporter Adapters

The domain categories for the HP Perf Agent and HP Reporter adapters focus on server level activity and performance on the UNIX and Windows platforms. Recent changes were made to data collection by HP Perf Agent and HP Reporter. As a result, it is possible to monitor the performance of logical systems that are configured as virtual guests of host servers. These adapters provide some support of the new technology of virtualization. Operating environments that are currently supported for virtualization are HP Virtual machines, AIX LPARs, and VMWARE ESX guests on Linux. These adapters use the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables. Filters that query the operating system are used to divide aggregation tables that contain UNIX platform performance measurements from those that contain Windows platform performance measurements.

Focus of Report-Ready Data for the HP Perf Agent and HP Reporter Adapters

Report-ready data for these adapters focuses primarily on the following areas:

• utilization of CPU, memory, queuing, paging, swap, disk, and network on the global server level
• utilization of CPU for individual CPU processors
• utilization, response times, transfer rates, and wait and queuing for physical disks
• packet and data volume transfer activity, utilization, queuing, and error rates for network interfaces
• utilization of CPU and memory for logical systems to determine the share of resource utilization for the virtual guests associated with host servers
**MS System Center Operations Manager - MS SCOM Server-Based Domain Categories**

*About the MS System Center Operations Manager - MS SCOM Server-Based Domain Categories*

The domain categories for this adapter represent a subset of data collected by a Microsoft product called System Center Operations Manager. They focus on server-level activity and performance on the Windows platform. These adapter and domain category combinations use the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables.

*Focus of Report-Ready Data for the MS SCOM Adapter - MS SCOM Server-Based Domain Categories*

Report-ready data for this adapter and domain combination focuses primarily on the following areas:

- utilization of CPU and memory the global server level
- utilization, response times, transfer rates, and wait and queuing for logical and physical disks

**SAPR3 Adapter - Systems, Machines, Tasks, and Transactions**

*About the SAPR3 Adapter - Systems, Machines, Tasks, and Transactions Domains*

SAP R/3 performance data is collected by using the SAS IT Management Adapter for SAP in conjunction with SAS/ACCESS to SAP R/3 software. This adapter and domain category combination uses the event hourly summarization strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

These staged tables are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, and monthly time periods. Hourly activity is included in a number of these aggregation tables. (There are no sub-hourly aggregation tables for this domain category due to the staged data being pre-summarized to the hourly level.) There are groups of aggregation tables that are created for each of the staged tables in the previous table. Filters that query the transaction code are used to exclude blank transaction codes from the system-transaction aggregation tables.

*Focus of Report-Ready Data for the SAPR3 Adapter - Systems, Machines, Tasks, and Transactions Domain Categories*

Report-ready data for these adapter and domain combinations focuses primarily on the following areas for various groups of classifications:

- event, task type, and transaction counts
- total and average values for CPU, database, elapsed, response, processing, overhead, wait, and RFC times
total and average values for database requests and physical database accesses and changes
- total and average values for kilobytes of data transferred
- request counts and time expended for Sequential Reads, Direct Reads, Update, Insert, and Delete operations
- counts of physical records read, updated, inserted, and deleted
- lock counts

SAPR3 Adapter - SAPBTCH (Batch Job) and SAPWKLD (Workload)

About the SAPR3 Adapter - SAPBTCH (Batch Job) and SAPWKLD (Workload) Domains
SAP R/3 performance data is collected by using the SAS IT Resource Management Adapter for SAP in conjunction with SAS/ACCESS to SAP R/3 software. This adapter and domain categories combination uses the event activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

These staged tables are read into a series of aggregation jobs that create aggregation tables for daily, weekly, and monthly time periods. (At this time, there is no hourly, sub-hourly, or shift-based activity in these aggregations.) There are several groups of aggregation tables that are created for each of the staged tables that are listed in the previous table. Filters that query transaction code are used to exclude blank transaction codes from the workload-related aggregation tables that focus on transaction activity.

Focus of Report-Ready Data for the SAPR3 Adapter - SAPBTCH and SAPWKLD Domain Categories
Report-ready data for these adapter and domain combinations focuses primarily on the following areas for various groups of classifications:
- event, job, and transaction counts
- total and average values for CPU, database, elapsed, response, processing, overhead, wait, and RFC times
- total and average values for database requests and physical database accesses and changes
- total and average values for kilobytes of data transferred
- request counts and time expended for Sequential Reads, Direct Reads, Update, Insert, and Delete operations
- counts of physical records read, updated, inserted, and deleted
- lock counts

SAR Adapter - SAR Domain Category

About the SAR Adapter - SAR Domain Category
This domain category represents a subset of data collected by the System Activity Reporter (SAR) utility on various UNIX environments. The data focuses on server level activity and performance on the UNIX platform. This adapter and domain category
combination uses the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data. The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables.

**Focus of Report-Ready Data for the SAR Adapter**
Report-ready data for this adapter focuses primarily on the following areas:

- utilization of CPU, memory, queuing, cache, paging, and swapping on the global server level
- utilization of CPU for individual CPU processors
- utilization, response times, transfer rates, and wait and queuing for physical disks
- packet and data volume transfer activity for network interfaces

**SAS Environment Manager Adapter - Agent-Collected Metrics (ACM) Data Source Domain Categories**

**About the SAS Environment Manager Adapter – Agent-Collected Metrics (ACM) Data Source Domain Categories**
This ACM data source domain category represents a subset of data collected by the SAS Environment Manager Data Mart on various Windows and UNIX environments. It focuses on level activity and performance of SAS Resources. This includes administering the SAS Web Application Server resources and monitoring SAS foundation servers, SAS metadata server resources, such as authorization and user definitions on Windows and UNIX platforms. This adapter and domain category combination uses the SAS Resources activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation (SAS Environment Manager) is used in staging the data. The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregations tables.

**Focus of Report-Ready Data for the Agent-Collected Metrics (ACM) Data Source Domain Categories**
Report-ready ACM data for this adapter focuses primarily on the following areas:

- response time for SAS HTTP web services
- workload, CPU usage, and memory usage for each platform in your environment
- usage and response information for file mounts
- total number of clients per minute on the SAS Metadata Server machine
**About the SAS Environment Manager Adapter - Audit, Performance, and Measurement (APM) Data Source Domain Categories**

This APM data source domain category represents a subset of data collected by the SAS Environment Manager Data Mart (an extension of APM package ETL) on various Windows and UNIX environments. It focuses on creating auditing authentication reports for regulatory compliance or producing reports on the performance and usability of your SAS Intelligence Platform. This adapter and domain category combination uses the SAS Artifacts Resources usage activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables.

**Focus of Report-Ready Data for the Audit, Performance and Measurement (APM) Data Source Domain Categories**

Report-ready APM data for this adapter focuses primarily on the following areas:

- the most heavily used SAS procedures
- the top ten users of the SAS Workspace Server
- the number of times per day that each user ID has accessed the SAS Metadata Server
- each instance of an authentication error or an unauthorized login attempt
- the response time and run time for SAS stored processes

**SMF Adapter - RMF Domain Category**

**About the SMF Adapter - RMF Domain Category**

Resource Management Facility (RMF) data collection represents a subset of the following record types: 70, 71, 72, 75, 77, and 78. These record types are collected by SMF on the z/OS platform. This adapter and domain category combination uses the server activity strategy for staging and aggregating data. MXG software is the primary tool that is used in staging the data. A SAS IT Resource Management staging transformation uses the MXG staged output to complete the staging of the data.

The staged tables for this adapter are read into a number of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in many of these aggregations. These aggregations are structured by domain categories. In some cases, domain categories are further broken down into subsets of aggregations known as subcategories. The following table summarizes these domain categories and subcategories.

**Focus of Report-Ready Data for the SMF Adapter - RMF Domain Category**

Report-ready data for this adapter and domain combination focuses primarily on the following domain categories:
utilization of CPU, memory, queuing, paging, and swap activity on the global server level

CPU-based hardware MSU and MIPS usage on the global server level and by Processor engine type

utilization of CPU and level of service measurements by logical partition (LPAR)

CPU-based hardware MSU and MIPS usage by LPAR and by Processor engine type

utilization of CPU for individual CPU processors

utilization of CPU, memory, I/O, and level of service measurements by defined workload

CPU-based software MSU and MIPS usage by defined workload and by Processor engine type

utilization of CPU, memory, I/O, and level of service measurements by defined Service class and period

CPU-based software MSU and MIPS usage by defined Service class and period and by Processor engine type

utilization, response times, and wait and queuing for devices (disk and tape)

**SMF Adapter - Jobs, TSO, and OMVS Domain Categories**

*About the SMF Adapter - Jobs, TSO, and OMVS Domain Categories*

Batch job, TSO session, and OMVS session data collection represents a subset of record types (6, 26, and 30) collected by SMF on the z/OS platform. The full complement of data that is collected by SMF for these record types contains performance measurements for batch jobs, TSO sessions, started tasks, Open Edition MVS sessions, and APPC tasks. For SAS IT Resource Management 3.2 and later, this domain category focuses solely on Batch job, TSO sessions, and OMVS session activity. This adapter and domain category combination uses the event activity strategy for the staging and aggregating of data. MXG software is the primary tool that is used in staging the data. A SAS IT Resource Management staging transformation uses the MXG staged output as input and then completes the staging of the data.

This staged table is read into a number of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, and monthly time periods. Shift-based activity is included in a number of these aggregation tables. These aggregations are structured by domain categories. All domain categories in this group are further broken down into subsets of aggregations known as subcategories. The following table summarizes these domain categories and subcategories.

*Focus of Report-Ready Data for the SMF Adapter - Jobs, TSO, and OMVS Domain Categories*

Report-ready data for these adapter and domain combinations focuses primarily on the following domain categories:

- job counts, TSO session counts, and OMVS session counts for various groups of classifications
- accumulated service and times for CPU, memory, and I/O for individual batch jobs, TSO sessions, OMVS sessions across various groups of classifications
• accumulated CPU-based software MSU and MIPS by Engine type for individual batch jobs, TSO sessions, and OMVS sessions across various groups of classifications

• printing output that is associated with batch jobs and TSO sessions

• utilization of tape resources for batch jobs

• batch job, TSO session, and OMVS abends and associated return codes

**SMF Adapter - CICS Domain Category**

**About the SMF Adapter - CICS Domain Category**

CICS data represents record type 110 collected by SMF on the z/OS platform. This adapter and domain category combination uses the event hourly summarization strategy for the staging and aggregating of data. MXG software is the primary tool that is used in staging the data and in performing the hourly summarization of the staged data. A SAS IT Resource Management staging transformation uses the MXG staged output as input, and then completes the staging of the CICS transaction data. The staging job generates the XCICSUM staged table as output.

This staged table is read into a number of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, and monthly time periods. Hourly and shift-based activity is included in many of these aggregations. There are no sub-hourly aggregations for this domain category because the staged data is pre-summarized to the hourly level. A filter that queries transaction ID is used to exclude all CICS management transactions from the aggregated data. Other filters can easily be created that can be used to exclude conversational transactions. Filters can also be created to include or exclude various operating environments (such as production, test, development, or quality assurance) from the aggregated data. These aggregations are structured by domain categories. All domain categories are further broken down into subsets of aggregations known as subcategories.

**Focus of Report-Ready Data for the SMF Adapter - CICS Domain Category**

Report-ready data for this adapter and domain combination focuses primarily on the following areas, using the classifications previously specified:

• transaction counts

• average response time

• average and accumulated CPU time

• file access counts

• counts and percentages of selected response time criteria

• monitoring of service level objectives for transactions

*Note:* SAS IT Resource Management includes the new metrics that the ASUMCICX member creates.

• This MXG member is stored in a location that is based on its operating environment.

*Windows Specifics*

```
SASHome\SASFoundation\9.4\itmsmvadata\sasmisc
```

*UNIX Specifics*
Before you use the ASUMCICX member, you must run the UTILEXCL MXG job. This job creates and implements the IMACEXCL member that is customized for your site. Documentation for ASUMCICX and UTILEXCL can be found inside each member.

**SMF Adapter - DB2 Domain Category**

**About the SMF Adapter - DB2 Domain Category**
DB2 data represents record type 101 collected by SMF on the z/OS platform. This adapter and domain category combination uses the event activity strategy for the staging and aggregating of data. MXG software is the primary tool that is used in staging the data. A SAS IT Resource Management staging transformation uses the MXG staged output as input, and then completes the staging of the DB2 accounting data. The staging job that the Adapter Setup wizard creates from the DB2 report group generates the XDBACCT staged table as output.

This staged table is read into a number of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, and monthly time periods. Hourly and shift-based activity is included in many of these aggregations. These aggregations are structured by domain categories. All domain categories are further broken down into subsets of aggregations known as subcategories.

**Focus of Report-Ready Data for the SMF Adapter - DB2 Domain Category**
Report-ready data for this adapter and domain combination focuses primarily on the following areas, using the classifications previously specified:

- thread counts
- CPU, Elapsed, and I/O time in DB2
- CPU and Elapsed total time (inside and outside DB2)
- CPU and Elapsed percentages in DB2
- lock, latch, and I/O wait time in DB2
- lock escalations
- SQL operations counts

**SNMP Adapter - Network Activity, Device and Interface Data, and System Data**

**About the SNMP Adapter - Network Activity, Device and Interface Data, and System Data Domain Categories**
The SNMP adapter contains several domain categories that are based on MIB II SNMP metrics. The data that is collected by default by the SNMP adapter is focused on measuring network activity through several protocols (IP, TCP, UDP, and ICMP), as well as device and interface data and system data. The SAS IT Resource Management staging transformation for SNMP is used in staging the data.
These staged tables are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, and monthly time periods. Hourly and shift-based activity is included in a number of these aggregation tables, as well as several simple aggregations.

**Focus of Report-Ready Data for the SNMP Adapter**

Report-ready data for this adapter focuses primarily on the following areas:

- Throughput - bits per second, packets or datagrams per second, packet sizes, and packet types
- Error Rates
- Utilization and Availability by interface
- TCP Connections

**VMware Adapter - Cluster, Guest, and Host Domain Categories**

**About the VMware Adapter - Cluster Storage, Cluster System, Guest Disk, Guest Network, Guest Storage, Guest System, Host Disk, Host Network, Host Storage, and Host System Domain Categories**

The domain categories for this adapter represent a subset of data stored in the VMware vCenter database. They focus on cluster, guest, and host level activity and performance. These adapter and domain category combinations use the server activity strategy for the staging and aggregating of data. A SAS IT Resource Management staging transformation is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create aggregation tables across a spectrum of daily, weekly, monthly, and sub-hourly time periods. Hourly and shift-based activity is included in a number of these aggregation tables.

**Focus of Report-Ready Data for the VMware Adapter**

Report-ready data for this adapter focuses primarily on the following areas:

- effective CPU, effective Memory, Failover, Total Memory, and Total CPU for the cluster
- utilization of CPU and memory, CPU ready, memory ballooning, and paging for guests
- utilization of CPU and memory, memory ballooning, and paging for hosts
- transfer rates and counts of reads and writes for disks
- packet and data volume transfer activity for network interfaces
- utilization of space for data stores

**Web Log Adapter - All Domain Categories**

**About the Web Log Adapter - All Domain Categories**

The Web Log adapter contains four domain categories that are supported by the Adapter Setup wizard. These domain categories represent different categorizations of the same, limited set of metrics that are available from web logs. The data that is collected focuses
on measuring page counts and requests, the size of those requests and the response time
to service those requests. The SAS IT Resource Management staging transformation for
the Web Log adapter is used in staging the data.

The staged tables for this adapter are read into a series of aggregation jobs that create
aggregation tables across a spectrum of daily, weekly, and monthly time periods. Hourly
and shift-based activity is included in a number of these aggregation tables, but no
simple aggregations are included.

Focus of Report-Ready Data for the Web Log Adapter

Report-ready data for this adapter focuses primarily on the following metrics:

• Bytes sent and received
• Number of pages received
• Number of requests sent
• Response time

What Are Key Metrics?

Key metrics are a subset of the available metrics provided by adapters for the server
performance area such as resource utilization. SAS IT Resource Management identifies
key metrics because monitoring hundreds of available metrics within and across adapters
is not effective. You can use key metrics to quickly view the most critical data for a
performance area. You can also collect key metrics over a long period of time to create
capacity planning and forecasting plans.

Key metrics are standardized across adapters, enabling metrics from various data sources
to be identified and compared appropriately. SAS IT Resource Management supports the
collection of these performance measurements in the IT data mart by staging and
aggregating key metrics via adapter domain categories in the Adapter Setup wizard.

The Adapter Setup wizard creates key metric aggregations and regular aggregations for
the specific domain categories that you choose for a given adapter. Key metrics
aggregations are named with a prefix of “KeyMetrics.” The following image shows a
key metrics aggregation, circled in red, in a process flow diagram.
SAS IT Resource Management identified important measures for adapters for which it provides aggregation tables. Typically, these measures can be found in the key metrics aggregation tables for various domain categories within an adapter. Often these measures can also be found in other summarized aggregation tables. In that case, they can have a corresponding rank measure that can be used for reporting on the top or bottom resources for the specific measure.

In addition to identifying these important measures, SAS IT Resource Management selected common labels for these measures when they represent the same activity across adapters. When you design a user-written adapter, you should use these common labels, if your data represent a similar measurement.

Key metrics aggregations are designed to be narrow tables that serve as the source for capacity planning and forecasting. Key metrics aggregations include only key metrics and any relevant classification and ID columns that are associated with these key metrics to provide vital data for the performance metric.

Note: The measurements in a key metrics aggregation are considered key metrics and they are not ranked. However, these same individual measurements can be included in aggregations that are not key metrics aggregations. When a measurement is in a regular summarized aggregation, it can be ranked. If it is ranked, the measurement is considered a ranked metric (not a key metric) in the context of the regular summarized aggregation table.

This appendix provides information about the key metrics that are provided by SAS IT Resource Management adapters. To find other key metrics that are not listed in this appendix, see [http://support.sas.com/documentation/onlinedoc/itsv/zipfiles/HTMLDoc_3.8/DataModel.html](http://support.sas.com/documentation/onlinedoc/itsv/zipfiles/HTMLDoc_3.8/DataModel.html). This section of the SAS IT Resource Management web page contains detailed information about all of the metrics that are provided by adapters for staged and aggregation tables.
Key Metrics for the Server Performance Domain Category

Adapters extract and transform data from various data sources to report on several server performance metrics. Measuring server performance includes performance areas such as CPU, memory, I/O, paging and swapping, cache, and network time.

The following table shows the key metrics that are relevant to server performance and the adapter domain categories that support each metric. An X indicates that the key metric listed in the row is supported by the adapter domain category in the corresponding column.

Note: For the SAR, BMC Perf Mgr UNIX, and HP Perf Agent and HP Reporter UNIX domain categories, an X indicates that the corresponding metric is present for at least one of the supported environments (HP, Sun, AIX, Linux) that can run on the platform. The X does not necessarily mean that the metric is available in all environments for the domain category. For example, CpuWaitIoBusyPct is found in AIX and Sun environments on UNIX, but it is not available in HP and Linux environments.

In the following table, the abbreviated column headings stand for the following adapters:

- DT: Demand Technology Performance Sentry
- RMF: IBM Resource Management Facility
- SAR: System Activity Reporter
- BMCU: BMC Performance Manager for Servers - UNIX
- BMCW: BMC Performance Manager for Servers - Windows
- HPU: HP Perf Agent Server and HP Reporter Server for UNIX systems
- HPW: HP Perf Agent Server and HP Reporter Server for Windows systems
- SC: Microsoft System Center Operations Manager
- VMC: VMware vCenter Server
- EV: SAS Environment Manager

Table A6.1 Key Metrics for Server Performance Adapters

<table>
<thead>
<tr>
<th>Metric Category</th>
<th>Column Label Root</th>
<th>DT</th>
<th>RMF</th>
<th>SAR</th>
<th>BMCU</th>
<th>BMCW</th>
<th>HPU</th>
<th>HPW</th>
<th>SC</th>
<th>VMC</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>AllEngCpuHardwareMipsUsage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>AllEngCpuHardwareMsuUsage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>CpuBusyPct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>CpuInterruptRate</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>CpuIoInterruptRate</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
## Key Metrics for the Server Performance Domain Category

<table>
<thead>
<tr>
<th>Metric Category</th>
<th>Column Label Root</th>
<th>DT</th>
<th>RMF</th>
<th>SAR</th>
<th>BMCU</th>
<th>BMCW</th>
<th>HPU</th>
<th>HPW</th>
<th>SC</th>
<th>VMC</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>CpuLoadAvg</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>CpuReadyPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>CpuSystemBusyPct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>CpuUsedMSec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>CpuUserBusyPct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>CpuWaitIoBusyPct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>FourHourMsuRollingAvg</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>IfaEngCpuBusyPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>IfaEngCpuHardwareMipsUsage</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>IfaEngCpuHardwareMsuUsage</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>IffrEngCpuBusyPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemCpuBusyPct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemEntitledCpu</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemEntitledCpuBusyPct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemHypervisorBusyPct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemPhysicalCpuBusyPct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemPhysicalCpusUsage</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LogicalSystemRunQueueLength</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>LparCpuBusyPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>LparMsuHourlyRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>MsuHourlyRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>ReadyTasksWaitingPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CPU</td>
<td>RunQueueLength</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Metric Category</td>
<td>Column Label Root</td>
<td>DT</td>
<td>RMF</td>
<td>SAR</td>
<td>BMCU</td>
<td>BMCW</td>
<td>HPU</td>
<td>HPW</td>
<td>SC</td>
<td>VMC</td>
<td>EV</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>CPU</td>
<td>StandardEngCpuBusyPct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>StandardEngCpuHardwareMipsUsage</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>StandardEngCpuHardwareMsuUsage</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>StandardEngCpuSoftwareMsuUsage</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>ZipEngCpuBusyPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>ZipEngCpuHardwareMipsUsage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU</td>
<td>ZipEngCpuHardwareMsuUsage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>DeviceActivePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>DeviceBusyPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>DeviceIoRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>DeviceQueueAvgLength</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>DeviceResponseAvgMSec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskBusyPct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskPhysicalIoRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskPhysicalReadRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskPhysicalReadRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskPhysicalWriteRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskPhysicalWriteRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskQueueAvgLength</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskReadCount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskReadRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Disk</td>
<td>DiskReadTransferRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
## Key Metrics for the Server Performance Domain Category

<table>
<thead>
<tr>
<th>Metric Category</th>
<th>Column Label Root</th>
<th>DT</th>
<th>RMF</th>
<th>SAR</th>
<th>BMCU</th>
<th>BMCW</th>
<th>HPU</th>
<th>HPW</th>
<th>SC</th>
<th>VMC</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk</td>
<td>DiskReadTransferRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskResponseAvgMsec</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskSpaceAvailableGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskSpaceAvailablePct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTotalCount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTransferLatencySec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTransferRate</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISK</td>
<td>DiskTransferRateBytes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTransferRateKB</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTransferReadRate</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTransferTotalRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskTransferWriteRate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskUsageRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskWriteCount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskWriteRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskWriteTransferRateBytes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskWriteTransferRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disk</td>
<td>DiskPhysicalIoRate</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>AvailableCapacityPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>AvailableHostMemoryGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>CacheReadHitPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>LogicalSystemPhysicalMemoryUsageMB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>LogicalSystemMemoryUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryActiveGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Metric Category</td>
<td>Column Label Root</td>
<td>DT</td>
<td>RMF</td>
<td>SAR</td>
<td>BMCU</td>
<td>BMCW</td>
<td>HPU</td>
<td>HPW</td>
<td>SC</td>
<td>VMC</td>
<td>EV</td>
</tr>
<tr>
<td>----------------</td>
<td>------------------</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryAvailable</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryAvailableMB</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryAvailablePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryBallooningGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryCacheUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryCommittedPct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryConsumedGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryGrantedGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryOverheadGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryPagesAvailableAix</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryPagesAvailableSunSco</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemorySharedGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemorySwapInGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemorySwapOutGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemorySystemCacheUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemorySystemUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryTotalUsage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryUsagePct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryUserUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryVirtualUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>MemoryZeroGB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Memory</td>
<td>PagingBlockRate</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>PagingFileUsagePct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>PagingInputRate</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>PagingOutputRate</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric Category</td>
<td>Column Label Root</td>
<td>DT</td>
<td>RMF</td>
<td>SAR</td>
<td>BMCU</td>
<td>BMCW</td>
<td>HPU</td>
<td>HPW</td>
<td>SC</td>
<td>VMC</td>
<td>EV</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>Memory</td>
<td>PagingRate</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>PagingReadRate</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>PagingWriteRate</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>ReadyTasksWaitingPct</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>RemainingFreeMemoryGB</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>SwapRate</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>SwapSpaceUsagePct</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>TotalMemoryLiability GB</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>TpsRecoveryPct</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>InterfaceUsagePct</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>NetworkPacketsReceivedCount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>NetworkPacketsSentCount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>NetworkPacketsTotalCount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>NetworkReceivedRate KB</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>NetworkSentRateKB</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>PacketsTotalRate</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>ReceivedRateKB</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>SentRateKB</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>ThroughputRateKB</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>TotalRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>NetworkUsageRateKB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>System Logical Memory</td>
<td>LogicalSystemPhysicalMemoryUsagePct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
About the Detail Aggregation Template Tables for Amazon
CloudWatch and Ganglia Adapters, and for
Selected IBM SMF Staged Tables

Detail aggregation template tables are supplied for Amazon CloudWatch and Ganglia
adapters, and for Selected IBM SMF Staging Tables. The Adapter Setup and Add
Domain Category wizards do not create jobs that produce aggregations for tables of the
Amazon CloudWatch (ACW) and the Ganglia adapters, or for selected tables of the IBM
System Management Facility (SMF) adapter.

These tables can be accessed by using the Aggregations through Template wizard. To do
so, perform the following steps:

1. In a job, right-click an Aggregation transformation.
   
   Note: Each detail aggregation table requires its own Aggregation transformation (in
   its own job) because a transformation supports only one input source.

2. Select Add Aggregation Table → Aggregations through Template → From
   Supplied Template.

3. Select the tables that you want to create aggregations for.
   
   Note: A detail aggregation can be associated only with the staged table from which
   it is derived. For example, the ACW_EC2_CPU staged table must be the input to
   the transformation in order to generate the DetailCPU table.

4. Enter information that is requested by the wizard’s prompts. Click Finish.

For more information, see “Creating Aggregation Tables with the Aggregations through
Template Wizard” on page 182.

The detail aggregation template tables that are supplied for these adapters and selected
IBM SMF tables are as follows:

Table A6.2 Template Tables per Adapter

<table>
<thead>
<tr>
<th>ACW</th>
<th>Ganglia</th>
<th>SMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>DetailCPU</td>
<td>DetailGanglia</td>
<td>DetailCicstran</td>
</tr>
<tr>
<td>DetailDatabase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DetailDisk</td>
<td>DetailPrint</td>
<td></td>
</tr>
<tr>
<td>DetailMemory</td>
<td>DetailSteps</td>
<td></td>
</tr>
<tr>
<td>DetailNetwork</td>
<td>DetailType30_1</td>
<td></td>
</tr>
</tbody>
</table>
Focus of Report-Ready Data for Amazon CloudWatch and Ganglia Adapters, and for Selected IBM SMF Staging Tables

The template tables that are available for the ACW, Ganglia, and SMF adapters focus on the granular measurements that are available from these adapters and tables.
Appendix 7
Naming Standards

About Naming Standards for SAS IT Resource Management Objects

SAS IT Resource Management uses specific naming conventions and locations when naming and saving the various folders, jobs, transformations, filters, and tables that it supplies and creates. These conventions simplify the management and maintenance of the various objects that are interrelated. For best results, if you choose to create or edit IT data mart folders, subfolders, jobs, transformations, tables, or any other object for processing your IT resource data, then use the same naming and storage conventions that SAS IT Resource Management uses for consistency and efficiency.

Naming Standards and Location of Objects

**Aggregations**

The following table describes the standard naming conventions and storage locations that SAS IT Resource Management uses when creating and saving the various objects that are associated with aggregations.

<table>
<thead>
<tr>
<th>Object</th>
<th>Naming Convention</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>aggregation job</td>
<td><code>&lt;domain category&gt;</code></td>
<td>In the IT Data Marts tree: <code>&lt;IT data mart name&gt;</code> ⇔ <code>&lt;adapter type&gt;</code>&lt;number&gt; ⇔ Domain Categories ⇔ <code>&lt;domain category&gt;</code></td>
<td></td>
</tr>
<tr>
<td>Object</td>
<td>Naming Convention</td>
<td>Location</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Aggregation transformation</td>
<td>The naming standard for aggregation transformations can vary slightly. However, the typical structure is <code>&lt;adapter identifier&gt; &lt;domain category&gt;</code> (Example: NTSMF Disk)</td>
<td>An active Aggregation transformation is in the aggregation job. A template to create your own Aggregation transformation is in the Transformations tree in SAS IT Resource Management.</td>
<td>Transformation names cannot contain double quotation marks.</td>
</tr>
<tr>
<td>column labels (aggregation table)</td>
<td><code>&lt;corresponding staged table column name&gt;</code> <code>&lt;statistic&gt;</code></td>
<td>In an aggregation table.</td>
<td>Column names use the following guidelines:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mixed case and no spaces.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Abbreviate when necessary or standardized (such as Geometric Mean to GMean or Range to Rng).</td>
</tr>
<tr>
<td>column label (ranked)</td>
<td>In the Adapter Setup wizard: <code>&lt;measurement&gt;Rank</code> (Example: CacheReadHitPctWMeanAscRank)</td>
<td>In a table.</td>
<td>In the Adapter Setup wizard:</td>
</tr>
<tr>
<td></td>
<td>In the Aggregation wizards: <code>&lt;measurement&gt;Rank&lt;number (optional)&gt;</code> (Examples: CacheReadHitPctWMeanDescRank, CacheReadHitPctWMeanDescRank01)</td>
<td></td>
<td>• Mixed case.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Appended with a number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In the Aggregation wizards:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mixed case.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Appended with a number if necessary. The numbering starts with the second instance of a label with a similar name. For example, CRHTPCTRank1 has a label of CacheReadHitPct WMeanDescRank with no appended number. But CRHTPCTRank2 has a label of CacheReadHitPct WMeanDescRank01 where the appended number is 01.</td>
</tr>
</tbody>
</table>

## Appendix 7 • Naming Standards
<table>
<thead>
<tr>
<th>Object</th>
<th>Naming Convention</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>column name (ranked)</td>
<td>In the Adapter Setup wizard: &lt;measurement&gt;&lt;rank&gt;&lt;number&gt; (Examples: DAYDATERANK01, CRHTPCTRANK01)</td>
<td>In a table.</td>
<td>In the Adapter Setup wizard:</td>
</tr>
<tr>
<td></td>
<td>In the Aggregation wizards: &lt;measurement&gt;Rank&lt;order(optional)&gt; (Examples: DAYDATEDescRank, CRHTPCTRank)</td>
<td></td>
<td>• Uppercase.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Appended with a number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In the Aggregation wizards:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mixed case.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Not always appended with a number.</td>
</tr>
<tr>
<td>library (aggregation)</td>
<td>&lt;domain category&gt; &lt;unique number&gt; (Example: Disk 5455)</td>
<td>In the IT Data Marts tree: &lt;IT data mart name&gt; ⇒ &lt;adapter type&gt;&lt;number&gt; ⇒ Domain Categories ⇒ &lt;domain category&gt;.</td>
<td></td>
</tr>
<tr>
<td>libref (in an aggregation library)</td>
<td>AGG &lt;same unique number as the library&gt; (Example: AGG 5455)</td>
<td></td>
<td>Mixed case with no spaces.</td>
</tr>
<tr>
<td>simple aggregation table</td>
<td>Detail&lt;measurement category&gt; (Example: DetailDisk)</td>
<td>In the IT Data Marts tree: &lt;IT data mart name&gt; ⇒ &lt;adapter type&gt;&lt;number&gt; ⇒ Domain Categories ⇒ &lt;domain category&gt;.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tables of MXG views that were created by former versions of SAS IT Resource Management are identified in the metadata by the prefix MXG_Simple_.</td>
<td></td>
<td>Note: Starting with SAS IT Resource Management 3.5, MXG views are not created.</td>
</tr>
<tr>
<td>summarized aggregation table</td>
<td>&lt;time period&gt;&lt;measurement category&gt; (Example: MonthShiftDisk)</td>
<td>In the IT Data Marts tree: &lt;IT data mart name&gt; ⇒ &lt;adapter type + number&gt; ⇒ Domain Categories ⇒ &lt;domain category&gt;.</td>
<td>Mixed case with no spaces.</td>
</tr>
<tr>
<td>summarized aggregation table (key metrics)</td>
<td>KeyMetrics&lt;measurement category&gt; (Example: KeyMetricsDisk)</td>
<td></td>
<td>In the same folder as its aggregation tables and aggregation job. In the IT Data Marts tree: &lt;IT data mart name&gt; ⇒ &lt;adapter type&gt;&lt;number&gt; ⇒ Domain Categories ⇒ &lt;domain category&gt;.</td>
</tr>
</tbody>
</table>
**Information Maps**

The following table describes the standard naming conventions and storage locations that SAS IT Resource Management uses when creating and saving the various objects that are associated with information maps.

<table>
<thead>
<tr>
<th>Object</th>
<th>Naming Convention</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>information map</td>
<td>An information map has the same name as its corresponding source table. (Example: MonthShiftDisk)</td>
<td>In the IT Data Marts tree: &lt;IT data mart name&gt; &lt;adapter type&gt;&lt;number&gt; Domain Categories &lt;domain category&gt;.</td>
<td></td>
</tr>
<tr>
<td>information map filter (date type)</td>
<td>Includes descriptive words that show the performance area first, then a verb, the type of metric, and a statistic. (Examples: MemoryUsagePctWMean, PagesFreedRateMax)</td>
<td>In the Information Map transformation that is part of the information map job. Information map filters are available on the Information Map Parameters tab of the Information Map transformation properties.</td>
<td>Mixed case with no spaces.</td>
</tr>
<tr>
<td>Object</td>
<td>Naming Convention</td>
<td>Location</td>
<td>Notes</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------</td>
<td>----------</td>
<td>-------</td>
</tr>
<tr>
<td>information map filter (statistic type)</td>
<td>Includes descriptive words and components that are based on the following guidelines:  &lt;br&gt;• The first two characters (if the filter is based on a rank column from a joined table) show which level the column comes from (such as D for Day level table, W for Week level table, M for Month level table, or nothing when it is not from a joined table).  &lt;br&gt;• The text string Top or Bot corresponds to ascending or descending order.  &lt;br&gt;• The label name on which the column is based, when appropriate, is included.  &lt;br&gt;• The text string DescRank or AscRank is included to show the rank order when appropriate. (Examples: BotMemoryAvailableMB, TopCpuBusyPct)</td>
<td>In the Information Map transformation that is part of the information map job. Information map filters are available on the Information Map Parameters tab of the Information Map transformation properties.</td>
<td>Mixed case with no spaces.</td>
</tr>
<tr>
<td>information map job</td>
<td><code>&lt;domain category&gt;</code> &lt;br&gt;Information Map &lt;br&gt;(Example: Disk Information Map)</td>
<td>In the IT Data Marts tree: &lt;br&gt;<code>&lt;IT data mart name&gt;</code> ⇐ &lt;br&gt;<code>&lt;adapter type&gt;</code>&lt;number&gt; ⇐ &lt;br&gt;Domain Categories ⇐ &lt;br&gt;<code>&lt;domain category&gt;</code></td>
<td></td>
</tr>
<tr>
<td>Information Map transformation</td>
<td><code>&lt;time period&gt;</code>&lt;measurement category&gt; &lt;br&gt;(Example: MonthShiftDisk)</td>
<td>An active Information Map transformation is in the information map job. A template to create your own Information Map transformation is in the Transformations tree in SAS IT Resource Management.</td>
<td>• The same name as the aggregation table that it uses.  &lt;br&gt;• Cannot contain double quotation marks.</td>
</tr>
</tbody>
</table>
### Reporting

The following table describes the standard naming conventions and storage locations that SAS IT Resource Management uses when creating and saving the various objects that are associated with reporting.

<table>
<thead>
<tr>
<th>Object</th>
<th>Naming Convention</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>domain category</td>
<td>Includes descriptive words for the resource that is being measured.</td>
<td>In the Folders tree: Products ⇒ SAS IT Resource Management ⇒ Adapters ⇒ &lt;adapter type&gt; ⇒ IT Template Tables.</td>
<td></td>
</tr>
<tr>
<td>Performance Report transformation</td>
<td>&lt;domain category&gt; &lt;time period&gt; (Example: Disk Monthly)</td>
<td>An active Performance Report transformation is in the reporting job. A template to create your own Performance Report transformation is in the Transformations tree in SAS IT Resource Management.</td>
<td>Transformation names cannot contain double quotation marks.</td>
</tr>
<tr>
<td>report definition</td>
<td>Includes descriptive words that indicate the measures that are reported, the filters that are used, and the time period that is reported. (Example: DiskBusyHighUsageHoursForTheDay)</td>
<td>In the Folders tree: Shared Data ⇒ SAS IT Resource Management ⇒ 3.3 IT Report Definitions ⇒ &lt;adapter type&gt; ⇒ &lt;domain category or performance area&gt; ⇒ Supplied ⇒ &lt;time period&gt;.</td>
<td>Save the report definitions that you create in the Folders tree at Shared Data ⇒ SAS IT Resource Management ⇒ IT Report Definitions ⇒ &lt;adapter type&gt; ⇒ &lt;domain category or performance area&gt; ⇒ User-Defined ⇒ &lt;time period&gt;.</td>
</tr>
<tr>
<td>reporting job</td>
<td>&lt;domain category&gt; &lt;time period&gt; Reporting (Example: Disk Monthly Reporting)</td>
<td>In the IT Data Marts tree: &lt;IT data mart name&gt; ⇒ &lt;IT data mart name&gt; &lt;number&gt; ⇒ Domain Categories ⇒ &lt;domain category&gt;.</td>
<td></td>
</tr>
</tbody>
</table>

### Staging

The following table describes the standard naming conventions and storage locations that SAS IT Resource Management uses when creating and saving the various objects that are associated with staging.
<table>
<thead>
<tr>
<th>Object</th>
<th>Naming Convention</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
</table>
| column labels (staged table)   | `<performance area or object> <verb (if needed)> <interpretation>` (Examples: MemoryUsagePct, MemoryActivePages, PagesFreedRate) | In a staged table. | Column names use the following guidelines:  
  - Mixed case and no spaces.  
  - Limit of 40 characters.  
  - Abbreviate when necessary or standardized (such as Average to Avg, Minimum to Min, or Percent to Pct). |
| library (staging)              | `<adapter type> Staging <unique number>` (Example: SAR Staging 1115)               | In the IT Data Marts tree: `<IT data mart name> ⇨ <adapter type><number> ⇨ Staging.` | Mixed case with no spaces. |
| libref (in a staging library)  | STG `<same unique number as the library>` (Example: STG 1115)                     | In the IT Data Marts tree: `<IT data mart name> ⇨ <adapter type><number> ⇨ Staging.` | |
| staging job                    | `<adapter type> Staging` (Example: SAR Staging)                                    | In the IT Data Marts tree: `<IT data mart name> ⇨ <adapter type><number> ⇨ Staging.` | |
| staged table                   | A staged table has the same name as the template table on which it is based.       | In the IT Data Marts tree: `<IT data mart name> ⇨ <adapter type><number> ⇨ Staging.` | Starting with SAS IT Resource Management 3.5, MXG views are not created. In former versions of SAS IT Resource Management, they were identified in the metadata by the prefix MXG_Staged_. |
| staging transformation         | `<adapter type>` (Example: SAR)                                                    | An active staging transformation is in the staging job. A template to create your own staging transformation for an adapter is in the Transformations tree in SAS IT Resource Management. | Transformation names cannot contain double quotation marks. |
Appendix 8
Macros

Introduction to the Macros in SAS IT Resource Management 583

%RMDELETE 584
%RMDELETE Overview 584
%RMDELETE Syntax 584
%RMDELETE Required Arguments 584
%RMDELETE Options 585
%RMDELETE Notes 585
%RMDELETE Examples 586

%RMDELPVT 586
%RMDELPVT Overview 586
%RMDELPVT Syntax 587
%RMDELPVT Required Arguments 587
%RMDELPVT Options 587
%RMDELPVT Notes 588
%RMDELPVT Example 588

%RMDMPATH 589
%RMDMPATH Overview 589
%RMDMPATH Syntax 589
%RMDMPATH Required Arguments 589
%RMDMPATH Optional Parameters 590

Duplicate-Data Checking Macros 590
%RMDUPCHK 590
%RMDUPDSN 594
%RMDUPINT 595
%RMDUPUPD 595

%RMMSBMCP 596
%RMMSBMCP Overview 596
%RMMSBMCP Syntax 596
%RMMSBMCP Required Arguments 597
%RMMSBMCP Options 597
%RMMSBMCP Example 598

%RMMSDTPS 598
%RMMSDTPS Overview 598
%RMMSDTPS Syntax 598
%RMMSDTPS Required Arguments 599
%RMMSDTPS Options 599
%RMMSDTPS Example 600
Introduction to the Macros in SAS IT Resource Management

SAS IT Resource Management provides the following macros:

- “%RMDELETE” on page 584 - for purging, erasing, or deleting an IT data mart or a table.
- “%RMDELPVT” on page 586 - for deleting unused private code macros.
- “%RMDMPATH” on page 589 - for modifying root paths that are associated with the pathnames for SAS libraries in the IT data mart.
- “Duplicate-Data Checking Macros” on page 590 - for duplicate-data checking.
  - “%RMDUPCHK” on page 590 - for executing the duplicate-data checking process.
  - “%RMDUPDSN” on page 594 - for generating the name of the control data set.
  - “%RMDUPINT” on page 595 - for setting up the macro definitions that are used by the other duplicate-data checking macros.
  - “%RMDUPUPD” on page 595 - for updating the permanent control data sets.
- “%RMMMSBMCMP” on page 596 - for working with the BMC Perf Mgr file adapter.
- “%RMMMSDTPS” on page 598 - for working with the DT Perf Sentry adapter.
- “%RMMMSMXG ” on page 600 - for working with adapters based on MXG.
- “%RMMSSCOM” on page 604 - for working with the SCOM adapter.
- “%RMMSSNMP” on page 608 - for working with the SNMP adapter.
- %RMPDB2DM - for migrating a SAS IT Resource Management 2.7 PDB to a SAS IT Resource Management IT data mart. For more information, see Sas IT Resource Management 3.8: Migration Guide. To locate the SAS IT Resource Management documentation, use the Products Index at http://support.sas.com/documentation/index.html.
- “%RMPROINT” on page 610 - for converting counters to rates within staging code.
- “%RMRUNETL” on page 615 - for running ETL jobs.
- %RMUPGRDM - for upgrading the data to the data model of SAS IT Resource Management 3.8. For more information about this macro, see SAS IT Resource Management 3.8: Migration Guide. To locate the SAS IT Resource Management documentation, use the Products Index at http://support.sas.com/documentation/index.html.
- “Backup and Recovery Macros” on page 620 - for backing up and recovering processes for a staging or aggregation transformation.
  - “%RM_BACKUP” on page 621 - for backing up content associated with a staging or aggregation transformation.
• “%RM_Restore” on page 624 - for restoring content associated with a staging or aggregation transformation.

• “%RMVINST” on page 619 - for verifying that the application server is correctly configured.

• “Macros to Handle Large Data Volumes” on page 625 - for working with large data volumes.

• “%RMCMB” on page 625 - for creating a view of multiple data files.

• “%RMMKLIKE” on page 627 - for creating a mirrored set of libraries.

%RMDELETE

%RMDELETE Overview

The %RMDELETE macro enables you to purge, erase, or delete either a table or an entire IT data mart. The TYPE=, DATAMART=, and TABLEID= arguments determine the actions to perform.

%RMDELETE Syntax

%RMDELETE(
  DATAMART="name-of-ITdatamart" | TABLEID="table-ID",
  METAPASS="user-password",
  METASERVER="name-of-metadata-server",
  METAUSER="user-ID",
  TYPE="PURGE | ERASE | DELETE",
  WORKDIR="directory-path-for-work-files",
  METADATAREPOSITORY="name-of-metadata-repository",
  METAPORT="metadata-server-port"
);

%RMDELETE Required Arguments

DATAMART="name-of-ITdatamart"
  specifies the name of the IT data mart that is to be purged, erased, or deleted. If the TABLEID argument is not specified, a value for this option is required.

TABLEID="table-ID"
  specifies the name of the table that is to be purged, erased, or deleted. If the DATAMART argument is not specified, a value for this option is required.

METAPASS="user-password"
  specifies the password to use in authenticating the user ID to the metadata server.

  You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

  TIP If you use the PWENCODE form of the password, be sure to handle embedded braces ({}) carefully. Do not confuse them with square brackets ([]).

METASERVER="name-of-metadata-server"
  specifies the name of the metadata server. A value for this parameter is required.
METAUSER= *user-ID*

the user ID that is to access the metadata server. A value for this parameter is required.

**TYPE=**PURGE | ERASE | DELETE

specifies the function that the macro is to perform. The function varies depending on whether an IT data mart or a table is specified. A value for this

**PURGE** If the DATAMART argument is specified, the PURGE function deletes the contents of all the physical tables that are associated with the specified IT data mart. If the TABLEID argument is specified, the PURGE function deletes the contents of the specified physical table.

**ERASE** If the DATAMART argument is specified, the ERASE function deletes all the physical tables, libraries, and folders that are associated with the specified IT data mart. It also deletes the metadata for the specified IT data mart. If the TABLEID argument is specified, the ERASE function deletes the physical table and the metadata for the specified table.

**DELETE** If the DATAMART argument is specified, the DELETE function deletes the metadata for the specified IT data mart. If the TABLEID argument is specified, the DELETE function deletes the metadata for the specified table.

**WORKDIR=*directory-location***

specifies a directory where %RMDELETE can write temporary external files. If this directory does not exist, it is created. For z/OS, this parameter needs to be a UNIX System Services directory path (zFS file system). A value for this

---

**%RMDELETE Options**

**METAREPOSITORY=**name-of-metadata-repository

the name of the metadata repository. The default value for this option is Foundation.

**METAPORT=**metadata-server-port

the port for the metadata server. The default value for this option is 8561.

---

**%RMDELETE Notes**

On Windows, run this macro with the *sasbatch.bat* command in order to set the correct options.

The %RMDELETE code must be run on the same machine that the data is located, because the data libraries are accessed with local LIBNAME statements.

If %RMDELETE is accessing an IT data mart on a metadata server on z/OS, the SAS session and the metadata server must have the same character-set encoding.

**CAUTION:**

On a directory-based system, if you specify the erase function for an IT data mart, any content that exists under the root path of that IT data mart is deleted. In other words, content that is not related to the IT data mart is deleted. (This applies only to directory-based systems. It does not apply to traditional z/OS systems.)
%RMDELETE Examples

**Example 1: Purging All Tables in an IT Data Mart**
The following example purges all the tables in the IT data mart called “myITDataMart”.

```
%rmdelete(
    datamart=myITDataMart
    metapass=myPassword,
    metaserver=myServer,
    metauser=myUserid,
    type=purge,
    workdir=c:\temp\workdir
);
```

**Example 2: Erasing a Table in an IT Data Mart**
The following example erases the physical table with the A55DZBQ6.B70000ZC metadata ID. It also deletes the metadata for that table.

```
%rmdelete(
    metapass=myPassword,
    metaserver=myServer,
    metauser=myUserid,
    tableID=A55DZBQ6.B70000ZC
    type=erase,
    workdir=c:\temp\workdir
);
```

%RMDELPVT

**%RMDELPVT Overview**

The %RMDELPVT macro deletes the unused private code macros that are stored in the data libraries of staged and aggregation tables.

The private code macros are in a catalog in each library called SASMACR. Each time the code is generated for a job, either from the PFD or by deploying the job, a new version of the private code macro is generated. Old versions of the private code macros are not deleted, so the SASMACR catalog continues to grow every time the code is generated.

The %RMDELPVT macro deletes the unused private code macros from the SASMACR catalog. %RMDELPVT determines whether a private code macro is still in use. It does so by parsing the SAS code for all the deployed jobs and retrieving the name of the private code macro from the code. (This private code macro that is used in a deployed job is considered to be in use, and it is not deleted.) All private code macros that are not used in deployed jobs are deleted.
%RMDELPVT Syntax

%RMDELPVT(
  BACKUPLOCATION=\textit{name-of-the-backup-library}
  ,DATAMART=\textit{name-of-the-IT-data-mart}
  ,METAPASS=\textit{user-password}
  ,METASERVER=\textit{name-of-metadata-server}
  ,METAUSER=\textit{user-ID}
  ,DOBACKUP=Yes | No
  ,DODELETE=Yes | No
  ,DOREPORT=Yes | No
  ,DORESTORE=Yes | No
  ,METAPORT=\textit{metadata-server-port}
);

%RMDELPVT Required Arguments

\textbf{BACKUPLOCATION=\textit{name-of-the-backup-library}}

specifies the name of an existing SAS library that stores a backup of the SASMACR catalogs.

\textit{Note:} The entire contents of this library will be deleted before running the backup procedure.

The default value of this argument is \textbf{YES}. This argument is required if the \textbf{DORESTORE} option is set to \textbf{Yes}.

\textbf{DATAMART=\textit{name-of-the-IT-data-mart}}

specifies the name of the IT data mart. The macro will clean up all the private code in this IT data mart.

This value is not case sensitive.

\textbf{METAPASS=\textit{user-password}}

specifies the password to use in authenticating the user ID to the metadata server.

You can use the PWENCODE form of the password. For more information, see the \textbf{PWENCODE} procedure in the Base SAS Procedures Guide.

\textbf{T I P} If you use the PWENCODE form of the password, be sure to handle embedded braces (\{\}) carefully. Do not confuse them with square brackets (\[]\]).

\textbf{METASERVER=\textit{name-of-metadata-server}}

specifies the name of the metadata server.

\textbf{METAUSER=\textit{user-ID}}

specifies the user ID that is to access the metadata server.

%RMDELPVT Options

\textbf{DOBACKUP=Yes | No}

specifies whether to perform a backup of the SASMACR catalogs before they are cleaned.

The default value of this argument is \textbf{YES}. 


**DODELETE=Yes | No**
specifies whether to delete the unused private macros from the data mart libraries. A report that indicates the results of the process is generated.

The default value of this argument is **No**.

**DOREPORT=Yes | No**
specifies whether to create a report that shows the private macros that are found in the IT data mart libraries. It also shows which private macros are in use in deployed jobs.

The default value of this argument is **Yes**.

**DORESTORE=Yes | No**
specifies whether to restore the data from the backup made during a previous run of the macro. If doRestore is set to **Yes**, only the BACKUPLOCATION option is required. No other functions are performed and all other options are ignored.

The default value of this argument is **No**.

**METAPORT=metadata-server-port**
specifies the port of the metadata server.

The default value for this option is **8561**.

---

**%RMDELPVT Notes**

The %RMDELPVT provides the ability to back up the SASMACR catalogs before cleaning them. It also provides the ability to restore the data from the backup.

**%RMDELPVT Example**

**Example 1: Run the Report and Perform the Backup and Delete Functions**

This example runs the report and performs the backup and delete functions on a data mart called "my IT Data Mart".

```sas
%rmdelpvt(
  backupLocation=c:\rmdelpvt_backup,
  dataMart=my IT Data Mart,
  doBackup=YES,
  doDelete=YES,
  doReport=YES,
  metaPass=myPassword,
  metaPort=8561,
  metaServer=myServer,
  metaUser=myUserid
);
```

**Example 2: Restore the Backup**

This example restores the backup to the original IT data mart.

```sas
%rmdelpvt(
  backupLocation=c:\rmdelpvt_backup)
  doRestore=YES
```
%RMDMPATH

%RMDMPATH Overview

%RMDMPATH modifies the root paths that are associated with the pathnames for SAS libraries in the IT data mart.

%RMDMPATH Syntax

%RMDMPATH(
DATAMART= name of the IT data mart to use
,METAPASS= password for the metauser
,METAPORT= service or port for the metadata server
,METASERVER= host-name or IP address for the metadata server
,METAUSER= user ID for metadata server access and definition
,NEW_ROOTPATH= new root path value
,OLD_ROOTPATH= old root path that will be renamed
,<,DEFAULT_ROOTPATH =YES | NO> 
,<,DOREPORT= YES | NO> 
,<,DORENAMES= YES | NO> 
,<,REPOS= Foundation | metadata repository> 
,<,_RC= macro variable name to hold return code>
);

%RMDMPATH Required Arguments

DATAMART= name of the IT data mart to use
 specifies the name of the IT data mart. A value for this parameter is required.

METAPASS= password for the metauser
 specifies the password to use for connecting the user ID to the metadata server. A value for this parameter is required.

METAPORT= service or port for the metadata server
 specifies the TCP/IP service name or port number that the metadata server is listening on. A value for this parameter is required.

METASERVER= host-name or IP address for the metadata server
 specifies the host name or TCP/IP address of the metadata server.

METAUSER= user ID for metadata server access and definition
 specifies the user ID for accessing the metadata server. A value for this parameter is required. For more information, see the SAS 9.4 Intelligence Platform: System Administration Guide.

NEW_ROOTPATH= new root path value
 specifies the new root path value that replaces the old root path value in all of the pathnames for SAS libraries. A value for this case-sensitive parameter is required.

OLD_ROOTPATH= old root path that will be renamed
 specifies the old root path value that will be renamed. This parameter is matched with the pathnames of all SAS libraries in the IT data mart, starting in column 1 of the pathname. A value for this case-sensitive parameter is required.
%RMDMPATH Optional Parameters

DEFAULT_ROOTPATH =YES | NO
specifies that the default root path associated with the IT data mart will be renamed in addition to the pathnames associated with SAS libraries. A value for this parameter is optional. The default value for this parameter is YES.

DORENAMES=YES | NO
specifies that the SAS libraries will be renamed. A value for this parameter is optional. The default value for this parameter is NO.

DOREPORT=YES | NO
specifies that a report is produced that details what SAS libraries were renamed. A value for this parameter is optional. The default value for this parameter is YES.

REPOS=Foundation | metadata repository
specifies the metadata repository that contains the IT data mart. A value for this parameter is optional. The default value for this parameter is Foundation.

Note: IT data marts are created in the Foundation repository by default, but they can also be created in other repositories.

_RC=macro variable name to hold return code
specifies the name of a macro variable that holds the value of the return code from the execution of this macro. A value for this parameter is optional. This parameter is not case-sensitive.

Duplicate-Data Checking Macros

%RMDUPCHK

%RMDUPCHK Overview
%RMDUPCHK checks for duplicate data and deletes it. It also builds up record counts of incoming and deleted data and datetime ranges for each system or machine. These record counts are stored in the control data set. If the control data set indicates that a gap was detected in the data, a report is generated.

The control data set is stored in the same library as the staged tables. This data set is created and managed by the %RMDUPxxx macros. (Users do not usually access this library.)

Note: For information about how to set up the %RMDUPCHK macro, see “Working with Duplicate-Data Checking Macros” on page 540. For information about how control data sets work, see “Control Data Sets for Duplicate-Data Checking” on page 539.

%RMDUPCHK Syntax
%RMDUPCHK(
ENDFILE=variable-name,
_IDVAR=variable-name,
_SOURCE=identifier,
_TIMESTMP=timestamp-variable-name
,<FORCE=YES | NO>
%RMDUPCHK Required Arguments

**ENDFILE=variable-name**

specifies the name of the SAS variable that is used as the END= keyword for the SAS INFILE statement that reads the raw data.

**IDVAR=variable-name**

specifies the name of a SAS character variable that identifies the system or machine that generated the input data. The name of this variable can be no more than 32 characters in length.

**SOURCE=identifier**

specifies a unique three-character code that identifies the type of data.

**TIMESTAMP=timestamp-variable-name**

specifies the name of the SAS variable that contains the datetime stamp that uniquely identifies the time of the event or interval being recorded.

The SOURCE entries for the supported adapters are listed in the following table.

<table>
<thead>
<tr>
<th>ADAPTER</th>
<th>Value for the SOURCE Parameter for %RMDUPCHK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon CloudWatch</td>
<td>(Multiple values are needed so that %RMDUPCHK can be invoked with each value.)</td>
</tr>
<tr>
<td>ASG TMON2CIC</td>
<td>TM2</td>
</tr>
<tr>
<td>ASG TMONDB2</td>
<td>TMD</td>
</tr>
<tr>
<td>ASG TMONDB2 V5</td>
<td>TM5</td>
</tr>
<tr>
<td>BMC Mainview</td>
<td>IMF</td>
</tr>
<tr>
<td>BMC Perf Mgr</td>
<td>PAT</td>
</tr>
<tr>
<td>CA TMS</td>
<td>TMS</td>
</tr>
<tr>
<td>Comma Separated Values</td>
<td>CSV</td>
</tr>
<tr>
<td>DT Perf Sentry</td>
<td>NTS</td>
</tr>
<tr>
<td>DT Perf Sentry with MXG</td>
<td>NTS</td>
</tr>
<tr>
<td>Ganglia</td>
<td>GAN</td>
</tr>
</tbody>
</table>
%RMDUPCHK Options

**FORCE=** YES | NO

specifies whether duplicate input data should still be processed, or whether it is a duplicate.

- **FORCE=** YES indicates that, if a duplicate is detected, the duplicate data should be processed.
- **FORCE=** NO indicates that duplicate data should not be processed.

The default value for this option is **NO**.

**INT=** interval

represents the maximum time gap (or interval) that is to be allowed between the timestamps on any two consecutive records from the same system or machine. If the

<table>
<thead>
<tr>
<th>ADAPTER</th>
<th>Value for the SOURCE Parameter for %RMDUPCHK</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP Perf Agent</td>
<td>(Multiple values are needed so that %RMDUPCHK can be invoked with each value.)</td>
</tr>
<tr>
<td>HP Reporter</td>
<td>(Multiple values are needed so that %RMDUPCHK can be invoked with each value.)</td>
</tr>
<tr>
<td>IBM DCOLLECT DCO</td>
<td></td>
</tr>
<tr>
<td>IBM EREP ERP</td>
<td></td>
</tr>
<tr>
<td>IBM IMS IMS</td>
<td></td>
</tr>
<tr>
<td>IBM SMF SMF</td>
<td></td>
</tr>
<tr>
<td>IBM TPF TPF</td>
<td></td>
</tr>
<tr>
<td>IBM VMMON VMM</td>
<td></td>
</tr>
<tr>
<td>MS SCOM SCO</td>
<td></td>
</tr>
<tr>
<td>RRDtool RRD</td>
<td></td>
</tr>
<tr>
<td>SAP ERP BAT, SAP, and others. (Multiple values are needed so that %RMDUPCHK can be invoked with each value.)</td>
<td></td>
</tr>
<tr>
<td>SAR SAR</td>
<td></td>
</tr>
<tr>
<td>SAS EV</td>
<td>(Multiple values are needed so that %RMDUPCHK can be invoked with each table source value.)</td>
</tr>
<tr>
<td>SNMP SNM</td>
<td></td>
</tr>
<tr>
<td>VMware vCenter</td>
<td>(Multiple values are needed so that %RMDUPCHK can be invoked with each value.)</td>
</tr>
<tr>
<td>Web Log WWW</td>
<td></td>
</tr>
</tbody>
</table>
interval between the timestamp values exceeds the value of this option, then an observation with the new time range is created in the control data set. This is referred to as a gap in the data.

The value for this option must be provided in the format **hh:mm**, where **hh** represents hours and **mm** represents minutes. For example, to specify an interval of 14 minutes, use **INT=0:14**. To specify an interval of 1 hour and 29 minutes, use **INT=1:29**.

The default value for this option is **0:29**, or 29 minutes.

**KEEP=number-of-weeks**

specifies the number of weeks for which control data should be kept. Because this value represents the number of Sundays between two dates, a value of 2 results in a maximum retention period of 20 days.

The default value for this option is **2**.

**REPORT=YES | NO**

specifies whether to display the duplicate-data checking messages in the SAS log or to save the messages in an audit table. If set to **Yes**, this parameter causes all the messages from duplicate-data checking to appear in the SAS log. If set to **No**, the duplicate-data checking messages are saved in an audit data table that is stored in the staging library. The name of the audit table is **source AUDIT** (where **source** is the 3-character data source code).

The default value of this option is **YES**.

*Note:* If you are monitoring very high numbers of resources, setting this option to **NO** can be beneficial. Eliminating the report reduces CPU consumption, shortens elapsed time, and makes the SAS log more manageable.

**TERM=YES | NO**

controls whether SAS terminates if any duplicate input data is detected.

The default value of this option is **NO**.

**%RMDUPCHK Notes**

The Adapter Setup wizard prompts the user to specify how to handle duplicate records. Valid entries for the mode of duplicate-data checking are Discard, Force, or Terminate.

• **Discard**: Duplicate-data-checking macros are executed.
  
  FORCE=NO
  
  and
  
  TERM=NO
  
  are implied.

• **Force**: Duplicate-data-checking macros are executed. FORCE=YES and TERM=NO are implied.

• **Terminate**: Duplicate-data-checking macros are executed.
  
  FORCE=NO
  
  and
  
  TERM=YES
  
  are implied.

You can change the mode of duplicate-data-checking for a table on the Properties dialog box for that table.
Note: For information about how to set up the %RMDUPCHK macro, see “Working with Duplicate-Data Checking Macros” on page 540. For information about how control data sets work, see “Control Data Sets for Duplicate-Data Checking” on page 539.

%RMDUPCHK Example
The following example provides duplicate checking for the data that is read from the NTSMF adapter:

```sas
%rmdupchk(  
  endfile=_eof,  
  idvar=machine,  
  int=00:18,  
  keep=52,  
  report=yes,  
  source=nts,  
  timestamp=datetime
 );
```

%RMDUPDSN

%RMDUPDSN Overview
%RMDUPDSN generates the name of the data duplication control data set. This is a temporary SAS data set that will contain datetime ranges for the data that is being processed when duplicate-data checking is enabled. This information is also used by other duplicate-data-checking macros, such as %RMDUPCHK and %RMDUPUPD.

For supplied adapters, the %RMDUPDSN macro is automatically submitted in the staging code when duplicate-data checking is enabled. For user-written adapters, the duplicate-data checking is not automatically enabled. For information about how to enable duplicate-data checking in the user-written staging code, see “Duplicate Checking” on page 341.

%RMDUPDSN Syntax
%RMDUPDSN(  
  SOURCE=identifier );

%RMDUPDSN Required Arguments
SOURCE=identifier
specifies a unique three-character code that identifies the type of data. It should be the same as the value that was coded for the SOURCE= parameter of the %RMDUPCHK macro.

%RMDUPDSN Notes
This macro executes only one time. It creates a global macro variable, &RMDUPDSN, that contains the name of the data duplication control data set. The global macro variable is resolved by the %RMDUPDSN macro.

%RMDUPDSN Example
This example shows the creation of a control data set, called cpnts.dsn, that is used to detect data duplication.
Overview
%RMDUPINT sets up the macro definitions that are used by the other duplicate-data-checking macros. These macro definitions generate the name of the data duplication control data set.

Syntax
%RMDUPINT;

Notes
This macro requires no parameters. It contains the macro definitions and naming conventions for the control data set. The %RMDUPINT macro also defines the &RMDUPDSN macro variable that contains the data set name that is used in the %RMDUPDSN macro.

For supplied adapters, the %RMDUPINT macro is automatically submitted in the staging code when duplicate-data checking is enabled. For user-written adapters, the duplicate-data checking is not automatically enabled. To enable duplicate-data checking, in the user-written staging code, specify the %RMDUPINT macro in front of the staging code.

For information about how to enable duplicate-data checking in the user-written staging code, see “Duplicate Checking” on page 341.

Example
%rmdupint;

Preview
%RMDUPUPD

Overview
%RMDUPUPD updates the permanent control data sets with information from a temporary control data set.

Syntax
%RMDUPUPD;

Notes
This macro requires no parameters. It reads the temporary control data set that was built by the %RMDUPCHK macro. It splits the contents into individual control data sets, depending on the number of staging transformations that contributed to the control data set.

The individual control data sets are then merged with their corresponding permanent data sets. If, during the merging process, the time interval between any two records is greater than the allowed time interval, then both records are written out. (The allowed
time interval is the value that was specified by the \texttt{INT=} option of the \texttt{%RMDUPCHK} macro.)

\texttt{%RMDUPUPD} subsequently generates a report that informs the user of the possibility of missing data. Records that relate to data that are older than the \texttt{KEEP} value are deleted. This macro is executed automatically by the staging transformations of all the supplied adapters. For user-written staging transformations, this macro must be coded to execute after the staged tables have been populated.

\texttt{%RMDUPUPD Notes}

This macro requires no parameters. It reads the temporary control data set that was built by the \texttt{%RMDUPCHK} macro. It splits the contents into individual control data sets, depending on the number of staging transformations that contributed to the control data set.

The individual control data sets are then merged with their corresponding permanent data sets. If, during the merging process, the time interval between any two records is greater than the allowed time interval, then both records are written out. (The allowed time interval is the value that was specified by the \texttt{INT=} option of the \texttt{%RMDUPCHK} macro.)

\texttt{%RMDUPUPD} subsequently generates a report that informs the user of the possibility of missing data. Records that relate to data that are older than the \texttt{KEEP} value are deleted. This macro is executed automatically by the staging transformations of all the supplied adapters. For user-written staging transformations, this macro must be coded to execute after the staged tables have been populated.

\texttt{%RMDUPUPD Example}

\begin{verbatim}
\texttt{%rmdupupd;}
\end{verbatim}

\texttt{%RMMSBMCP}

\texttt{%RMMSBMCP Overview}

\texttt{%RMMSBMCP} reads the records from a BMC Perf Mgr file that was created with the \texttt{DUMP HISTORY} command. It then creates the appropriate table metadata and column metadata for the SAS IT Resource Management BMC Perf Mgr adapter.

\textit{Note:} Run this program only after you have created an IT data mart and a job that contains a BMC Perf Mgr transformation.

\texttt{%RMMSBMCP Syntax}

\begin{verbatim}
\texttt{%RMMSBMCP(}
\texttt{LOGFILE=path-and-filename-to-BMC-Perf-Mgr-log}
\texttt{,METAPASS=user-password}
\texttt{,METASERVER=name-of-metadata-server}
\texttt{,METAUSER=user-ID}
\texttt{,<,APPSERVER=name-of-application-server>}
\texttt{,<,CREATEMETADATA=Yes | No>}
\texttt{,<,FILEDEVICE=type-of-device>}
\texttt{,<,FILENOOFVOLUMES=number-of-volumes>}
\end{verbatim}
%RMMSBMCP Required Arguments

LOGFILE=path-and-filename-to-BMC-Perf-Mgr-log
specifies the path to the BMC Perf Mgr log file.

METAPASS=user-password
specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

TIP If you use the PWENCODE form of the password, be sure to handle embedded braces ({}) carefully. Do not confuse them with square brackets ([]).

METASERVER=name-of-metadata-server
specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

METAUSER=user-ID
specifies the user ID that is to access the metadata server. Do not enclose the value for this parameter in quotation marks.

%RMMSBMCP Options

APPSERVER=name-of-application-server
specifies the name of the application server. The default value for this option is SASITRM.

CREATEMETADATA=Yes | No
specifies that the macro is to create the metadata for the tables and columns in the log file.

The default value for this option is N, which means do not create the metadata. The value N produces only a report of the metadata that would have been created.

FILEDEVICE=type-of-device
specifies the type of device. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILENOOFVOLUMES=number-of-volumes
specifies the number of volumes. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILESSPACEPRIMARY=primary-space-allocation
specifies the primary space allocation. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILESPACESECONDARY=secondary-space-allocation
specifies the secondary space allocation. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.
**JOBID=metadata-id-of-staging-job**
specifies the metadata ID of the staging job. The metadata-ID should be in the format Axxxxxxxx.Zyyyyyyyy and follow these specifications:

- Axxxxxxxx is any set of eight alphanumeric characters preceded by the character “A.”
- Z is any alphabetic character.
- yyyyyyyyy is any set of eight alphanumeric characters.

*Note:* This option is required if CREATEMETADATA is set to Y.

**METAPORT=metadata-server-port**
specifies the port of the metadata server. Do not enclose the value for this parameter in quotation marks.

**METAREPOSITORY= name-of-metadata-repository**
specifies the name of the metadata repository that contains the IT data mart. The default value for this option is Foundation. Do not enclose the value for this parameter in quotation marks.

---

**%RMMSBMCP Example**

This example reads the BMC Perf Mgr log file called c:\BMCPerfMgr\citral_Windows_format2.dat and creates the metadata for the tables and columns defined in this log file.

```verbatim
%rmmsbmcp(  
createMetadata=Y,  
jobID=A5FWNTN9.BN0000RX,  
logfile=c:\BMCPerfMgr\citral_Windows_format2.dat  
metapass=myPassword,  
metaserver=myServer,  
metauser=myUserid,  
);  
```

---

**%RMMSDTPS**

**%RMMSDTPS Overview**

%RMMSDTPS reads the header records from a DT Perf Sentry log file and creates the appropriate table and column metadata for the SAS IT Resource Management DT Perf Sentry adapter.

*Note:* Run this program only after you have created an IT data mart and a job that contains a DT Perf Sentry transformation.

**%RMMSDTPS Syntax**

```
%RMMSDTPS  
LOGFILE=path-and-filename-to-DT-Perf-Sentry-log  
,METAPASS=user-password  
,METASERVER=name-of-metadata-server  
```
%RMMSDTPS Required Arguments

LOGFILE=\path-and-filename-to-DT-Perf-Sentry-log
specifies the path to the DT Perf Sentry log file.

METAPASS=\user-password
specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

TIP If you use the PWENCODE form of the password, be sure to handle embedded braces ({}) carefully. Do not confuse them with square brackets ([]).

METASERVER=\name-of-metadata-server
specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

METAUSER=\user-ID
specifies the user ID that is to access the metadata server. Do not enclose the value for this parameter in quotation marks.

%RMMSDTPS Options

APPSERVER=\name-of-application-server
specifies the name of the application server. The default value for this option is SASITRM.

CREATEMETADATA=Yes | No
specifies that the macro is to create the metadata for the tables and columns in the log file.

The default value for this option is N, which means do not create the metadata. The value N produces only a report of the metadata that would have been created.

FILEDEVICE=\type-of-device
specifies the type of device. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILENOOFVOLUMES=number-of-volumes
specifies the number of volumes. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILESACEPRIMARY=primary-space-allocation
specifies the primary space allocation. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.
FILESPACESECONDARY=\textit{secondary-space-allocation}  
specifies the secondary space allocation. This value is required only if the library and  
tables are going to be stored on z/OS with a traditional file system.

JOBID=\textit{metadata-id-of-staging-job}  
specifies the metadata ID of the staging job. The metadata-ID should be in the format  
Axxxxxxx.Zyyyyyyyy and follow these specifications:

- Axxxxxxx is any set of eight alphanumeric characters preceded by the character “A.”
- Z is any alphabetic character.
- yyyyyyyyy is any set of eight alphanumeric characters.

\textit{Note}: This option is required if CREATEMETADATA is set to Y.

METAPORT=\textit{metadata-server-port}  
specifies the port of the metadata server. Do not enclose the value for this parameter  
in quotation marks.

METAREPOSITORY=\textit{name-of-metadata-repository}  
specifies the name of the metadata repository that contains the IT data mart. The  
default value for this option is \textit{Foundation}. Do not enclose the value for this  
parameter in quotation marks.

\%RMMSDTPS Example

This example reads the DT Perf Sentry log file called \texttt{c:\DTPerfSentry\arlington-1.smf}  
and creates the metadata for the tables and columns defined in this log file.

\begin{verbatim}
%rmmsdtps(
    createMetadata=Y,
    jobID=A5016lHR.BP0001MU,
    logfile=c:\DTPerfSentry\arlington-1.smf
    metapass=myPassword,
    metaserver=myServer,
    metauser=myuserid,
);  
\end{verbatim}

\%RMMSMXG

\%RMMSMXG Overview

\%RMMSMXG reads the data sets from a SAS library, typically an MXG PDB, and  
creates the appropriate metadata for a SAS IT Resource Management adapter.

\textit{Note}: Run this program only after you have created an IT data mart and a job that  
contains a staging transformation for an adapter that is based on MXG (for example,  
IBM SMF or TMON2CIC). This macro adds the staged tables or columns to the  
same metadata folder as the staging job and links them to the staging transformation  
in that job.
%RMMSMXG Syntax

```
%RMMSMXG(
  ADAPTER=adapter
  ,DATETIME=datatime-column
  ,METAPASS=user-password
  ,METAUSER=user-ID
  ,METASERVER=name-of-metadata-server
  ,MXGPDB=path-and-filename-to-an-MXG-PDB
  ,TABLES=list-of-tables | _ALL_
  ,<,ACTION=CREATE_TABLES | CREATE_COLUMNS>
  ,<,APPSERVER=name-of-application-server>
  ,<,CREATEMETADATA=Yes | No>
  ,<,FILEDEVICE=type-of-device>
  ,<,FILENOOFVOLUMES=number-of-volumes>
  ,<,FILESPECPRIORITY=primary-space-allocation>
  ,<,FILESPECESECONDARY=secondary-space-allocation>
  ,<,JOBID=metadata-id-of-staging-job>
  ,<,METAPORT=metadata-server-port>
  ,<,METAREPOSITORY=name-of-metadata-repository>
);
```

%RMMSMXG Required Arguments

**ADAPTER=adapter**

specifies the name of the adapter with which these tables are associated (for example, SMF or TMON2CIC).

**DATETIME=datatime-column**

specifies the name of the MXG column that is to be assigned to the DATETIME column in the SAS IT Resource Management staged table. A single DATETIME column is required in every SAS IT Resource Management staged table, but MXG data sets do not always contain one. Use this parameter to select the MXG column. The parameter is usually specified as follows:

- For event type data, such as CICS, TYPE30, or other transactional data, use DATETIME=SMFTIME.
- For interval data, such as RMF, use DATETIME=STARTIME.
- For TMON2CIC data, use DATETIME=STRTTIME.

The name that you provide will be used for all tables listed. Therefore, you might need to invoke this macro multiple times using a different list of tables and column names for this parameter.

**METAPASS=user-password**

specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

**TIP** If you use the PWENCODE form of the password, be sure to handle embedded braces ({}), carefully. Do not confuse them with square brackets ([ ]).
**METASERVER=** *name-of-metadata-server*

specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

**METAUSER=** *user-ID*

specifies the user ID that is to access the metadata server. Do not enclose the value for this parameter in quotation marks.

**MXGPDB=** *path-and-filename-to-an-MXG-PDB*

specifies the path to a set of SAS data sets, typically an MXG PDB.

**TABLES=** *list-of-tables | _ALL_

specifies the tables of the MXG PDB for which you want to generate metadata. You can generate metadata for all of the tables of the PDB or simply a list of the PDB’s tables. (The list of tables must be space-delimited.)

**%RMMSMXG Options**

**Action=** CREATE_TABLES | CREATE_COLUMNS

specifies what objects the macro creates.

- The CREATE_TABLES specifies that the macro is to add tables from an MXG PDB to a staging job.
- CREATE_COLUMNS specifies that the macro is to add columns from the tables of the MXG PDB to the corresponding tables that exist in the staging job. The macro performs two tasks:
  1. It discovers what staged tables already exist in the staging job and compares the columns of those tables to the columns of the corresponding tables of the MXG PDB.
  2. It adds any new columns that are in tables of the MXG PDB to the corresponding tables in the staging job.

  *Note:* The macro works in accordance with the value that is specified in the TABLES= parameter. Therefore, it can add all new columns to all staged tables in the job or all new columns to a select list of tables in the job.

The default value for this option is CREATE_TABLES.

**APPSERVER=** *name-of-application-server*

specifies the name of the application server. The default value for this option is SASITRM.

**CREATEMETADATA=** Yes | No

specifies that the macro is to create the metadata for the tables and columns in the log file.

The default value for this option is No, which means do not create the metadata. The value N produces only a report of the metadata that would have been created.

**FILEDEVICE=** *type-of-device*

specifies the type of device. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

**FILENAMEOOFVOLUMES=** *number-of-volumes*

specifies the number of volumes. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.
FILESPACE.PRIMARY = primary-space-allocation
specifies the primary space allocation. This value is required only if the library and
tables are going to be stored on z/OS with a traditional file system.

FILESPACE.SECONDARY = secondary-space-allocation
specifies the secondary space allocation. This value is required only if the library and
tables are going to be stored on z/OS with a traditional file system.

METAPORT = metadata-server-port
specifies the port of the metadata server. Do not enclose the value for this parameter
in quotation marks.

METAREPOSITORY = name-of-metadata-repository
specifies the name of the metadata repository that contains the IT data mart. The
default value for this option is Foundation. Do not enclose the value for this
parameter in quotation marks.

JOBID = metadata-id-of-staging-job
specifies the metadata ID of the staging job. The metadata-ID should be in the format
Axxxxxxxx.Zyyyyyyyyy and follow these specifications:
• Axxxxxxxx is any set of eight alphanumeric characters preceded by the character
  “A.”
• Z is any alphabetic character.
• yyyyyyyyy is any set of eight alphanumeric characters.

Note: This option is required if CREATEMETADATA is set to Y.

%RMMSMIXG Example
This example reads an MXG PDB called MYUSER.DAILY.TMON2CIC.PDB and
creates the metadata for a single TMON2CIC table, MONICSE. It uses STRTTIME as
the DATETIME column.

```%RMMSMIXG
%rmmsmxg (mxgpdb=MYUSER.DAILY.TMON2CIC.MXGPDB, 
adapter=TMON2CIC, 
tables=MONICSE, 
datetime=STRTTIME, 
createMetadata=Y, 
jobID=A5C7461J.AT0002OS, 
metaserver=myServer, 
metaport=61825, 
metauser=myUserid, 
metapass=myPassword 
);
```
This example reads an MXG PDB called MYUSER.DAILY.MXGPDB and creates the
metadata for three SMF tables. It uses SMFTIME as the DATETIME column.

```%RMMSMIXG
%rmmsmxg (mxgpdb=MYUSER.DAILY.MXGPDB, 
adapter=SMF, 
tables=TYPE4224 TYPE4225 TYPE4226, 
datetime=SMFTIME, 
createMetadata=Y, 
jobID=A5C2952J.BS0001OS, 
metaserver=myServer, 
```
%RMMSSCOM

%RMMSSCOM reads a management pack file in XML format and creates table and column metadata and formats for the SAS IT Resource Management MS SCOM adapter.

A management pack is a grouping of classes, monitors, object discoveries, rules, tasks, views, and knowledge. These groups provide System Center Operations Manager (SCOM) management servers and agents with the information necessary to monitor an application.

If the management pack is sealed, you need to unseal it first to get the XML file.

Note: Run this program only after you have created an IT data mart and a job that contains an SCOM transformation.

Special Considerations for the Amazon Web Services (AWS) Management Pack

The AWS Management Pack enables Microsoft System Center Operations Manager to access your AWS resources (such as instances and volumes). The Microsoft System Center Operations Manager can collect performance data and monitor those resources. The AWS Management Pack is an extension to MS SCOM. Two versions of the AWS Management Pack are available:

• System Center 2012 - Operations Manager
• System Center Operations Manager 2007 R2

For information about using %RMMSSCOM to collect AWS Management Pack 2012 data and create the staged table metadata from it, see %RMMSSCOM Example 2 on page 607. After the program executes, check the SAS log for errors. If executed
successfully, the program produces a report of tables and metadata for the AWS 2012 version.

**Figure A8.1** Report Generated by %RMMSSCOM

![Report Generated by %RMMSSCOM](image)

**TIP** Open the existing staging job in the SAS IT Resource Management client to ensure that the staged table for the AWS 2012 version was created.

**%RMMSSCOM Syntax**

```plaintext
%RMMSSCOM(
  METAPASS=user-password
  ,METAUSER=user ID
  ,MPFILE=path-and-filename-of-the-management-pack
  ,OUTPUTFILEPATH=path-of-output-text-file
  ,APPSERVER=name-of-application-server>
  ,CREATEMETADATA=Yes | No>
  ,FILEDEVICE=type-of-device>
  ,FILENOOFVOLUMES=number-of-volumes>
  ,FILESPACEPRIMARY=primary-space-allocation>
  ,FILESPACESECONDARY=secondary-space-allocation>
  ,JOBID=metadata-id-of-staging-job>
  ,METAPORT=metadata-server-port>
  ,METAREPOSITORY=name-of-metadata-repository>
);
```
%RMMSSCOM Required Arguments

METAPASS=user-password
specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

TIP If you use the form of the password, be sure to handle embedded braces ({}) carefully. Do not confuse them with square brackets ([]).

METASERVER=name-of-metadata-server
specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

METAUSER=user-ID
specifies the user ID that is to access the metadata server. The user must be able to read and write metadata in the IT data mart. Do not enclose the value for this parameter in quotation marks.

MPFILE=path-and-filename-of-the-management-pack
specifies the path to the management pack.

OUTPUTFILEPATH=path-of-output-text-file
specifies the path for a temporary text file called Temp_RMMSCOM.txt. This file will contain the data that is retrieved from the management pack.

%RMMSSCOM Options

APPSERVER=name-of-application-server
specifies the name of the application server.

The default value for this option is SASITRM.

CREATEMETADATA=Yes | No
specifies that the macro is to create the metadata for the staging tables.

The default value for this option is No, which means do not create the metadata. The value No produces only a report of the metadata that would have been created.

FILEDEVICE=type-of-device
specifies the type of device. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILENOOFVOLUMES=number-of-volumes
specifies the number of volumes. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILESPACEPRIMARY=primary-space-allocation
specifies the primary space allocation. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

FILESPACESECONDARY=secondary-space-allocation
specifies the secondary space allocation. This value is required only if the library and tables are going to be stored on z/OS with a traditional file system.

JOBID=metadata-id-of-staging-job
specifies the metadata ID of the staging job. The metadata-ID should be in the format Axxxxxxxx.Zyyyyyyyyy and follow these specifications:
• `Axxxxxxxx` is any set of eight alphanumeric characters preceded by the character “A.”
• `Z` is any alphabetic character.
• `yyyyyyyyy` is any set of eight alphanumeric characters.

*Note:* This option is required if `CREATEMETADATA` is set to `Yes`.

**METAPORT=metadata-server-port**

Specifies the port of the metadata server.

The default value for this option is 8561. Do not enclose the value for this parameter in quotation marks.

**METAREPOSITORY=metadata-repository**

Specifies the name of the metadata repository that contains the IT data mart. Do not enclose the value for this parameter in quotation marks.

The default value for this option is `Foundation`.

---

### %RMMSSCOM Example 1 for the Microsoft SQL Server 2008 R2 Management Pack

This example reads the Microsoft SQL Server 2008 R2 management pack in XML format and creates table and column metadata and formats for the MS SCOM adapter.

```
%msscom(
  createMetadata=Y,
  jobID=A5016lHR.BP0001MU,
  metaserver=myServer,
  metauser=myUserid,
  mpfile=c:\msscom\SQLServer2008R2.xml,
  outputfilepath=c:\temp
);
```

### %RMMSSCOM Example 2 for the AWS Management Pack 2012 Management Pack

This example reads the AWS Management Pack 2012 management pack in XML format and creates table and column metadata and formats for the MS SCOM adapter.

```
%msscom(
  MPFile="C:\SCOMTEST\aws\Microsoft.AWS.WebServices.2012.Monitoring.xml",
  outputFilePath=C:\SCOMTEST\aws,
  createMetadata=Y,
  jobID=A52ZNBYU.BS000348,
  metaserver=myServer,
  AppServer=SASApp,
  metaport=8561,
  metauser=myUserid,
  metapass=myPassword
);
```
%RMMSSNMP

%RMMSSNMP Overview

%RMMSSNMP reads a management information base (MIB) definition and creates the appropriate table and column metadata and formats for the SAS IT Resource Management SNMP adapter.

Note: Run this program only after you have created an IT data mart and a job that contains an SNMP transformation.

%RMMSSNMP Syntax

%RMMSSNMP(
METAPASS=\text{user-password}
,\text{METASERVER}=\text{name-of-metadata-server}
,\text{METAUSER}=\text{user-ID}
,\text{MIBFILE}=\text{path-and-filename-of-the-MIB-definition}
,<,\text{APPSERVER}=\text{name-of-application-server}>
,<,\text{CREATEMETADATA}=\text{Yes} \mid \text{No}>
,<,\text{FORMATLIBPATH}=\text{path-to-library-for-formats}>
,<,\text{JOBID}=\text{metadata-id-of-staging-job}>
,<,\text{KEEPRECOMMENDEDONLY}=\text{Yes} \mid \text{No}>
,<,\text{METAPORT}=\text{metadata-server-port}>
,<,\text{METAREPOSITORY}=\text{name-of-metadata-repository}>
);

%RMMSSNMP Required Arguments

\textbf{METAPASS=\text{user-password}}

specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the \texttt{PWENCODE} procedure in the Base SAS Procedures Guide.

\textbf{TIP} If you use the form of the password, be sure to handle embedded braces (\{\}) carefully. Do not confuse them with square brackets (\[\]).

\textbf{METASERVER=\text{name-of-metadata-server}}

specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

\textbf{METAUSER=\text{user-ID}}

specifies the user ID that is to access the metadata server. Do not enclose the value for this parameter in quotation marks.

\textbf{MIBFILE=\text{path-and-filename-of-the-MIB-definition}}

specifies the path to the management information base (MIB) definition file.
%RMMSSNMP Options

APPSERVER=\textit{name-of-application-server}
specifies the name of the application server.

The default value for this option is \texttt{SASITRM}.

CREATEMETADATA=\texttt{Yes} | \texttt{No}
specifies that the macro is to create the metadata for the MIB tables.

The default value for this option is \texttt{N}, which means do not create the metadata. The value \texttt{N} produces only a report of the metadata that would have been created.

FORMATLIBPATH=\textit{path-to-library-for-formats}
specifies the path to the library where the formats for this macro are to be stored.

The default value for this option is the WORK library.

JOBID=\textit{metadata-id-of-staging-job}
specifies the metadata ID of the staging job. The metadata-ID should be in the format \texttt{Axxxxxxxx.Zyyyyyyyyy} and follow these specifications:

- \texttt{Axxxxxxxx} is any set of eight alphanumeric characters preceded by the character “A.”
- \texttt{Z} is any alphabetic character.
- \texttt{yyyyyyyyy} is any set of eight alphanumeric characters.

\textit{Note:} This option is required if CREATEMETADATA is set to \texttt{Y}

KEEPRECOMMENDEDONLY=\texttt{Yes} | \texttt{No}
specifies that the macro should keep only the recommended tables and columns.

The default value for this option is \texttt{N}, which means that all tables and columns are to be kept. This includes the tables and columns that are deprecated or obsolete, and columns whose Max-Access attribute has a value of \texttt{not-accessible}.

METAPORT=\textit{metadata-server-port}
specifies the port of the metadata server.

The default value for this option is \texttt{8561}. Do not enclose the value for this parameter in quotation marks.

METAREPOSITORY=\textit{name-of-metadata-repository}
specifies the name of the metadata repository that contains the IT data mart. Do not enclose the value for this parameter in quotation marks.

The default value for this option is \texttt{Foundation}.

%RMMSSNMP Example

This example reads the BGP-4-MIB definition and creates the metadata for the recommended tables and columns that are in the MIB definition.

```sql
%rmssnmp{
createMetadata=Y,
formatLibPath=c:\mibFormats,
jobID=A5016lHR.BP0001MU,
keepRecommendedOnly=Y,
metapass=myPassword,
}```
%RMPROINT

%RMPROINT Overview

%RMPROINT creates an output SAS view that converts the values of the variables of data type C2RATE or D2RATE from counters or deltas into rates. This macro processes either counters or deltas in a single invocation (but not both). If DURATION is missing, then the macro also sets the value of DURATION to be the difference between successive values of the variable DATETIME within one BY group.

%RMPROINT Syntax

%RMPROINT(
  ADAPTER=adapter-name
 ,BYGROUP=list-of-BY-vars
 ,IN=input-SAS-table
 ,OUT=output-SAS-table
 ,VARS=list-of-vars
 <,CONVERT=C2RATE>
 <,_RBDF=relative-bad-delta-factor>
);

%RMPROINT Required Arguments

ADAPTER=adapter-name
  specifies the name of the adapter to which the table belongs.

BYGROUP=bygroup
  specifies the space-delimited list of BY variables that govern how this data is sorted.

IN=infile
  specifies the input SAS table.

OUT=outfile
  specifies the output SAS table. (This table can be the same as the input table.)

VARS=variable-name

%RMPROINT Options

CONVERT=conversion-type
  specifies the type of conversion to be performed. The following values are valid for conversion-type:

  •
    • C2RATE
The data is converted from counter to rate. The default value for this option is C2RATE.

- D2RATE
  The data is converted from the delta value to rate.

\_RBDF=\textit{relative-bad-delta-factor}

specifies the name of the SAS macro variable that is created that contains the Relative Bad Delta Factor as a percentage. The default value of this option is RBDFTMP.

\%RMPROINT Notes

The \%RMPROINT macro converts metrics that are considered counters or deltas to rates. A counter is a metric whose value is constantly increasing. A delta is a metric whose value represents the difference between the value of a counter at the start and end of an interval of time. The rate is determined by taking the delta metric (or by calculating the delta from the counter) and dividing it by the duration of the interval. The following table lists the counters that are converted to rates for the NTSMF Adapter.

\begin{table}[h]
\centering
\caption{List of Counters That Are Converted to Rates for NTSMF Adapters}
\begin{tabular}{|l|l|}
\hline
NTSMCNT Table & NTTCP Table \\
\hline
ALMSGKB & CNCACTV \\
\hline
EXTMSGS & CNCFLRS \\
\hline
EXTRMKB & CNCTPSV \\
\hline
INTMSGS & CNCTRST \\
\hline
INTRMKB & \\
\hline
TTLMSGS & \\
\hline
\end{tabular}
\end{table}

The following table lists the counters that are converted to rates for the SAR Adapter.

\begin{table}[h]
\centering
\caption{List of Counters That Are Converted to Rates for SAR Adapters}
\begin{tabular}{|l|l|l|l|}
\hline
XTYTCPS TABLE & \\
\hline
ICIMDEU & ICOMDEU & IMFQGOK & IMRMSOK \\
\hline
ICIMECQ & ICOMECCQ & IMFGCRC & IMRMSRE \\
\hline
ICIMECR & ICOMECCR & IMFGLD & IMRSMAC \\
\hline
ICICERR & ICOMERR & IMIADRE & IMRSMFU \\
\hline
ICIMIPP & ICOMIPP & IMIDELV & IMRSMTO \\
\hline
\end{tabular}
\end{table}
For example, if you have recorded odometer mileage and the start time of each mileage reading, then the counter is mileage. When this macro is executed, the duration is determined by calculating the difference between the start times of one observation and the preceding observation. Then, the number of miles per second can be calculated for each observation. To calculate the number of miles per second, find the difference between the odometer mileage of one observation and the mileage of the preceding observation. Then divide the result by the duration in seconds.

A counter continues increasing across all intervals until it reaches its maximum value and then, typically, it resets to zero and starts again. The counter maximums are 65,536 (for a 16-bit counter), 4,294,967,296 (for a 32-bit counter), and 18,446,744,073,709,551,616 (for a 64-bit counter). Using the previous and current value of the counter and knowing the maximum limit for that particular counter, it is possible to calculate the rate for that interval, based on these assumptions:

- If the previous value is smaller than the current value, it is assumed that the counter has not reset.
- If the previous value is larger than the current value, it is assumed that the counter has reset one time.

Note: For information about “Length and Precision of Variables” when using any 64-bit counter, see the SAS Companion documentation for your host.

**Fast-Moving Counters**

A problem that exists, especially for 16-bit counters, is that fast-moving counters can reset more than one time during an interval. One way to resolve this problem is to sample at a shorter interval. This shorter interval would ensure that there is not enough time during the interval for the counters to reset more than once.

SAS IT Resource Management also provides another way to resolve this problem. Although SAS IT Resource Management converts counters to rates automatically, there are three macro variables that you can use to affect how the conversion is done. By default, these macro variables are set as follows:

- Macro variable CP16PCT is for use with 16-bit counters. By default, it is set as follows:
As a result of this setting, a threshold is calculated for 16-bit counters, and the threshold has the following value:

\[ 0.95 \times 65536 = 62259.2 \]

- Macro variable CP32PCT is for use with 32-bit counters. By default, it is set as follows:

\[ \%let \text{cp32pct} = 0.97; \]

As a result of this setting, a threshold is calculated for 32-bit counters, and the threshold has the value of

\[ 0.97 \times 4292967296 = 4164178277 \]

- Macro variable CP64PCT is for use with 64-bit counters. By default, it is set as follows:

\[ \%let \text{cp64pct} = 0.97; \]

As a result of this setting, a threshold is calculated for 64-bit counters, and the threshold has the value of

\[ 0.97 \times 18446744073709551616 = 17893341751498265067 \]

When a rate is being determined and the current value is less than the previous value, one of the following situations might have occurred:

- If the previous value is greater than or equal to the threshold, the rate is calculated based on the assumption that one reset occurred during the interval. That is, the previous value was so close to the counter's maximum that it is possible that it was reset once during the interval.

  In this case, a "Corrected" message (see the following example) is written to the SAS log.

- If the previous value is less than the threshold, the rate is not calculated, and, instead, the rate is set to missing. That is, the previous value is so far from the counter's maximum that the counter must have been moving extremely fast to reset during the interval. And if the counter is moving that fast, it is possible that it was reset more than one time during that interval.

  In this case, a "Set to missing" message (see the following example) is written to the SAS log.

Example

The following example illustrates the situation for a 16-bit counter, assuming 5-minute intervals:

<table>
<thead>
<tr>
<th>Table A8.4  Table of Counters and Calculated Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter Value</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>20000</td>
</tr>
<tr>
<td>40000</td>
</tr>
</tbody>
</table>
In the preceding table, the calculated rates for the first three counter values are computed according to the following rules:

- The first observation's rate is missing, because there is no previous value with which to calculate the difference.

- The first time the counter resets, the value preceding the reset (62260) meets (or exceeds) the default threshold of 95% for 16-bit counters (62259.2). The rate is therefore calculated based on one reset, and the following message is written to the SAS log:

  (CLEANUP) Obs4 16 bit Overflow Start 01JAN01:00:10:00 SVAL=62260 Corrected End 01JAN2001:00:15:00.00 SVAL=300

- The second time the counter resets, the value preceding the reset (62259) does not meet (or exceed) the default threshold of 95% for 16-bit counters (62259.2). The rate is therefore set to missing, and the following message is written to the SAS log:

  (CLEANUP) Obs 7 Inconsistent Start 01JAN01:00:25:00 SVAL=62259 Set to missing End 01JAN2001:00:30:00.00 SVAL=2000

A large percentage of your data might be producing the second type of message. If so, the work that is measured by the counters might have increased so much that the counters are resetting more than one time within an interval. Take one or both of the following actions as needed:

- Reduce the interval at which you sample, although this will increase the volume of data that you collect.

- Lower the thresholds. For example, you could insert the following SAS statement in the process-and-reduce job before the call to the process macro:

  %let cp16pct=0.94;

  *Note: As you lower the thresholds, more rates are calculated, but the rates might be incorrect because of multiple resets due to fast-moving counters.

%RMPROINT Example

If you are working with a supported adapter, this macro is submitted automatically when necessary. If you are working with user-written staging code, you must submit the macro yourself if it is needed. To do so, execute it as a separate step in a job after the data has been staged.

DATA
%RMRUNETL

%RMRUNETL Overview

This is the order that the ETL jobs are run by %RMRUNETL:

1. the staging job
2. the aggregation jobs
3. information map jobs
4. the report jobs

Note: The aggregation, information map, and report jobs are run in parallel using Multi-
Processing (MP) Connect.

If the staging job fails, the aggregation, information map, and report jobs are not run.
After each job completes, the SAS log is examined by the program. The completion
status of the job (Success, Warning, or Error) is sent by email to the specified recipient.
If the log displays warnings or errors, the email includes the text of the error or warning
along with the corresponding line number in the log file.

%RMRUNETL Syntax

%RMRUNETL(  
<ADAPTER=adapter-name>  
<AGGJOB1=path-to-aggregation-job1>,...<AGGJOB20=path-to-aggregation-job20>  
<AGGLOG1=path-to-aggregation-log1>,...<AGGLOG20=path-to-aggregation-log20>  
<EMAILFROM=sending-email-address>  
<EMAILO=email.address@company.com >  
<INFOMAPJOB1=path-to-infomap-job1>,...<INFOMAPJOB20=path-to-infomap-job20>  
<INFOMAPLOG1=path-to-infomap-log1>,...<INFOMAPLOG20=path-to-infomap-log20>  
REPORTJOB1=path-to-report-job1>,...<REPORTJOB20=path-to-report-job20>  
REPORTLOG1=path-to-report-log1>,...<REPORTLOG20=location-of-report-log20>  
RUNDATE=date-that-this-macro-is-run>  
STAGINGJOB=path-to-staging-job>  
STAGINGLOG=path-to-staging-log>  
);

%RMRUNETL Required Arguments

There are no required parameters for this macro. All parameters are optional. However,
you must specify at least one job in order to run this macro.
%RMRUNETL Options

**ADAPTER=adapter-name**

This value is used in the subject of the email messages that are sent out and in the
name of the audit table. This option can be left blank.

**AGGJOB1=path-to-aggregation-job1...AGGJOB20=path-to-aggregation-job20**

specifies the paths to a maximum of 20 aggregation jobs. These jobs will be run in
parallel.

*Note:* The path must include the name of the file that contains the job.

**AGGLOG1=path-to-aggregation-log1...AGGLOG20=path-to-aggregation-log20**

specifies the paths to a maximum of 20 aggregation logs.

*Note:* The path must include the name of the file that contains the log.

**EMAILFROM=email.address@company.com**

specifies the email address from which the email is to be sent. If blank, this value is
set to the address that is specified in EMAILTO.

**EMAILTO=email.address@company.com**

specifies the email address to which the status email is to be sent. If this value is
blank, a warning is written in the log that email is not going to be sent.

**INFOMAPJOB1=path-to-infomap-job1...INFOMAPJOB20=path-to-infomap-job20**

specifies the paths to a maximum of 20 information map jobs. These jobs will be run
in parallel.

*Note:* The path must include the name of the file that contains the job.

**INFOMAPLOG1=path-to-infomap-log1...INFOMAPLOG20=path-to-infomap-log20**

specifies the paths to a maximum of 20 information map logs.

*Note:* The path must include the name of the file that contains the log.

**REPORTJOB1=path-to-report-job1...REPORTJOB20=path-to-report-job20**

specifies the paths to a maximum of 20 report jobs. These jobs will be run in parallel.

*Note:* The path must include the name of the file that contains the job.

**REPORTLOG1=path-to-report-log1...REPORTLOG20=path-to-report-log20**

specifies the paths to a maximum of 20 report logs.

*Note:* The path must include the name of the file that contains the log.

**RUNDATE=date-that-this-macro-is-run**

specifies the date that is used in email messages and in log filenames. If this value is
blank, it is set to today's date.

**STAGINGJOB=path-to-staging-job**

specifies the path to the staging job that you want to run.

*Note:* The path must include the name of the file that contains the job.

**STAGINGLOG=path-to-staging-log**

specifies the path to the staging log that is produced by the staging job. If the
STAGINGJOB option is specified, then the STAGINGLOG must also be specified.

*Note:* The path must include the name of the file that contains the job.
%RMRUNETL Notes

This macro can be run in batch mode, or interactively from the SAS Display Manager. It can run Windows, UNIX, or z/OS jobs that are stored in a PDS.

If an option for a job is specified, the corresponding log option must also be specified. For example, if there is a path specified for the AggJob2 option, the AggLog2 option cannot be left blank.

%RMRUNETL Examples

Example 1: Running a Staging Job, Two Aggregation Jobs, and a Report Job

This example shows the code that runs a staging job, two aggregation jobs, and a report job. Email is to be sent to and from the same email address. The RUNDATE option defaults to today's date.

```sas
%rmrunetl(adapter=SNMP,
    aggJob1=C:\jobs\_1_aggJob.sas,
    aggJob2=C:\jobs\_2_aggJob.sas,
    aggLog1= C:\jobs\logs\_1_aggJob.log,
    aggLog2= C:\jobs\logs\_2_aggJob.log,
    emailto=email@address.com,
    reportJob1= C:\jobs\_1_reportJob.sas,
    reportLog1= C:\jobs\_1_reportJob.log,
    stagingJob=C:\jobs\staging.sas,
    stagingLog= C:\jobs\logs\staging.log
);
```

Example 2: Running an MS SCOM Job on Windows

MS_SCOM_Overall.bat: This code shows the Windows bat job that runs the MS_SCOM_Overall.sas program.

```bash
echo off
set ADAPTER=MSSCOM
set DATETIME=%date:~10,4%%date:~4,2%%date:~7,2%_%time:~0,2%%time:~3,2%%time:~6,2
set DATETIME=%DATETIME: =0%
set BASE=C:\Data\Jobs\%ADAPTER%
set LOGDIR=%BASE%\logs
set JOBDIR=C:\SAS\ITRM33\Lev1\SASITRM\SASEnvironment\SASCode\Jobs\set SRC=MS_SCOM_Overall
set SAS=C:\SAS\ITRM33\Lev1\SASITRM\sas.bat
%SAS% -sysin %BASE%\%SRC%.sas -log %LOGDIR%\%SRC%_%DATETIME%.log
```

MS_SCOM_Overall.sas: This code shows the SAS program that runs all the daily jobs (staging, aggregation, and reporting) for an MS SCOM data mart.

```sas
%let adapter = %sysget(ADAPTER);
%let datetime = %sysget(DATETIME);
%let JOBhome = %sysget(JOBDIR);
%let LOGhome = %sysget(LOGDIR);
```
Example 3: HP_Perf_Agent_Overall:
This code shows the UNIX script (bash, Bourne, and related shells) that runs the HP_Perf_Agent_Overall.sas program.

```sas
%let adapter = %sysget(ADAPTER);
%let datetime = %sysget(DATETIME);
%let JOBhome = %sysget(JOBDIR);
%let LOGhome = %sysget(LOGDIR);
%rmrunetl(adapter = &adapter,
    stagingJob = &JOBhome/HP_Perf_Agent_Staging.sas,
    stagingLog = &LOGhome/HP_Perf_Agent_Staging_&datetime..log,
    aggJob1 = &JOBhome/DiskUnix_Aggregation.sas,
    aggJob2 = &JOBhome/SystemUnix_Aggregation.sas,
    aggLog1 = &LOGhome/DiskUnix_Aggregation_&datetime..log,
    aggLog2 = &LOGhome/SystemUnix_Aggregation_&datetime..log,
    reportJob1 = &JOBhome/DiskUnix_Daily_Reporting.sas,
    reportJob2 = &JOBhome/SystemUnix_Daily_Reporting.sas,
    emailto = email.address@company.com
);
```

HP_Perf_Agent_Overall.sas: This code shows the SAS program that runs all the daily jobs (staging, aggregation, and reporting) for an HP Perf Agent data mart.
%RMVINST

%RMVINST Overview

%RMVINST verifies that the application server is correctly configured for use by SAS IT Resource Management.

CAUTION:
Use this macro only under the direction of Technical Support. This macro produces a large volume of information, the interpretation of which requires thorough knowledge of SAS IT Resource Management metadata structures.

The output produced by %RMVINST can be useful for debugging issues related to JAR files and JEOPTIONS settings.

The %RMVINST macro reports on the following issues:

- Can SAS run Java successfully?
- What version of Java is running?
- Has the location of the SAS JAR files been set with the JREOPTIONS system option?
- Are the SAS JAR files in the correct location?
- Is SAS able to access the SAS IT Resource Management JAR files?
- What version of the SAS IT Resource Management JAR files is being accessed?

To execute this macro, add it to a SAS IT Resource Management job or program that you submit from SAS.

Output from running the macro in batch is written to log and list files in the current directory. If you are running batch jobs in z/OS, the output is written to the SAS log and list in the job output.) For more information about this macro and each of these parameters, see the documentation that is provided inside the macro.

%RMVINST Syntax

%RMVINST(
    METAPASS=user-password
    ,METAPORT=metadata-server-port
    ,METASERVER=name-of-metadata-server
    ,METAUSER=user-ID
    );

%RMVINST Required Arguments

METAPASS=user-password
    specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.
You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

**TIP** If you use the PWENCODE form of the password, be sure to handle embedded braces (\{\}) carefully. Do not confuse them with square brackets (\[\]).

**METAPORT=** *metadata-server-port*

specifies the password that is associated with the metauser ID. Do not enclose the value for this parameter in quotation marks.

**METASERVER=** *name-of-metadata-server*

specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

**METAUSER=** *user-ID*

specifies the user ID that accesses the metadata server. Do not enclose the value for this parameter in quotation marks.

*Note:* All four parameters are required. If you do not supply a value for any parameter, %RMVINST uses the equivalent SAS option, if you have set one.

### %RMVINST Example

```sas
%MVMVINST(
    metapass=my-password,
    metaport=8561,
    metaserver=mybox.subdomain.domain.com,
    metauser=my-username
);
```

---

### Backup and Recovery Macros

#### Overview of the Backup and Recovery Macros

The %RM_BACKUP and %RM_RESTORE macros provide an easy way for users to recover the content of failed SAS IT Resource Management staging or aggregation jobs. The following table shows the items that are managed by these macros.

<table>
<thead>
<tr>
<th>SAS IT Resource Management Transformation Type</th>
<th>Items Backed Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staging transformation</td>
<td>Data duplication control information for this transformation</td>
</tr>
<tr>
<td></td>
<td>Staged data (if requested)</td>
</tr>
<tr>
<td></td>
<td>Deployed job code (if available)</td>
</tr>
</tbody>
</table>
For each staging or aggregation transformation, there should be a corresponding execution of the ％RM_BACKUP macro. This invocation of the backup macro would execute between successful runs of the staging or aggregation transformation. The backups could be done in one of the following ways:

- as a separately scheduled job
- by means of the Precode and Postcode tab on the Properties dialog box of the staging or aggregation transformation
- as a separate user-written transformation in the same job as the staging or aggregation transformation

### Managing the Backup and Restore Libraries

Each invocation of ％RM_BACKUP uses libraries that you define and assign in order to store the items needed for recovery. To manage these libraries, it is important to determine how you want to handle recovery scenarios.

For example, you might decide to have a permanent SAS library that is always overwritten for a given backup invocation. In this scenario, you must always handle any recovery before the next regularly scheduled run for the SAS IT Resource Management job that contains the transformation that you are backing up. Otherwise, the valid backup recovery data is overwritten.

In a more likely scenario, you might define a set of recovery libraries. For example, if you want to have a 10-day recovery window, you should set up 10 libraries, one for each day of processing. Each day’s backup would use the next available library.

### ％RM_BACKUP

### ％RM_BACKUP Overview

％RM_BACKUP backs up all the needed content for the given SAS IT Resource Management transformation so that recovery can be performed.
%RM_BACKUP Syntax
%RM_BACKUP(
  ,OUT=libref-of-the-backup-library
  ,METAPASSWORD=user-password
  ,METAPORT=metadata-server-port
  ,METASERVER=name-of-metadata-server
  ,METAUSER=user-ID
  ,TRANSFORMID=metadata-ID-of-the-ITRM-transformation
  ,<,METAREPOSITORY=name-of-metadata-repository>
  ,<,STAGEDDATA=Y | N>
  ,<_RC=return-code>
);

%RM_BACKUP Required Arguments

Note: If the SAS code that contains the macro invocation is submitted to an application server that uses token authentication (such as when submitting from the Code Editor window in the SAS IT Resource Management client), the following parameters are not required: METAPASS, METAPORT, METAREPOSITORY, METASERVER, and METAUSER. For more information about token authentication, see SAS 9.4 Intelligence Platform: Security Administration Guide.

OUT=libref-of-the-backup-library
specifies the libref of the already assigned library that is used for the content being backed up. This libref must refer to a library that has already been assigned.

METAPASS=user-password
specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

TIP If you use the PWENCODE form of the password, be sure to handle embedded braces ({}) carefully. Do not confuse them with square brackets ([]).

METAPORT=metadata-server-port
specifies the port of the metadata server. Do not enclose the value for this parameter in quotation marks.

METASERVER=name-of-metadata-server
specifies the name of the metadata server. Do not enclose the value for this parameter in quotation marks.

METAUSER=user-ID
specifies the user ID that can access the metadata server. Do not enclose the value for this parameter in quotation marks.

TRANSFORMID=metadata-ID-of-the-ITRM-transformation
specifies the metadata ID of the SAS IT Resource Management transformation that you want to back up. To find this value, perform the following steps:

1. In the IT Data Marts view of the SAS IT Resource Management client, double-click to open the job that contains the transformation that you want to back up.

2. In the Diagram tab of the Job Editor window, click the transformation to highlight it.

3. Locate the Basic Properties view in the left panel of the client.

4. Scroll downward to find the metadata ID of the transformation that you highlighted.
**Figure A8.2  Locating the Metadata ID**

**%RM_BACKUP Options**

**METAREPOSITORY=** *name-of-metadata-repository*

specifies the name of the metadata repository. The default for this option is `Foundation`.

**STAGEDDATA=** *Y | N*

specifies whether to back up the staged data, if the transformation being backed up is a staging transformation. The default for this option is `N`.

*Note:* The default is not to back up the staged data because the recovery process typically requires this data to be staged again.

**_RC=_** *return-code*

specifies name of the macro variable to contain the return code. The default for this option is `RC`.

**%RM_BACKUP Example**

```
LIBNAME MYBKUP 'C:\mybackup';

%rm_backup(metaPassword=my-password, 
            metaPort=8561, 
            metaRepository=MYFOUNDATION, 
            metaServer=my-server, 
            metaUser=my-userID,
```

%RM_Restore

%RM_RESTORE Overview
%RM_RESTORE restores all the content for the given SAS IT Resource Management transformation that was backed up by a previous invocation of the %RM_BACKUP macro. Any restored data, such as aggregation tables, status tables, and so on, is stored in the location specified by the metadata. The deployed job code is saved in the location that you specify in the JOBCODE= parameter.

%RM_RESTORE Syntax
%RM_RESTORE
   (JOBCODE=jobcode-location,
    LIB=libref-of-the-backup-library,
    METAPASSWORD=user-password,
    METAPORT=metadata-server-port,
    METASERVER=name-of-metadata-server,
    METAUSER=user-ID,
    TRANSFORMID=metadata-ID-of-the-ITRM-transformation,<
    METAREPOSITORY=name-of-metadata-repository>,
    _RC=return-code
   );

%RM_RESTORE Required Arguments
Note: If the SAS code that contains the macro invocation is submitted to an application server that uses token authentication (such as when submitting from the Code Editor window in the SAS IT Resource Management client), the following parameters are not required: METAPASS, METAPORT, METAREPOSITORY, METASERVER, and METAUSER. For more information about token authentication, see SAS 9.4 Intelligence Platform: Security Administration Guide.

JOBCODE=jobcode-location
   specifies the path and file where you want to save the restored deployed job.
   Note: At backup, if the job was not deployed, or the job code could not be found at the location indicated by metadata, then there is no job code to restore. A note is produced in the SAS log if there is no job code to restore.

LIB=libref-of-the-backup-library
   specifies the libref of the library used for the content being restored. This libref must refer to a library that has already been assigned.

METAPASS=user-password
   specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.
   You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

TIP If you use the PWENCODE form of the password, be sure to handle embedded braces ({})) carefully. Do not confuse them with square brackets ([]).
METAPORT=metadata-server-port
specifies the port of the metadata server. Do not enclose the value for this parameter
in quotation marks.

METASERVER=name-of-metadata-server
specifies the name of the metadata server. Do not enclose the value for this parameter
in quotation marks.

METAUSER=user-ID
specifies the user ID that accesses the metadata server. Do not enclose the value for
this parameter in quotation marks.

TRANSFORMID=metadata-ID-of-the-ITRM-transformation
specifies the metadata ID of the SAS IT Resource Management transformation that
you want to restore.

%RM_RESTORE Options

METAREPOSITORY=name-of-metadata-repository
specifies the name of the metadata repository. The default for this option is
Foundation.

_RC=return-code
specifies name of the macro variable that contains the return code. The default for
this option is RC.

%RM_RESTORE Example

LIBNAME mybkup 'c:\mybackup' access=readonly;

%rm_restore(jobcode=my-jobcode-location,
   lib=mybkup,
   metaPassword=my-password,
   metaPort=8561,
   metaRepository=MYFOUNDATION,
   metaServer=my-server,
   metaUser=my-userID,
   transformid=A$HHVCMR.BV00019I, /* metdata ID of the transformation */
   _rc=my-return-code
);

Macro to Handle Large Data Volumes

%RMCMB

%RMCMB Overview
%RMCMB combines up to 255 similar tables into one table. It creates a table in the
target library path from like-named tables in source library paths. For each set of the
like-named tables that are specified by the SOURCE1-SOURCEN parameters, the macro
creates a single table in the path specified by the TARGET parameter. (%RMCMB uses
SQL to create the table by taking the union of the source tables.)

All rows and columns that are found in the source tables are kept in the new target table.
%RMCMB Syntax

%RMCMB(
    SOURCE1=path-to-source1-table,
    TARGET=path-to-target-table,
    <,SOURCE2=path-to-source2-table,…,SOURCEN=path-to-sourceN-table>,
    <,MEMTYPE=DATA | VIEW>
);  

%RMCMB Required Arguments

SOURCE1=path-to-source1-table
    specifies the first path to use as the source file system location from which tables will be combined.
    Do not enclose this value in quotation marks or brackets. A value for this parameter is required.

TARGET=path-to-target-table
    specifies the path to use as the target file system location to which the new table will be written.
    Do not enclose this value in quotation marks or brackets. A value for this parameter is required.

%RMCMB Options

MEMTYPE=DATA | VIEW
    specifies what type of target to create.
    DATA Specify DATA to create a SAS data table. This is the default value for this option.
    VIEW Specify VIEW to create an SQL view.

SOURCE2=path-to-source2-table,…,SOURCEN=path-to-sourceN-table
    specifies additional paths to use as the source file system location from which tables will be combined.
    Do not enclose this value in quotation marks or brackets. Values for these parameters are optional.
    Note: No more than 255 source locations can be specified.

%RMCMB Note

When creating a SAS data table, the data is automatically compressed. When creating a SAS SQL view, the data is not compressed. The SAS SQL view uses embedded libref information for each source location. Therefore, the view can be used later without re-specifying the various locations.

%RMCMB Example

The following example combines two source tables into a target that is a view:

%rmcmb(source1=path-to-source1-location,
    source2=path-to-source2-location,
    target=path-to-target-location,
    memtype=view
);
%RMMKLIKE

%RMMKLIKE Overview
%RMMKLIKE creates a set of physical libraries, based on an existing job that is specified by the user. The job must contain a staging or Aggregation transformation. For each SAS library that is currently used to contain target tables from that transformation, %RMMKLIKE creates a new physical location. This macro can be executed multiple times in order to produce multiple mirrored sets of libraries.

Note: If the specified job contains a staging or Aggregation transformation where all of the target tables are contained in one SAS library, only one new physical location is created.

%RMMKLIKE does not copy any SAS catalogs or data sets to the newly created mirrored libraries. When running the deployed jobs with the overridden target libraries, the target tables are written to the specified libraries. The original location is used but only for referencing internal control information written at deployment time. The overridden location is used for everything else.

Windows Specifics
The new physical location is a directory. The directory name is formed from the combination of the user-specified root location and the last element of the existing physical location for the current SAS library. For example, if the user specifies

\texttt{ROOT=C:\TEMP\new},

and the SAS library containing target tables for the specified job is currently \texttt{C:\users\myid\datamart\stg938}, then the new location would be created at \texttt{C:\TEMP\new\stg938}.

UNIX Specifics
The new physical location is a directory. The directory name is formed from the combination of the user-specified root location and the last element of the existing physical location for the current SAS library. For example, if the user specifies

\texttt{ROOT=/tmp/myid/new},

and the SAS library containing target tables for the specified job is currently \texttt{/u/myid/datamart/stg938}, then the new location would be created at \texttt{/tmp/myid/new/stg938}.

z/OS Specifics
For zFS, refer to the UNIX Specifics. For traditional z/OS file system libraries, the new physical location is also a traditional file system library. The attributes of the new library (such as DCB and size) are based on the existing library. For example, if the user specifies \texttt{ROOT=MYID.NEW}, and the SAS library containing target tables for the specified job is currently \texttt{MYID.OLD.DM.STG938}, then the new location would be created at \texttt{MYID.NEW.STG938}.

%RMMKLIKE Syntax
%RMMKLIKE(
   JOB=complete-metadata-path-to-the-job,
   _ROOT=physical-root-location
   <,METAPASS=metadata-server-password>
   <,METAPORT=metadata-server-port>
   <,METAREPOSITORY=name-of-metadata-repository>
   <,METASERVER=name-of-metadata-server>
   <,METAUSER=user-ID>
);

Macros to Handle Large Data Volumes 627
%RMMKLIKE Required Arguments

JOB=complete-metadata-path-to-the-job
specifies the complete metadata path, including the job name, to an existing job that contains one or more SAS IT Resource Management transformations. This argument must be specified completely.

This is an example of a completely specified path to a job: /My Folder/Subfolder/MyJob.

Note: If a job has been deployed, there is a metadata object for the job and a separate metadata object for the deployed job. For the purposes of %RMMKLIKE, use the original job object, not the deployed job.

ROOT=physical-root-location
specifies the new path root to use in constructing the new names. If the user-specified root location does not exist, the %RMMKLIKE macro creates it.

A value for this parameter is required.

The following paths are valid examples:

Windows Specifics
C:\public\newLocation

UNIX Specifics
/tmp/newLocation

Note: The previous (UNIX) path is also a valid example for the z/OS ZFS file system.

z/OS Specifics
MYGRP.NEWLOC.

%RMMKLIKE Options

METAPASS=metadata-server-password
specifies the password to use for authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

TIP If you use the PWENCODE form of the password, be sure to handle embedded braces ({{}) carefully. Do not confuse them with square brackets ([]).

METAPORT=metadata-server-port
specifies the port to use in accessing the metadata server, in numeric (integer) format. Do not enclose the value for this parameter in quotation marks.

METAREPOSITORY=name-of-metadata-repository
specifies the name of the repository in which to look for the specified job. The default value for this parameter is Foundation. Do not enclose the value for this parameter in quotation marks.

METASERVER=name-of-metadata-server
specifies the domain name of the metadata server in TCP/IP format. Do not enclose the value for this parameter in quotation marks.

METAUSER=user-ID
specifies the user ID to use in accessing the metadata server. Do not enclose the value for this parameter in quotation marks.
Note: The METAPASS, METAPORT, METAREPOSITORY, METASERVER, and METAUSER parameters are optional. You can specify any or all of them as SAS options instead. However, you must do one or the other.

**%RMMKLIKE Example**
The following example pertains to the Windows environment:

```
%rmmklike(
    job=/My Folder/Subfolder/MyJob,
    metapass=mypassword,
    metaport=8561,
    metarepository=MyRepository,
    metaserver=mybox.subdomain.domain.com,
    metauser=myuserID,
    root=C:\public\newLocation
);
```

---

### Macros for SAS Visual Analytics Integration

**%RMVALOAD**

**%RMVALOAD Overview**
%RMVALOAD loads a LASR table into memory. This macro can also be used to load a LASR table incrementally.

Note: This macro cannot be executed on z/OS or H6I (HP-UX on Itanium).

**%RMVALOAD Syntax**

%RMVALOAD(
FOLDER=folder-path
, LASRLIBRARY=lasr-library-name
, LASRPORT=lasr-port
, LASRTAG=lasr-tag
, METAPASS=user-password
, METASERVER=name-of-metadata-server
, METAUSER=user-ID
, SOURCELIBPATH=source-library-path
, APPEND=Y | N>
, GRIDHOST=grid-host-server>
, GRIDINSTALLLOC=grid-install-location>
, METAPORT=metadata-server-port>
, METAREPOSITORY=name-of-metadata-repository>
, SIGNER=authorization-web-service-uri>
, TYPE=VA-environment-type>
);

**%RMVALOAD Required Arguments**

**FOLDER=folder-path**  
specifies the metadata path for the folder in which to store the LASR table metadata.
LASRLIBRARY=\textit{lasr-library-name} 

specifies the LASR Library name to use in accessing the SAS LASR Analytic Server.

LASRPORT=\textit{lasr-port}  

specifies the port to use in accessing the SAS LASR Analytic Server, in integer format.

LASRTAG=\textit{lasr-tag}  

specifies the tag to use for accessing the SAS LASR Analytic Server.

METAPASS=\textit{user-password}  

specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

\textbf{TIP} If you use the PWENCODE form of the password, be sure to handle embedded braces (\{\}) carefully. Do not confuse them with square brackets (\[\]).

METASERVER=\textit{name-of-metadata-server}  

specifies the name of the repository in which to look for the specified job. The default value for this parameter is \textit{Foundation}. Do not enclose the value for this parameter in quotation marks.

specifies the domain name of the metadata server in TCP/IP format.

METAUSER=\textit{user-ID}  

specifies the user ID to use in accessing the metadata server. Do not enclose the value for this parameter in quotation marks.

SOURCELIBPATH=\textit{source-library-path}  

specifies the source library path.

\%RMVALOAD Options

\textbf{APPEND=\texttt{Y}} | \texttt{N}  

specifies whether to append to the existing table in the SAS LASR Analytic Server. The default value for this parameter is \texttt{N}.

GRIDHOST=\textit{grid-host-server}  

specifies the domain name of the Grid Host server in TCP/IP format.

GRIDINSTALLLOC=\textit{grid-install-location}  

specifies the location of the SAS High-Performance Analytics components. This parameter is required for a Massive Parallel Processing (MPP) type of environment.

METAPORT=\textit{metadata-server-port}  

specifies the port to use in accessing the metadata server, in integer format. The default value for this parameter is \texttt{8561}. Do not enclose the value for this parameter in quotation marks.

METAREPOSITORY=\textit{name-of-metadata-repository}  

specifies the name of the repository in which to look for the specified job. The default value for this parameter is \textit{Foundation}. Do not enclose the value for this parameter in quotation marks.

SIGNER=\textit{authorization-web-service-uri}  

specifies the URI for the SAS LASR authorization web service.
TYPE=SMP | MPP
specifies the type of SAS Visual Analytics environment. The default value for this parameter is SMP.

- Specify SMP (that is, Symmetric Multi-Processing) if you are working with a non-distributed SAS Visual Analytics environment.
- Specify MPP (that is, Massive Multi-Processing) if you are working with a distributed SAS Visual Analytics environment.

%RMVALOAD Notes
You can append data to an existing LASR table in both the non-distributed and distributed SAS Visual Analytics environments. The LASR table is available to applications during the append process. To incrementally load SAS IT Resource Management data, specify the optional parameter of APPEND=Y.

%RMVALOAD Example
The following example loads the PCSDSK table (labeled HP Perf Agent Disk Stage Table) to the SAS LASR Analytic Server in a non-distributed SAS Visual Analytics environment:

```sas
%RMVALOAD(
  append=N
 , folder=/Shared Metadata/LASR/ITRM
 , gridHost=mygrid.subdomain.domain.com
 , gridInstallLoc=/opt/TKGrid
 , lasrLibrary=Visual Analytic LASR
 , lasrPort=10010
 , lasrTag=ITRM
 , metaPass=mypassword
 , metaServer=mybox.subdomain.domain.com
 , metaUser=myuserid
 , signer=mywebserviceURI
 , sourceLibPath=C:\MyDataMart\HPPerfAgent\HPPerfAgent1\stage
 , type=SMP
);
```

The following example loads the PCSDSK table (labeled HP Perf Agent Disk Stage Table) to the SAS LASR Analytic Server in a distributed SAS Visual Analytics environment:

```sas
%RMVALOAD(
  append=N
 , folder=/Shared Metadata/LASR/ITRM
 , gridHost=mygrid.subdomain.domain.com
 , gridInstallLoc=/opt/TKGrid
 , lasrLibrary=Visual Analytic LASR
 , lasrPort=10010
 , lasrTag=ITRM
 , metaPass=mypassword
 , metaServer=mybox.subdomain.domain.com
 , metaUser=myuserid
 , signer=mywebserviceURI
 , sourceLibPath=C:\MyDataMart\HPPerfAgent\HPPerfAgent1\stage
 , type=MPP
);
```
%RMVASTOP

%RMVASTOP Overview
%RMVASTOP stops the SAS LASR Analytic Server.

Note: This macro cannot be executed on z/OS or H6I (HP-UX on Itanium).

%RMVASTOP Syntax
%RMVASTOP( GRIDHOST=grid-host-server,GRIDINSTALLLOC=grid-install-location,LASRPORT=lasr-port,<SIGNER=authorization-web-service-uri>,<TYPE=VA-environment-type>);

%RMVASTOP Required Arguments
GRIDHOST=grid-host-server
specifies the domain name of the Grid Host server in TCP/IP format.

GRIDINSTALLLOC=grid-install-location
specifies the location of the SAS High-Performance Analytics components. This parameter is required for a Massive Parallel Processing (MPP) type of environment.

LASRPORT=lasr-port
specifies the port to use in accessing the SAS LASR Analytic Server, in integer format.

%RMVASTOP Options
SIGNER=authorization-web-service-uri
specifies the URI for the LASR authorization web service.

TYPE=SMP | MPP
specifies the type of SAS Visual Analytic environment. The default value for this parameter is SMP.

• Specify SMP (that is, Symmetric Multi-Processing) if you are working with a non-distributed SAS Visual Analytic environment.

• Specify MPP (that is, Massive Multi-Processing) if you are working with a distributed SAS Visual Analytic environment.

%RMVASTOP Example
The following example stops the SAS LASR Analytic Server in a non-distributed SAS Visual Analytics environment:

%RMVASTOP(
  gridHost=mygrid.subdomain.domain.com
  ,lasrPort=10010
  ,signer=mywebserviceURI
  ,type=SMP
);
The following example stops the SAS LASR Analytic Server in a distributed SAS Visual Analytics environment:

```sas
%RMVASTOP(
    gridHost=mygrid.subdomain.domain.com,
    gridInstallLoc=/opt/TKGrid,
    lasrPort=10010,
    type=MPP
);
```

**%RMVASTRT**

**%RMVASTRT Overview**

Starts the SAS LASR Analytic Server.

*Note:* This macro cannot be executed on z/OS or H6I (HP-UX on Itanium).

**%RMVASTRT Syntax**

```sas
%RMVASTRT(
    GRIDHOST=grid-host-server,
    GRIDINSTALLLOC=grid-install-location,
    LASRPORT=lasr-port,
    LASRTAG=lasr-tag,
    PATH=signature-file-path,
    NOCLASS=NOCLASS | [blank],
    NODES=number-of-machines,
    SIGNER=authorization-web-service-uri,
    TYPE=VA-environment-type
);
```

**%RMVASTRT Required Arguments**

- **GRIDHOST=grid-host-server**
  
specifies the domain name of the Grid Host server in TCP/IP format.

- **GRIDINSTALLLOC=grid-install-location**
  
specifies the location of the SAS High-Performance Analytics components. This parameter is required for a Massive Parallel Processing (MPP) type of environment.

- **LASRPORT=lasr-port**
  
specifies the port to use in accessing the SAS LASR Analytic Server, in integer format.

- **LASRTAG=lasr-tag**
  
specifies the tag to use for accessing the SAS LASR Analytic server.

- **PATH=signature-file-path**
  
specifies the directory to use for storing the server and table signature files.

- **SIGNER=authorization-web-service-uri**
  
specifies the URI for the SAS LASR authorization web service.
%RMVASTRT Options

NOCLASS=NOCLASS | [blank]

specifies that all character variables are not treated implicitly as classification variables. The default value for this parameter is NOCLASS.

Note: Specify NOCLASS in order to use the append data set that was specified in the %RMVALOAD macro.

NODES=ALL | number-of-machines

specifies the number of machines in the cluster. The default value for this parameter is ALL, which calculates the number automatically.

TYPE=SMP | MPP

specifies the type of SAS Visual Analytics environment. The default value for this parameter is SMP.

- Specify SMP (that is, Symmetric Multi-Processing) if you are working with a non-distributed SAS Visual Analytics environment.
- Specify MPP (that is, Massive Multi-Processing) if you are working with a distributed SAS Visual Analytics environment.

%RMVASTRT Example

The following example starts the SAS LASR Analytic Server in a non-distributed SAS Visual Analytics environment:

```sas
%RMVASTRT(
    gridHost=mygrid.subdomain.domain.com
    ,lasrPort=10010
    ,lasrTag=ITRM
    ,path=C:\Temp
    ,signer=mywebserviceURI
    ,type=SMP
);
```

The following example starts the SAS LASR Analytic Server in a distributed SAS Visual Analytics environment:

```sas
%RMVASTRT(
    gridHost=mygrid.subdomain.domain.com
    ,gridInstallLoc=/opt/TKGrid
    ,lasrPort=10010
    ,lasrTag=ITRM
    ,nodes=ALL
    ,path=/tmp
    ,type=MPP
);
```

%RMVATBL

%RMVATBL Overview

%RMVATBL registers a LASR table in the SAS Metadata Repository.

Note: This macro cannot be executed on z/OS or H6I (HP-UX on Itanium).
%RMVATBL Syntax

%RMVATBL(  
FOLDER=folder-path  
,LASRLIBRARY=lasr-library-name  
,METAPASS=user-password  
,METASERVER=name-of-metadata-server  
,METAUSER=user-ID  
,TABLE=table-name  
,<METAPORT=metadata-server-port>  
,<METAREPOSITORY=name-of-metadata-repository>  
);

%RMVATBL Required Arguments

FOLDER=folder-path  
  specifies the metadata path for the folder in which to store the LASR table metadata.

LASRLIBRARY=lasr-library-name  
  specifies the LASR Library name to use in accessing the SAS LASR Analytic Server.

METAPASS=user-password  
  specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

  You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

  **Tip**  
  If you use the PWENCODE form of the password, be sure to handle embedded braces ({}{}) carefully. Do not confuse them with square brackets ([][]).  

METASERVER=name-of-metadata-server  
  specifies the domain name of the metadata server in TCP/IP format. Do not enclose the value for this parameter in quotation marks.

METAUSER=user-ID  
  specifies the user ID to use in accessing the metadata server. Do not enclose the value for this parameter in quotation marks.

TABLE=table-name  
  specifies the table name to load to the SAS LASR Analytic Server.

%RMVATBL Options

METAPORT=metadata-server-port  
  specifies the port to use in accessing the metadata server, in integer format. The default value for this parameter is 8561. Do not enclose the value for this parameter in quotation marks.

METAREPOSITORY=name-of-metadata-repository  
  specifies the name of the repository in which to look for the specified job. The default value for this parameter is Foundation. Do not enclose the value for this parameter in quotation marks.

%RMVATBL Example

The following example registers the LASR table called PCSDSK in the SAS Metadata Repository:

```sas
%RMVATBL(  
FOLDER=folder-path  
,LASRLIBRARY=lasr-library-name  
,METAPASS=user-password  
,METASERVER=name-of-metadata-server  
,METAUSER=user-ID  
,TABLE=table-name  
,<METAPORT=metadata-server-port>  
,<METAREPOSITORY=name-of-metadata-repository>  
);
```
%RMVAUNLD Overview

%RMVAUNLD unloads LASR tables from memory.

Note: This macro cannot be executed on z/OS or H6I (HP-UX on Itanium).

%RMVAUNLD Syntax

%RMVAUNLD(
FOLDER=folder-path
,GRIDHOST=grid-host-server
,GRIDINSTALLLOC=grid-install-location
,LASRLIBRARY=lasr-library-name
,LASRPORT=lasr-port
,LASRTAG=lasr-tag
,METAPASS=user-password
,METAUSER=user-ID
,TABLES=table-name1 <…table-nameN>
,METAPORT=metadata-server-port
,METAREPOSITORY=name-of-metadata-repository
,SIGNER=authorization-web-service-uri
,TYPE=VA-environment-type
);
METAPASS=\texttt{user-password}

specifies the password to use in authenticating the user ID to the metadata server. Do not enclose the value for this parameter in quotation marks.

You can use the PWENCODE form of the password. For more information, see the PWENCODE procedure in the Base SAS Procedures Guide.

\textbf{Tip}\quad If you use the PWENCODE form of the password, be sure to handle embedded braces (\{\}) carefully. Do not confuse them with square brackets (\[\]).

\textbf{METASERVER=\texttt{name-of-metadata-server}}

specifies the domain name of the metadata server in TCP/IP format. Do not enclose the value for this parameter in quotation marks.

\textbf{METAUSER=\texttt{user-ID}}

specifies the user ID to use in accessing the metadata server. Do not enclose the value for this parameter in quotation marks.

\textbf{TABLES=\texttt{table-name1}...\texttt{table-nameN}}

specifies the table names to load to the SAS LASR Analytic Server.

\textit{Note:} One or multiple tables can be unloaded from the SAS LASR Analytic Server.

\textbf{\%RMVAUNLD Options}

\textbf{METAPORT=\texttt{metadata-server-port}}

specifies the port to use in accessing the metadata server, in integer format. The default value for this parameter is \texttt{8561}. Do not enclose the value for this parameter in quotation marks.

\textbf{METAREPOSITORY=\texttt{name-of-metadata-repository}}

specifies the name of the repository in which to look for the specified job. The default value for this parameter is \texttt{Foundation}. Do not enclose the value for this parameter in quotation marks.

\textbf{SIGNER=\texttt{authorization-web-service-uri}}

specifies the URI for the SAS LASR authorization web service.

\textbf{TYPE=\texttt{SMP} | \texttt{MPP}}

specifies the type of SAS Visual Analytics environment. The default value for this parameter is \texttt{SMP}.

\begin{itemize}
\item Specify \texttt{SMP} (that is, Symmetric Multi-Processing) if you are working with a non-distributed SAS Visual Analytics environment.
\item Specify \texttt{MPP} (that is, Massive Multi-Processing) if you are working with a distributed SAS Visual Analytics environment.
\end{itemize}

\textbf{\%RMVAUNLD Example}

The following example unloads the PCSDK and PCSCPU tables from the SAS LASR Analytic Server in a non-distributed SAS Visual Analytics environment:

\begin{verbatim}
\%RMVAUNLD(
    folder=/Shared Metadata/LASR/ITRM,
    gridHost=mygrid.subdomain.domain.com,
    lasrLibrary=Visual Analytic LASR,
    lasrPort=10010,
    lasrTag=ITRM,
    metaPass=mypassword,
    metaServer=mybox.subdomain.domain.com
)
\end{verbatim}
The following example unloads the PCSDSK and PCSCPU tables from the SAS LASR Analytic Server in a distributed SAS Visual Analytics environment:

```sas
%mVAUNLD(
   folder=/Shared Metadata/LASR/ITRM
   ,gridHost=mygrid.subdomain.domain.com
   ,gridInstallLoc=/opt/TKGrid
   ,lasrLibrary=Visual Analytic LASR
   ,lasrPort=10010
   ,lasrTag=ITRM
   ,metaPass=mypassword
   ,metaServer=mybox.subdomain.domain.com
   ,metaUser=myuserid
   ,tables=pcsdsk pcscpu
   ,type=MPP
);
```
Appendix 9
Best Practices and Troubleshooting Tips

How to Back Up SAS IT Resource Management ........................................ 640
  Introduction to the Backup Process .................................................. 640
  Scenario: Recovery of Metadata, Data, and Reports After a Job Fails .... 640
  Backing Up Metadata ......................................................................... 641
  Backing Up Data ................................................................................ 641
  Backing Up Reports .......................................................................... 642
  Backing Up Other Reporting-Related Content .................................. 642

How to Backload Raw Data .................................................................... 643

How to Set the Logging Level for the Web Application Server ............... 646

Debugging Problems in SAS IT Resource Management .......................... 647
  Problems with the SAS IT Resource Management Client .................. 647
  Problems with the SAS Metadata Server ......................................... 648
  Problems with the Object Spawner and Workspace Server ............... 648
  Client Logging Files ......................................................................... 649
  Server Logging Files ......................................................................... 649
  Turning On Standard Execution-time Debugging (ETLS_DEBUG) ....... 649
  Turning On Additional Execution-time Debugging (LOGGERLEVEL) ... 649
  Investigating Problems Using Java from SAS Foundation ............... 650

Use the Apply Button to Update Metadata .............................................. 651

Tips for Working with the IT Data Mart ................................................. 651
  Managing IT Data Marts ................................................................. 651
  Archiving Your Data ....................................................................... 651
  Storing Data Tables on z/OS Systems ............................................. 651
  Deleting IT Data Marts ................................................................... 652

Tips for Working with Aggregations ....................................................... 652

How to Maintain the Latest Raw Value in an Aggregation Table ............. 653
  Scenario: To Keep Only the Data of the Last Day That Was Processed of Each Month ......................................................... 653
  Proposed Outcome of the Technique That Maintains the Latest Data of Each Month ......................................................... 653
  Technique: Using the ID Column to Maintain Data from the Last Day of Every Month ......................................................... 654

Tips for Working with Information Maps ................................................. 655
  Using SAS Information Map Studio .................................................... 655

Tips for Configuring and Administering SAS IT Resource Management .... 656
  Installing and Configuring SAS IT Resource Management ............... 656
How to Back Up SAS IT Resource Management

Introduction to the Backup Process

The backup process takes a snapshot of the current state of the SAS IT Resource Management system. It is essential for record-keeping purposes to take backups before you make major changes to the tables and transformations in your system. Another good practice is to run the backup process nightly either before or after the system is being updated with new data.

Back up your SAS IT Resource Management system consists of backing up four separate areas of content:

- Metadata
- Data
- Reports
- Other report-related content

For best results, establish a formal, regularly scheduled backup process. It is important to back up all the above items at (approximately) the same point in time so that related information is synchronized. This practice is crucial if a restore becomes necessary.

Make sure that a backup process is put into place immediately after SAS IT Resource Management is initially deployed, and that backups are taken before major changes are made to the system. This practice can help the data administrator recover your system in the event of an error.

For information about backing up your system, see SAS Intelligence Platform: System Administration Guide at http://support.sas.com/documentation/index.html. The following scenario describes the case when a recovery from backup is necessary along with details about backing up and recovering each of the four areas of content.

Scenario: Recovery of Metadata, Data, and Reports After a Job Fails

The following scenario illustrates how regularly scheduled backups are used to recover from a change to the system that resulted in a corrupted SAS Metadata server. In the scenario, the corruption is not discovered until the results of the next day's processing of the daily job reveal issues that lead to the identification of the metadata server corruption.

- Day 1
  - At 2:00 a.m., the daily job is started.
  - At 4:00 a.m. (or as soon as the daily job finishes), the backup job runs, creating generation N of the metadata, data, reports, and report-related content.
  - Later in day 1, the metadata server is corrupted. The problem is not discovered at this time.
Day 2
  • At 2:00 a.m., the daily job is started.
  • At 4:00 a.m. (or as soon as the daily job finishes), the backup job runs, creating generation \(N + 1\) of the metadata, data, and reports.
  • Later in day 2, the error in the metadata server is discovered.
  • The system administrator can restore the metadata, data, and reports from the backup that was made on day 1 (generation \(N\)), and rerun the Day 2 daily job.

**Backing Up Metadata**

Metadata for SAS IT Resource Management is stored in the SAS Metadata Server. Here is a partial list of some operations that result in metadata being updated:

- An IT data mart is created or modified.
- The Adapter Setup wizard is executed.
- Staged tables or aggregations tables are created or modified.
- Jobs are created or modified.
- Reports are published with the ITRM Report Definition task in SAS Enterprise Guide.
- Information maps are created or modified.

The data administrator should back up the metadata either before or after these or similar activities.

*Note:* Metadata is not updated during the execution of the daily ETL or report jobs.

The SAS 9.4 Metadata Server includes a server-based facility that performs metadata server backups automatically on a scheduled basis. This facility can also be used to perform ad hoc backups and roll-forward recovery. (Roll forward recovery is the process of using a journal or log file of transactions that can be executed to recover a system.) For complete instructions for backing up the SAS Metadata Server, see Part 4, “Backing Up and Restoring Your SAS Content,” in the *SAS Intelligence Platform: System Administration Guide*. This documentation is located at [http://support.sas.com/documentation/index.html](http://support.sas.com/documentation/index.html).

**Tip**: If you stop the SAS Metadata Server to do a backup, any servers in your system that access the Metadata Server might be adversely affected.

*Note:* The server-based metadata backup facility replaces the %OMABAKUP macro, which was available in SAS 9.1 and 9.2. It also replaces the Backup and Restore Wizard in SAS Management Console, which was available in SAS 9.2.

**Backing Up Data**

SAS IT Resource Management stores data in files that reside in the customer’s physical file system. These files are pointed to by metadata objects in the IT data mart. Typically, all physical files for a single IT data mart reside underneath the root path of an IT data mart. To copy all of the files and subdirectories beneath this root path to a backup location, you can use these procedures, command, and tools:

- Base SAS DATASETS or COPY procedures
- operating systems commands
• third-party tools

Note: This backup procedure should be done for all IT data marts.

For best results, you should back up the entire contents of the IT data mart, instead of selecting specific files or directories. In other words, make sure that your backup procedure includes the aggregation tables, staged tables, and the Admin and spin libraries.

**Backing Up Reports**

SAS IT Resource Management uses SAS Content Server, a WebDAV server, to store report output. Report output is created by the report jobs and is displayed in ITRM Report Center. In addition, other SAS products that are included with SAS IT Resource Management, such as SAS Web Report Studio and SAS Information Delivery Portal, use SAS Content Server for storage of their reports and supporting files.

To back up SAS Content Server, perform the following steps:

1. Stop either the web application server or the SAS Content Server application.
   - Stop the SAS Web Application Server.
   
   Note: If you stop the SAS Content Server to do a backup, any servers in your system that access the SAS Content Server might be adversely affected.

2. Use operating systems commands or third-party tools to copy all the files and subdirectories from the middle-tier platform to a backup location.
   - If your middle-tier platform is on Windows, back up the files and subdirectories that are in this location:
     `<SAS-configuration-directory>\Lev1\AppData\SASContentServer\Repository`.
   - If your middle-tier platform is on UNIX, back up the files and subdirectories that are in this location:
     `<SAS-configuration-directory>/Lev1/AppData/SASContentServer/Repository`.

3. Start your web application server or SAS Content Server application.

**Backing Up Other Reporting-Related Content**

Updates can be made to copies of SAS Enterprise Guide projects that are used for reporting in SAS IT Resource Management. If that situation occurs, then those user-owned copied projects should be backed up by using operating system commands or third-party tools. If you installed the supplied SAS Enterprise Guide projects, they can be accessed by navigating to the location where you installed SAS IT Resource Management. The projects are located at `SASITResourceManagementSASEnterpriseGuideComponents\3.8`. For example, the projects might be located at `C:\Program Files\SASHome\SASITResourceManagementSASEnterpriseGuideComponents\3.8`.

Note: Making changes to supplied SAS Enterprise Guide projects is strongly discouraged. If you must change a project, copy the project and make your changes to that copied version of the project. For more information, see Appendix 4, “Best Practices” in the *SAS IT Resource Management 3.8: Reporting Guide*.

ITRM Report Center users can create galleries and gallery folders. You might want to back up those items so that they do not have to be manually re-created in the unlikely event of a system failure. If so, you should use operating systems commands or third-party tools to copy all of the files on the middle-tier platform:
• If your middle-tier platform is on Windows, back up the files that are in this location: 
  <SAS-configuration-directory>\Lev1\AppData\ITRMReportCenter.

• If your middle-tier platform is on UNIX, back up the files that are in this location: 
  <SAS-configuration-directory>/Lev1/AppData/ITRMReportCenter.

How to Backload Raw Data

You might want to process one or more sets of raw data into the SAS IT Resource Management system. Circumstances that might create the need to backload raw data range from populating an IT data mart with historical data to populating staged tables that were added to an adapter with the Add Domain Category wizard. When backloading raw data, you might want to include it in the aggregation tables and the reports that are created. The following diagram shows how you can accomplish this.
Is duplicate checking enabled in the staging transformation?

- **Yes**
  - Run the staging transformation.
  - Run the Aggregation transformation to add new data.
  - [Optional] Run the Information Map and Reporting transformations (if applicable).

- **No**
  - Get raw data to be staged.

Has all the raw data been staged and aggregated?

- **Yes**
  - Run the Information Map and Reporting transformations.

- **No**
  - Note the current Duplicate Checking option and temporarily set this option to FORCE.

Was the Duplicate Checking option temporarily set to FORCE?

- **Yes**
  - Reset the Duplicate Checking option to former setting.

- **No**
  - End the Backloading Process.
To backload data into your IT data mart, perform the following steps.

1. Run the staging job with a set of the raw data.

   If duplicate-data checking is enabled for this staging transformation, make sure that the data that you are trying to stage is not deleted because it appears to be duplicate data. To accomplish this, do the following:

   a. Right-click the staging transformation that processes the new domain category and select Properties.

   b. On the Properties dialog box, select the Staging Parameters tab.

   c. On the Duplicate Checking page, ensure that the Enable duplicate checking field is set to Yes. This setting enables you to specify the parameters that govern the duplicate-data checking process.

   d. Note the current setting of the Duplicate checking option. You will need to reset this option to its original value after you have completed the backloading tasks.

   Change the value of the Duplicate checking option to FORCE. This setting means that the transformation continues processing and accepts duplicate data if it is encountered.

   **Figure A9.2** Duplicate Checking Options with FORCE Specified

   e. Click OK to return to the process flow diagram.

2. Add the data to the IT data mart. To do so, perform these steps until all the sets of new data have been processed.

   a. Run the staging job with a set of the raw data that you are backloading into your IT data mart.

   b. Using the output of the staging transformation as the source table, run the corresponding Aggregation transformation.
c. [Optional] Run the corresponding Information Map and Performance Report transformations, if they exist. Review the reports to make sure they are what you want. (These transformations can be run for each set of raw data that is processed, or once for all the data that has been processed.)

3. After you have staged and aggregated all the data that you are backloading into your IT data mart, run the Information Map and Performance Report transformations.

   Note: The new data that was processed might have caused changes to the structure of the aggregation tables and the information maps for those tables. Running the Information Map transformation at this time ensures that any changes to the data structure are incorporated into the information map that is used for reporting.

4. If you changed the setting of your **Duplicate checking option** in Step 1, be sure to restore the setting to its original value after you finish the backloading tasks.

   Note: Duplicate-data checking macros are designed to prevent the same data from being processed into the IT data mart more than once. For information about the duplicate-data checking, see “Duplicate-Data Checking Overview” on page 537 in the Duplicate-Data Checking Appendix.

---

### How to Set the Logging Level for the Web Application Server

Most logging information is kept in application-specific log files. The log file for ITRM Report Center is located here:

**Windows Specifics**

```
<SAS-configuration-directory>\%Lev1%\Web\Logs\SASServer10_1\ITRMReportCenter<version-number>.log
```

**UNIX Specifics**

```
<SAS-configuration-directory>/Lev1/Web/Logs/SASServer10_1/ITRMReportCenter<version-number>.log
```

For ITRM Report Center, application logging is set to WARN by default. The logging level is set in the ITRMReportCenter-log4j.xml file that is located here:

C:\SAS\ITRMConfig\Lev1\Web\Common\LogConfig.

**Windows Specifics**

```
<SAS-configuration-directory>\%Lev1%\Web\Common\LogConfig
```

**UNIX Specifics**

```
<SAS-configuration-directory>/Lev1/Web/Common/LogConfig
```

The highlighted section of the following code shows where the logging level is set:

```xml
<category
   additivity="false"
   name="com.sas">
  <priority value="WARN"/>
  <appender-ref ref="SAS_CONSOLE"/>
</category
<category
   additivity="false"
   name="com.sas.solutions.itms">
```
Options for the logging level are DEBUG, INFO, WARN, and ERROR. Each logging level provides messaging according to the following table. To update the logging level, perform the following steps:

1. Update the highlighted line in the preceding code by changing \texttt{Warn} to one of the levels shown in the following table:

   \begin{table}[h]
   \centering
   \caption{Table of Logging Levels}
   \begin{tabular}{|ll|}
   \hline
   Logging Level & What Messages Are Logged \\
   \hline
   DEBUG & All messages \\
   INFO & All INFO, WARN, and ERROR messages \\
   WARN & All WARN and ERROR messages \\
   ERROR & All ERROR messages \\
   \hline
   \end{tabular}
   \end{table}

2. Save the file with your changes.
3. Restart SASServer10_1.

---

\textbf{Debugging Problems in SAS IT Resource Management}

If you are experiencing problems with SAS IT Resource Management, make sure that you have the most current hot fix for SAS IT Resource Management and for other products included in the software bundle. Hot fixes can be found at \url{http://support.sas.com} under the \texttt{Downloads and Hot Fixes} section. The correct third-party software support levels can be found at \texttt{Third-Party Software Reference}.

\textit{Problems with the SAS IT Resource Management Client}

If the SAS IT Resource Management client does not start, there might be a problem with the Java Virtual Machine (JVM) that is being used, or with the settings in the sasitrm.ini initialization file.

- The JVM is specified in the sassw.config file. (By default, this file is located in \texttt{C:/Program Files/SASHome/sassw.config}). Make sure that it satisfies the criteria that are listed under the \texttt{Third-Party Software Reference}. In addition, make sure that this JVM is correctly installed at the specified location.

- If you made any post-installation changes to the sasitrm.ini initialization file, verify that the changes were correctly made. Typographical errors can prevent the client from initializing properly.
If the client fails to connect to the metadata server that is specified in the login profile, verify the following items:

• The metadata server is started and operational.
• The metadata server is at an appropriate software version level for the client that you are using.
• The metadata server machine itself is accessible from the client on the network.
• The user ID and password are correct and the user can be properly authenticated on that server.

Some client operations create log files on the client machine, based on the Windows APPDATA environment variable. To see the current setting of the APPDATA environment variable, issue the following command in a DOS command prompt window:

```
SET APPDATA
```

The SAS IT Resource Management client creates logs during the execution of these tasks of the Adapter Setup and Add Domain Category wizards:

• adding new aggregation tables
• maintaining staged tables
• creating an IT data mart

These logs can be found in `%APPDATA%\SASITResourceManagement\version`. (For example, the logs for SAS IT Resource Management 3.8 can be found at `%APPDATA%\SASITResourceManagement\3.8`.)

### Problems with the SAS Metadata Server

The metadata server log can be used to diagnose failures that are related to metadata, including failure to connect to the metadata server. This log is available in the SAS configuration directories, under the `MetadataServer` subdirectory, in a `Logs` folder. By default, the logs are time-stamped. An examination of the relevant log can show problems in authenticating users, problems in the metadata server configuration, and other issues.

The logging level for the metadata server can be changed to increase the level of detail. For information about changing the logging level and many other useful topics, see the [SAS 9.4 Intelligence Platform: System Administration Guide](#).

For information about security and authentication, see the [SAS 9.4 Intelligence Platform: Security Administration Guide](#).

### Problems with the Object Spawner and Workspace Server

In some situations, the SAS IT Resource Management client can successfully connect to the appropriate metadata server but the user cannot start a workspace server session. If that is the problem, verify that the object spawner is correctly started on the appropriate server machine.

Also verify that the user is correctly authorized to create workspace server sessions.

By default, the object spawner performs only limited logging. However, the level of logging detail can be increased for both the object spawner and, specifically, the workspace server. All servers, such as the SAS Metadata Server, the object spawner, and the application and workspace servers, can be configured to have logs. These logs can be
useful in diagnosing problems. For information about configuring logging for these servers, see “Administering Logging for SAS Servers” in the *SAS 9.4 Intelligence Platform: System Administration Guide*.

For information about configuring servers, including setting up users and groups, see the *SAS 9.4 Intelligence Platform: Installation and Configuration Guide*. This document also includes a troubleshooting appendix.

**Client Logging Files**

The SAS IT Resource Management client automatically keeps log files for certain operations such as the following:

- creating an IT data mart
- running the Adapter Setup wizard
- adding staged tables

These log files can be useful to you or to Technical Support personnel, when investigating a problem.

On the client, these log files are located in a directory that is determined based on the APPDATA environment variable.

On Windows 7, this location is typically `C: \Users\userid\AppData\Roaming\SASHome\SASITResourceManagement\3.8`.

**Server Logging Files**

All servers, such as the SAS Metadata Server, the object spawner, and the application and workspace servers, can be configured to have logs. These logs can be useful in diagnosing problems. For information about configuring logging for these servers, see “Administering Logging for SAS Servers” in the *SAS Intelligence Platform: System Administration Guide*.

**Turning On Standard Execution-time Debugging (ETLS_DEBUG)**

You might want to turn on execution-time debugging in the generated code for SAS Data Integration Studio and SAS IT Resource Management transformations. To do so, add the following line to the generated code, before the transformation for which you would like additional debugging information: `%LET ETLS_DEBUG=1;`

**Turning On Additional Execution-time Debugging (LOGGERLEVEL)**

You might want to turn on additional execution-time debugging information in the generated code for SAS IT Resource Management transformations. To do so, add or edit the following line to the generated code before the transformation for which you would like additional debugging information: `%LET LOGGERLEVEL=[level];`

This is the standard way of turning on debugging transformations in SAS IT Resource Management. (For SAS IT Resource Management 2.7 users, the `LOGGERLEVEL` flag replaces the `CPDEBUG` macro flag).

Legal values for `[level]` include: FATAL, ERROR, WARN, INFO, DEBUG, or TRACE. Users who want additional debugging information should set the level to DEBUG:

```
%LET LOGGERLEVEL=DEBUG;
```
Investigating Problems Using Java from SAS Foundation

Some features use Java from SAS Foundation. These features include PROC INFOMAPS, the Information Map LIBNAME engine, and the migration of SAS IT Resource Management 2.7 PDBs to IT data marts supported in SAS IT Resource Management 3.3 and later. For problems in running Java from SAS, use the following techniques to investigate whether SAS is configured correctly to use Java:

• Verify that the Java JVM can be started, and that it is the correct version of the JVM. To do so, submit this SAS statement:

  proc javainfo all; run;

  The results of this code will include JVM details and properties. This statement can be added to the SAS code of a deployed job, or submitted directly from the Tools Source Editor menu item in SAS Data Integration Studio.

• Check the JREOPTIONS settings to make sure that the Java options are correct, particularly in these elements:

  • Memory options such as -Xmx are specified according to the installation and configuration documents.

  • To see the current JREOPTIONS, submit this SAS statement:

    proc options option=jreoptions; run;

    This statement can be added to the SAS code of a deployed job, or submitted directly from the Tools Source Editor menu item in SAS Data Integration Studio.

Note: When running jobs in SAS Foundation, make sure that SAS is invoked using the appropriate configuration files because these files have been written specifically for use by SAS IT Resource Management.

Troubleshooting Error Messages in the SAS Log

Error message appears in the SAS log: “ERROR: Failed to insert filter” or “ERROR: Failed to insert data source.”

Make sure that the user who is running the job has the proper authorizations. To do so, open the SAS Management Console and perform the following steps:

1. Set the repository to the foundation repository.

   Note: The selected repository must be the repository that is the required metadata store for a SAS Metadata Server. Each metadata server has one foundation repository. As a default, the name of the foundation repository is Foundation. (If you performed a custom installation, then you might have assigned a different name.)

2. In the User Manager component, select the user profile of the person who is running the job.

3. On the Logins tab, locate the entry for the authentication domain of the workspace server that was in use at the time of the error. (Each workspace server has an authentication domain.) The user ID and the password should be specified. The password cannot be left blank.
Use the Apply Button to Update Metadata

On any Properties dialog box, after you make a change to a field, use the Tab key to move out of that field. Then click Apply to make sure your changes are reflected in the metadata.

Tips for Working with the IT Data Mart

Managing IT Data Marts

Here are some tips that can help you manage IT data marts effectively:

- Do not create IT data marts with duplicate names. This practice offers clarity and improves your ease of use. In addition, if IT data marts do not have unique names, generated information maps might not be placed in the correct job.
- Store all data and information maps in the IT data mart.
- You can create IT data marts in different folders. The choice of a parent folder should reflect your intended use. For example, if you intend to share access to a new IT data mart, the /Shared Data/SAS IT Resource Management/IT Data Marts location is a logical place to create it. The /Products and /System folders are intended for product configuration files. Users are not typically permitted to write to these folders. Therefore, do not create IT data marts in those folders.
- The organization of your site's data into IT data marts depends on your site's needs. Typically, IT data marts are established for each adapter. However, you do not have to put data from multiple adapters into the same IT data mart, and you are not prevented from doing so. If you decide to use multiple IT data marts, you can still combine data from the various IT data marts using information maps or other similar techniques.

Archiving Your Data

SAS IT Resource Management does not provide an automated archiving feature. However, archiving is easy to accomplish. If you want to archive your staged data, in the staging job add another transformation that copies the staged table to a secure location. To do so, you can use the Extract or User-Written Code transformations that are provided by SAS Data Integration Studio in the Data section of the Transformations tree. (For information about these transformations, see “Working with Extract Transformations” and “Working with User-Written Code” in the Help for SAS Data Integration Studio.)

Storing Data Tables on z/OS Systems

For best results, store data tables in the zFS file system instead of the traditional z/OS file system.

Note: The documentation for SAS on z/OS has traditionally used the terms UNIX System Services (USS) and hierarchical file system (HFS) to refer to the UNIX file
system on z/OS. The SAS 9.4 documentation uses the terms UNIX file system and zFS to refer to this file system. zFS provides a hierarchical storage system (like UNIX or Windows) with outstanding performance. Using zFS for storing data tables can simplify the management of these tables and offer performance benefits over the traditional z/OS file system.

Deleting IT Data Marts

Here are some tips that can help you delete IT data marts effectively:

- Deleting an IT data mart might take a long time, depending on the contents of that IT data mart.
- When the IT data mart was created, the physical location for the Admin library was created. As certain wizards are executed, such as the Adapter Setup wizard, other physical locations are created. These physical locations each contain a `readme.txt` file that carries information about the IT data mart to which the library belongs. When that IT data mart is deleted, the physical tables that belong to that IT data mart are deleted. However, the directory structure is not deleted, and the `readme.txt` files remain for identification purposes. The physical directories that belonged to a deleted IT data mart are empty and can be removed from the location where they were specified using operating system commands.

Tips for Working with Aggregations

Here are some tips that can help you specify ID columns effectively in aggregations:

- ID column suggestions

  A useful technique for specifying ID columns is to choose columns that are based on or determined by the value of a column that is already in the class list. An example of this is to choose columns that are based on the `DATE` or `DATETIME` fields. These columns are less granular than the aging column.

  For example, consider the case where you have an aggregation that is aged according to the DAYDATE column, which records daily date values. The columns WEEKDATE and MONTHDATE are excellent candidates for use as ID columns because they are (essentially) determined by the value of DAYDATE. Thus, when creating reports, you can easily determine the days that belong with a particular week.

  The same is true for other types of date or datetime-based columns that the user might create, such as a column that represents the calendar quarter or accounting period.

- ranking of DATE/DATETIME-based class or ID columns

  This tip is a corollary to choosing ID columns based on date, or datetime values. If you have such columns in the class or ID list, then request a descending rank on the column. This action simplifies the report task of reporting on the "last N time periods" (such as the past three weeks). For example, suppose WEEKDATE is an ID column in an aggregation that has DAYDATE in the class list. In that case, a descending rank on WEEKDATE facilitates reporting on the past three weeks of daily values. The report simply needs to filter where `WeekDateRankDescending >= 3`. (All the supplied aggregations and information maps use this feature.)
How to Maintain the Latest Raw Value in an Aggregation Table

Scenario: To Keep Only the Data of the Last Day That Was Processed of Each Month

SAS IT Resource Management provides a technique that enables you to generate an aggregation table that contains the data from the last day of every month. This functionality is best used under the following conditions:

- You have data that is relatively stable (for example, configuration type data).
- You want to create a data source that can be used to compare the value of that data to what has been historically typical for that measurement.

The following example shows how to generate an aggregation table that captures these values from the last day of each month:

- the value of the day, from the column called DAYDATE
- the value of the amount of allocated storage, from the column called DCVALLO

To accomplish this task, start with an aggregation table that contains mainframe storage data that was captured by the DCOLLECT adapter.

Table A9.2  Daily Aggregation Table That Contains All of the Data That Has Been Processed

<table>
<thead>
<tr>
<th>DAYDATE</th>
<th>TotalMegabytesUsedByAllSystems (from DCVALLO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01MAY2011</td>
<td>20000M</td>
</tr>
<tr>
<td>02MAY2011</td>
<td>21000M</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>31MAY2011</td>
<td>29000M</td>
</tr>
<tr>
<td>01JUN2011</td>
<td>30000M</td>
</tr>
<tr>
<td>20JUN2011</td>
<td>31000M</td>
</tr>
<tr>
<td>21JUN2011</td>
<td>32000M</td>
</tr>
</tbody>
</table>

Proposed Outcome of the Technique That Maintains the Latest Data of Each Month

The desired result is an aggregation table that contains for each month the information that was processed from the last day of that month. The following display shows what that aggregation table should contain:
Table A9.3  New Aggregation Table That Contains Data from the Last Day of Each Month That Was Processed

<table>
<thead>
<tr>
<th>DAYDATE</th>
<th>TotalMegabytesUsedByAllSystems</th>
</tr>
</thead>
<tbody>
<tr>
<td>31MAY2011</td>
<td>29000M</td>
</tr>
<tr>
<td>21JUN2011</td>
<td>32000M</td>
</tr>
</tbody>
</table>

As each day’s data is read into the aggregation, the value of DAYDATE in each class combination should show the latest date. Similarly, TotalMegabytesUsedByAllSystems (a label that is used for the DCOLLECT DCVALLO measurement of allocated space) should show the latest value of allocated space in the class combination.

Note: After reading in the data from the next day (June 22, 2011), the new aggregation table should contain DAYDATE and DCVALLO values for these two dates:

- 31MAY2011
- 22JUN2011

**Technique: Using the ID Column to Maintain Data from the Last Day of Every Month**

An ID column is populated with the last value that is introduced to a class combination. Most commonly, this is used to populate something that is determined by the class list (for example, VOLSER).

A common usage pattern is to have an aging column (such as DAYDATE) in the class list and a value such as MONTHDATE as an ID column. (MONTHDATE can be determined from DAYDATE.)

To accomplish the goal of generating an aggregation table that contains only the data from the last day that was processed in every month, perform the following steps:

1. Use the Aggregation wizard to specify an aggregation table that reads a source table that can supply the values that you want to work with.
   
   Note: In the scenario described previously, the source for the TotalMegabytesUsedByAllSystems values is the column called DCVALLO, which is in the XDCVOLS table of the IBM DCOLLECT adapter.

2. Specify MONTHDATE as the aging column of the new aggregation table.

3. Specify DAYDATE as an ID column of the new aggregation table.

4. Specify the column that contains the values that you want to work with as an ID column of the new aggregation table. In this scenario, the column DCVALLO would be specified as an ID column.

5. Complete the specification of the new aggregation table.

6. Save and then run the job that generates the table.
The following display shows the page of the Aggregation wizard that accomplishes the goals of this scenario:

Figure A9.3 Specify Class and ID Variables Page of the Aggregation Wizard

Tips for Working with Information Maps

Using SAS Information Map Studio

You can use SAS Information Map Studio to test existing information maps and to create more complex information maps that join tables, establish pre-filters, and change aggregation statistics. If you do modify an existing information map with SAS Information Map Studio, save the new map under a different name.

Troubleshooting Problems with Information Maps

You receive the following error message "ERROR: Failed to insert filter filter name."

This error message appears in the SAS log if the user does not have the following privileges: Read Metadata, Write Metadata, Read, and Delete. This error message might also appear if the user's password is not registered in SAS Management Console. To register this password, perform the following steps:

2. Select the foundation repository.

Note: The selected repository must be the repository that is the required metadata store for a SAS Metadata Server. Each metadata server has one foundation.
repository. As a default, the name of the foundation repository is **Foundation**.
(If you performed a custom installation, then you might have assigned a different name.)

3. Select **User Manager** to display the list of user names that can be accessed on this repository.

4. From the list of names, select the user whose password you want to register.

5. Double-click to open the Properties dialog box for that user.

6. Click **Modify** to open the Edit Login Properties dialog box.

7. Select the **Logins** tab.

8. Enter the password of the user in the **Password** and **Confirm Password** fields.

9. Click **OK**.

10. Click **OK** to return to the list of user names that are displayed by the **User Manager**.


---

**Tips for Configuring and Administering SAS IT Resource Management**

**Installing and Configuring SAS IT Resource Management**

Here are some tips that can help you configure and administer SAS IT Resource Management effectively:

- Customizations have been made to the application server configuration (sasv9.cfg) and autoexec (appserver_autoexec.sas) files for SAS IT Resource Management. If you need to make additional customizations for site-specific reasons, you should instead modify sasv9_usermods.cfg or appserver_autoexec_usermods.sas.

- The metadata repository for SAS IT Resource Management can become very large, and the SAS Metadata Server also requires substantial memory. Install the physical repository on the fastest media available. Allocate the SAS Metadata Server as much memory as possible.

- Starting and stopping the servers can require several minutes.

- Occasionally, when starting the Object Spawner immediately after starting the SAS Metadata Server, the Object Spawner will fail because it is attempting to contact the SAS Metadata Server. To avoid this situation when automating start-up and shutdown procedures, put sleep or delaying steps into the scripts. This action allows the SAS Metadata Server to fully initialize before the Object Spawner attempts to contact it.
Handling Holidays

Overview of Handling Holidays

SAS IT Resource Management does not implement any specific holiday support. However, you can use the features of SAS IT Resource Management to prevent data that was generated on a holiday from being processed into an aggregation table. To accomplish this goal, perform the following steps.

1. If your site’s holidays can be specified as individual dates, define a SAS format to identify them. To do this, create a format that defines whether a given date is a holiday. For best results, create this format in the Admin library of the IT data mart. (This library is included in the SAS format search concatenation.)

You might want to specify holidays by using different date or datetime measurements (such as 8 AM on a given date). To do so, keep the entire holiday list in the source code of a formula. (This method is explained in the next step.)

Note: It is preferable to use formats to define holidays because formats can be easily revised to reflect changes to the list of holidays. In addition, you do not need to redeploy any jobs. If you use formulas to define your list of holidays, any changes to that list require that jobs be redeployed.

2. Define a formula in the SAS IT Resource Management client that identifies holidays. This formula will be used to create a computed column in the staged table.

To create a formula, select File ⇒ IT Resource Management ⇒ Formula. The New Formula wizard opens. On the General Information page of the wizard, specify a name for the formula. On the Expression page, enter the code to assign the Y or N value to the computed column. If you created a format in the previous step, use it in this formula.

In some cases, the holiday rule is not a simple assignment statement, based on a format. The rule that identifies whether data is generated on a holiday might require a more complex expression.

Note: If an expression is revised in order to accommodate a change in the list of holidays for a site, you must redeploy the jobs that use that formula. For information, see “About Formulas” on page 99.

3. Specify a distinct value for SHIFT if the data is for a holiday. To do this, you must modify the SHIFT formula to include the code to handle the holiday.

Note: Formulas cannot use other formulas because the order of computation is not guaranteed.

For information about the effects of changing a formula expression, see “Consequences of Changing a Formula” on page 105.

Note: To propagate any change to formulas used in existing jobs, you must redeploy those jobs.

4. To define a computed column in your staged table, you can use the holiday formula. You can also use the SHIFT formula for this purpose. This computed column specifies whether the data in this row of the table was generated on a holiday. For information about adding a computed column to a staged table, see “Modify a Staged Table” on page 130.
5. Define an input filter that prevents holiday data from being processed into the aggregation tables. You can define filters for the aggregation table in the Aggregation transformation that generates the table. To do so, perform the following steps:

a. Double-click the job that contains the Aggregation transformation. The job opens in the Diagram tab of the Job Editor window

b. Right-click the Aggregation transformation. From the Properties dialog box, select the ITRM Options tab. On this tab, you can define a filter by clicking New. In the List of Filters box, you can add a filter that can be used for this Aggregation transformation.

Figure A9.4  ITRM Options Tab

Note: Set the filter so that data that satisfies its conditions is the only data that is processed.

After you specify the holiday filter, click OK and save the job.

6. After the filter is added to the Aggregation transformation, you can use it with one or more aggregation tables that are generated by this transformation. To apply a filter to an aggregation table, do one of the following two steps.

• For a new aggregation table that you want to create, right-click the Aggregation transformation and select Add Aggregation Table from the Properties dialog box. Select the type of table that you want to create (summarized or simple.) Respond to the prompts of the wizard that opens. On the second page of the wizard, you can select the holiday filter that you want to use. When you have completed entering the information for the table, click Finish and save the job.

• For an existing aggregation table, right-click the table and select Edit Summarized Aggregation Table or Edit Simple Aggregation Table from the Properties dialog box. Then navigate to the Apply Filter page of the wizard and select the holiday filter that you want to use. When you have completed editing the table, click Finish and save the job.

Note: Implementing a filter does not change existing data in a table.

Note: Newly created jobs or jobs that have been changed must be saved and redeployed. For information about redeploying jobs, see “Redeploy All Jobs on the Server” on page 384.
Example of Handling Holidays

Overview of the Example
In this example, a format is specified defining Christmas Day as a specific holiday. The formula that is created uses the holiday format to specify a Holiday column. The Holiday column is added to a staged table as a computed column. This computed column contains a 'Y' for every row of data whose date column corresponds to the definition of the holiday.

After the staged table is populated with the computed Holiday column, a filter is created in the Aggregation transformation. The filter prevents holiday data from being processed into the aggregation table. This filter can be implemented for any aggregation table that is created or updated by that Aggregation transformation.

Creating the Format
The following code creates a SAS format that specifies the Christmas holiday for 2010 and 2011. The resulting value of holiday is a single-character of ‘Y’ or ‘N’ that indicates whether the date of the data is a holiday.

```sas
libname ADMIN BASE "c:\datamarts\smfasw\admin";
proc format library=admin;
 value holiday (default=1 min=1 max=1)
 '25Dec2010'd = 'Y'
 '25Dec2011'd = 'Y'
 other = 'N';
run;
```

Creating the Formula
The following formula uses the value of the `holiday` format to define the Holiday column:

```
Holiday = PUT(DAYDATE,holiday.);
```

Note: Add the Holiday column to the staged table as a computed column. This column can be used as a filter to exclude from the Aggregation transformation all data that was generated on a holiday. The filter ensures that only data that is not a holiday is processed.

(Optional) Including the Holiday Specification in the SHIFT Formula
Suppose your SHIFT formula currently has the following expression:

```
if weekday(datepart(datetime)) in (1,7) then shift = '3';
else if timepart(datetime) < '08:00:00't or
timepart(datetime) >= '17:00:00't
    then shift = '2';
else shift = '1';
```

In order to accommodate the holiday specification, change this expression as follows:

```
if put(DAYDATE,holiday.) eq 'Y' then shift = '0';
else if weekday(datepart(datetime)) in (1,7) then shift = '3';
```

else if timepart(datetime) lt '08:00:00't or
    timepart(datetime) ge '17:00:00't
    then shift = '2';
else shift = '1';

**Define an Input Filter for Holiday Data in an Aggregation Transformation**

Open the job that contains the appropriate Aggregation transformation. Right-click the transformation. On the Properties dialog box of the Aggregation transformation, select the **ITRM Options** tab. Click **New** to define the following filter. In the following display, the Holiday filter has this expression:

```
Holiday eq 'N'
```

**Figure A9.5  ITRM Options Tab**

Click **OK**.

**Use the Holiday Filter with One or More Aggregation Tables**

The Aggregation wizards enable you to specify the Holiday filter for your aggregation table. The following display shows the page of the Aggregation wizards where you can select the filter.

*Note:* The filter is an inclusive filter. Data that satisfies the conditions of the filter is processed into the aggregation table.
After you select the input filter, save the job and redeploy it for execution.

Note: The input filter does not affect data that is already in the aggregation table. However, it filters any new incoming data to the aggregation table.

Performance Issues

Improving Memory Performance

Out-of-memory issues can cause ETL jobs to fail.

To resolve out-of-memory issues on UNIX platforms, set the following SAS options as shown:

- `MEMSIZE=512M`
- `SORTSIZE=256M`
- `BUFSIZE=48K`
- `BUFNO=1500`

To resolve out-of-memory issues on z/OS platforms, set the following SAS options as shown:

- `SORTSIZE=256M`
- `BUFSIZE=48K`
• BUFNO=1500

Note: In addition, using SAS IT Resource Management software on z/OS requires that batch jobs have a REGION of at least 1024M. A parallel ASSIZEMAX of 1024M is also required.

To resolve out-of-memory issues on Windows (64-bit) platforms, set the following SAS options as shown:

• MEMSIZE=2G
• SORTSIZE=256M

Tip: SAS options can be set at configuration time, invocation time, or run time.

If you use the Adapter Setup wizard and specify multiple domains, you might experience job failure due to an out of memory condition. (This situation can occur if you simultaneously specify a full configuration level or multiple time periods.) To correct this problem, split the jobs into smaller pieces by running the Adapter Setup wizard several times with fewer domain categories (for example, only three domains).

Note: If you continue to experience out-of-memory issues, you might need to further increase the value of the MEMSIZE option. For information about metadata memory issues, see “Metadata Server Memory Management” on page 28.

Limiting the Processing of SMF Records by System

An aggregation filter can be used to limit the SMF records that are processed into an aggregation table to specific systems. However, the staging code must process the data that is not aggregated. In addition, the filter must be set on each SMF aggregation. It is more efficient to filter data during the staging job processing.

To limit the SMF records to process only specific systems during a staging job process, add an IF statement in the IMACFILE MXG SOURCLIB member. For example, if you want to process only those records from the 'PROD' and 'TEST' systems, place a copy of the IMACFILE MXG SOURCLIB member into your MXGUSER source library.

Modify the user IMACFILE MXGUSER member with the following SAS statement:

IF SYSTEM IN ('PROD','TEST');   /*Only process records for these systems */

where the systems for which you want to process SMF records are listed in the IN clause. For additional examples or information about coding the IF statement, please refer to the documentation found in the IMACFILE MXG SOURCLIB member.

Note: Make sure you have a working backup copy of your SAS IT Resource Management installation files and IT data marts before you make any changes.

Staging Jobs Fail Due to Lack of Space

Staging job fails due to lack of space on the WORK library on Windows.

The location of the Work library defaults to the user's C: drive. The space on this drive might not be adequate for running a staging job. To resolve this issue, edit the sas.cfg file to point WORK to a location that has more space.

Aggregation Jobs Require Lengthy Processing Times

Some aggregation jobs that contain rank variables or join columns can require a long time to finish.

For best results, minimize the number of rank variables or join columns that you specify in a summarized aggregation table.
Information Map Jobs Require Lengthy Execution Times

Executing a job that contains multiple information maps can take a long time. Information maps facilitate the process of generating reports on your IT data and are the required input to SAS Web Report Studio. Jobs that generate many information maps can take a long time to execute. Although SAS Enterprise Guide can generate reports from tables or information maps, using information maps is preferred.

The Adapter Setup wizard creates separate jobs for Information Map transformations. You do not need to schedule these Information Map jobs to run nightly. These Information Map jobs need to be run initially only once—after the underlying tables are written. The jobs should also be run again later if something changes about the structure of the tables for which information maps are to be created. For example, changing the class columns or statistics in an Aggregation transformation changes the resulting aggregation table. In that situation, the corresponding Information Map must be re-created as well.

If you are sure that you will never use specific information maps, remove the unneeded Information Map transformation from the process flow diagram before you deploy the job.
Appendix 10
Method for Overriding Locations at Execution Time

Overriding Locations at Execution Time

About Overriding Transformations .............................. 666
Processing Large Files of Data .................................. 666

Processing Multiple Files of Data ............................... 667
Overview of Handling Large Files of Data .................... 667
Details for Amazon CloudWatch ................................. 669
Details for ASG TMON2CIC ...................................... 669
Details for ASG TMONDB2 ........................................ 669
Details for ASG TMONDB2 V5 .................................... 669
Details for BMC Mainview IMS ................................... 670
Details for BMC Perf Mgr .......................................... 670
Details for CA TMS .................................................. 670
Details for Comma Separated Values (CSV) .................. 671
Details for DT Perf Sentry ........................................ 671
Details for DT Perf Sentry with MXG ......................... 671
Details for Ganglia .................................................. 671
Details for HP Perf Agent ......................................... 672
Details for HP Reporter ............................................ 672
Details for IBM AS400 ............................................. 672
Details for IBM DCOLLECT ...................................... 673
Details for IBM EREP .............................................. 673
Details for IBM IMS ............................................... 673
Details for IBM SMF ................................................ 674
Details for IBM TPF ................................................ 674
Details for IBM VMMON .......................................... 674
Details for MS SCOM ............................................... 675
Details for RRDtool ................................................ 675
Details for SAP ERP ............................................... 675
Details for SAR ..................................................... 676
Details for SNMP ................................................... 676
Details for VMware vCenter ....................................... 676
Details for VMware Data Acquisition ........................ 677
Details for Web Log ............................................... 677
Details for User-Written Staging Code ....................... 677
Details for Aggregation ............................................ 677

Overriding Locations in the Information Map Transformation .......................... 678
Overriding Locations in the Exception Transformation .................................. 678
Overriding Locations in the Performance Report Transformation .................... 679
Overriding Locations at Execution Time

About Overriding Transformations

It might be useful to be able to override the location settings of a SAS transformation at execution time without modifying the metadata for the job or other metadata objects. For example, your site might need to process large data quantities regularly. In that case, you might require more efficient ways of staging and aggregating your data. SAS IT Resource Management provides these methods to efficiently handle large data volumes:

- If you want to process individual files that contain large amounts of data, see “Processing Large Files of Data” on page 666.
- If you want to process multiple files of data, see “Processing Multiple Files of Data” on page 667.

Note: These methods are applicable only for jobs in a single IT data mart.

You might also want to override the locations that are specified in the Information Map, Exception, and Performance Report transformations.

- If you want to override the locations for the Information Map transformation, see “Overriding Locations in the Information Map Transformation” on page 678.
- If you want to override the locations for the Exception transformation, see “Overriding Locations in the Exception Transformation” on page 678.
- If you want to override the locations for the Performance Report transformation, see “Overriding Locations in the Performance Report Transformation” on page 679.

Processing Large Files of Data

If the file that you want to process contains a large amount of data, you might achieve better performance by dividing that data among several smaller files. Many of the tools that collect raw data have controls that enable the user to split the data among several smaller files. For example, tools that extract SMF data have this capability. For the database-oriented collectors, you can decide to run the staging job more frequently.

SMF data is typically collected and written to an output file by using an IBM utility called IFASMFDP. (This utility is also known as the SMF data set dump program.) It can be used to produce multiple output SMF files. With only a single pass of the input, it can select the data according to SMF record types that are specified in the SMF dump program parameters. For example, you can generate three separate SMF files: one with DB2 data, one with CICS data, and one with everything else. Thus, you could execute three staging jobs concurrently (to read each of the three SMF files) and then execute their associated aggregation jobs.
Processing Multiple Files of Data

Overview of Handling Large Files of Data

If you have multiple input files to stage each day, it can be time-consuming to run them all in sequence, one after the other. It is also laborious to create and maintain unique staging jobs for them. In some circumstances, it might be more efficient to stage the multiple files at the same time using the same staging job. To do so, you need to create mirror image copies of the staging library (and spin library, if required) that is associated with the staging job. You can then run the staging job multiple times, overriding the location of the libraries with paths to the locations of the copies that you made. This enables you to stage multiple input files at the same time.

Note: This feature does not include explicit grid enablement or the use of MPConnect.

The target staged tables can be combined into a single table or view for subsequent processing. This table or view can then be read into the aggregation job. The following flowchart shows this process:

The following steps describe how to process multiple files of data. Detailed information about these processes is provided for each adapter following the general overviews.

Overview of Staging the Data

1. Set up a staging job, the target staged table, and the appropriate staging library. Deploy the job.

2. For every one of the multiple input files that you want to run at the same time, make a copy of the staging library. For example, if you want to process ten files of raw data at the same time, create ten mirror copies of the staging library. You can use the \%RMMKLLIKE macro to copy the staging libraries. For information about this macro, see “\%RMMKLLIKE” on page 627.

Note: In situations where you have a large number of input files, you might want to consider grouping them into batches before creating the staging libraries. For example, if you have 100 files, you could separate them into batches of ten files each. Then, you would need to create only ten sets of libraries.
If the original staging job generated a spin library, make copies of that library too. If your staging job writes target staged tables to multiple SAS libraries, you can use the same technique to override one or all of the SAS libraries at execution time.

*Note:* The additional staging libraries can be located wherever you choose. However, make sure that you have Write access to the location and that there is sufficient disk space available at that location. (These objects should not be represented in the metadata library.)

3. When the original job is executed, it ordinarily uses the source and target specifications, such as file locations and SAS libraries, that are defined in the metadata. You can override the input or output specifications, but ordinarily you would override both. By overriding both locations, you can have parallel alternative locations for input and output. The examples here display how to override both input and output specifications in parallel.

For each of the multiple input files that you want to run, you need to redirect the source specification to your chosen input file. You also need to redirect the target staged table to the paths where the mirror copies of your staged libraries are located. For each of the multiple runs of the job, precede the deployed job code with SAS statements that redirect both input and output.

You can use any of the following methods to override the paths to the source and target specification:

- Write a SAS program that assigns the libref and then uses %INCLUDE to include the deployed code.
- Run the deployed code with an autoexec file that contains the FILENAME or LIBNAME statements that will redirect the source and target locations.
- Run the deployed code with SAS invocation-time options that assign the filerefs and librefs before running the deployed code.

*Note:* In following the sections that provide detailed instructions for each of the adapters, only the first method is shown.

Do not override any pre-assigned SAS libraries.

4. Run all ten staging jobs at the same time.

5. After all the staging jobs have completed successfully, the target staged tables can be read into the aggregation jobs.

**Overview of Aggregating the Data**

6. Combine the multiple staged tables into a single view or table, which can be read into the aggregation job. You can use the %RMCMB macro to combine the staged tables into a view or single table. For more information, see “%RMCMB” on page 625.

7. If the combined table (or view) resides in the same physical location that the aggregation job uses as input, as deployed, then you can run only the deployed aggregation job. If you want the aggregation job to use an alternate location for input data, then you can override that location at run time just as you can for staging jobs.

For more information, see “Details for Aggregation” on page 677.
Details for Amazon CloudWatch

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_ACW_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path, and the resulting staged tables are written to the alternate output location.

Details for ASG TMON2CIC

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref MONICICS. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME MONICICS "C:\Some\Other\Input\Path";
LIBNAME STGnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_ASG_TMONCICS_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for ASG TMONDB2

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref TMDBIN. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME TMDBIN "C:\Some\Other\Path";
LIBNAME STGnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_ASG_TMONDB2_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for ASG TMONDB2 V5

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref TMD2IN. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:
Details for BMC Mainview IMS

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref IMSLOG. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME IMSLOG "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_BMC_Mainview_IMS_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for BMC Perf Mgr

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_BMC_Perf_Mgr_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for CA TMS

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref TMC. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME TMC "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_CA_TMS_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.
Overriding Input Filenames and Output Libraries at Execution Time

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_CSV_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for DT Perf Sentry

Overriding Input Filenames and Output Libraries at Execution Time

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_HP_Perf_Sentry_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for DT Perf Sentry with MXG

Overriding Input Filenames and Output Libraries at Execution Time

Create a SAS program that redirects the input file location to another path using the fileref NTSMF. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME NTSMF "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_DT_Perf_Sentry_with_MXG_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for Ganglia

Overriding Input Filenames and Output Libraries at Execution Time

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:
When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

**Details for HP Perf Agent**

**Overriding Input Filenames and Output Libraries at Execution Time**

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

```sas
FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_Ganglia_Staging.sas';
```

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

**Details for HP Reporter**

**Overriding the Source Library at Execution Time**

Create a SAS program that redirects the input to either the path of a SAS library or a database library using the libref that was specified in the deployed code. In the example here, the job originally used an input library with the libref HPOVREP. (The libref must match the one used when the job was defined and deployed.) It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

```sas
LIBNAME reporter ORACLE PATH=XXX SCHEMA=XXX AUTHDOMAIN="OracleAuth" ;
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_HP_Reporte_Staging.sas';
```

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

**Details for IBM AS400**

**Overriding Input Filenames and Output Libraries at Execution Time**

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

```sas
FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_IBM_AS400_Staging.sas';
```

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.
Details for IBM DCOLLECT

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref DCOLLECT. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME DCOLLECT "C:\Some\Other\Path”;
LIBNAME STGnnnn "C:\Some\Other\Staging\Library”;
%INCLUDE ‘Original_IBM DCOLLECT_Staging.sas’;

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for IBM EREP

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref EREP. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME EREP "C:\Some\Other\Path" RECFM=S370VB LRECL=16384;
LIBNAME STGnnnn "C:\Some\Other\Staging\Library”;
%INCLUDE ‘Original_IBM_EREP_Staging.sas’;

*Note:* On Windows and UNIX, the FILENAME statement for EREP should also specify these SAS options: `RECFM=S370VB` and `LRECL=16384`.

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for IBM IMS

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path”;
LIBNAME STGnnnn "C:\Some\Other\Staging\Library”;
%INCLUDE ‘Original_IBM_IMS_Staging.sas’;

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.
Details for IBM SMF

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref SMF. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

```sas
FILENAME SMF "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original.ibm_smf_staging.sas';
```

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for IBM TPF

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref TPFIN. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

```sas
FILENAME TPFIN "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original.ibm_tpf_staging.sas';
```

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for IBM VMMON

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref MWINPUT. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

```sas
FILENAME MWINPUT "C:\Some\Other\Path" RECFM=F LRECL=4096;
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original.ibm_vmon_staging.sas';
```

*Note:* On Windows and UNIX, the FILENAME statement for MWINPUT should also specify these SAS options: RECFM=F and LRECL=4096.

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.
Details for MS SCOM

Overriding the Source Library at Execution Time
For the MS SCOM adapter, the connection information is overridden. (The SAS library
is not overwritten.) The input library for MS SCOM has connection information that
describes how to connect to the SCOM database. The connection is accomplished by
using SQL pass-through.

To override where the input is derived, you would not specify a new SAS LIBNAME
statement before executing deployed code. Instead, you should define the SAS macro
variable RM_SCOMConnection as the new connection information. For example, the
original (as deployed) SAS Library might have been defined as follows:

LIBNAME Srvr2008 ODBC NOPROMPT="dsn=ISD_DWMG02;uid=itmRO;pwd=Original;"
AUTHDOMAIN="DefaultAuth";

To override the location of the input data, in this case to specify a different DSN, User
ID, and password, define RM_SCOMConnection with this revised connection
information:

%LET RM_SCOMConnection=NOPROMPT="dsn=ISD_DWMG04;uid=itmAlt;pwd=Revised;"
AUTHDOMAIN="DefaultAuth";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_SCOM_Staging.sas';

When this is executed, the data is read from the database using the connection
information provided in the RM_SCOMConnection macro variable. The resulting staged
tables are written to the alternate output location.

Details for RRDtool

Overriding Input Filenames and Output Libraries at Execution Time
Create a SAS program that redirects the input file location to another path using the
fileref RAWDATA. It also redirects the output (staged table) library to another path,
using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_RRDtool_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the
resulting staged tables are written to the alternate output location.

Details for SAP ERP

Overriding the Source Library at Execution Time
Create a SAS program that redirects the input file location to another path using the
fileref SAP. It also redirects the output (staged table) library to another path, using the
SAS library libref that was used in the original deployed job:
LIBNAME SAP "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_SAP_ERP_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

**Details for SAR**

**Overriding Input Filenames and Output Libraries at Execution Time**

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_SAR_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

**Details for SNMP**

**Overriding Input Filenames and Output Libraries at Execution Time**

Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_SNMP_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

**Details for VMware vCenter**

**Overriding the Source Library at Execution Time**

Create a SAS program that redirects the input to either the path of a SAS library or a database library using the libref that was specified in the deployed code. In the example here, the job was originally defined using an input SAS library with the libref VMWARE. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

LIBNAME vmware ODBC DATASRC=VMware_XPDesktop AUTHDOMAIN="DefaultAuth";
LIBNAME STGnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_VMware_vCenter_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.
Details for VMware Data Acquisition

**Overriding the Source Library at Execution Time**
Create a SAS program that redirects the input to either the path of a SAS library or a database library using the libref that was specified in the deployed code. In the example here, the job was originally defined using an input SAS library with the libref VMWARE. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

LIBNAME vmware ODBC DATASRC=VMware_XPDesktop AUTHDOMAIN="DefaultAuth";
LIBNAME STGnnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_VMware_Data_Acquisition_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for Web Log

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnnn "C:\Some\Other\Staging\Library";
%INCLUDE 'Original_Web_Log_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for User-Written Staging Code

**Overriding Input Filenames and Output Libraries at Execution Time**
Create a SAS program that redirects the input file location to another path using the fileref RAWDATA. It also redirects the output (staged table) library to another path, using the SAS library libref that was used in the original deployed job:

FILENAME RAWDATA "C:\Some\Other\Path";
LIBNAME STGnnnnn "C:\Some\Other\Staging\Library";
INCLUDE 'Original_User_Written_Staging.sas';

When this is executed, the data is read from the user-supplied alternative path and the resulting staged tables are written to the alternate output location.

Details for Aggregation

**Overriding Input and Output Libraries at Execution Time**
Create a SAS program that redirects the input (staged table) library to another path and the output (aggregation table) library to another path. Both of these are done by using a
SAS LIBNAME statement. Each contains the same SAS library libref that was used in the original deployed job:

```sas
LIBNAME STGnnnA "C:\Some\Other\Staging\Library";
LIBNAME AGGnnnB "C:\Some\Other\Aggregation\Library";
%INCLUDE 'Original_System_Aggregation.sas';
```

When this is executed, the data is read from staged tables found in the user-supplied alternative path. The resulting aggregation tables are written to the alternate output location.

---

**Overriding Locations in the Information Map Transformation**

Use this feature to write maps to alternate locations in preparation for manually changing information map features, as needed, with SAS Information Map Studio.

For the Information Map transformation, the user can override the metadata folder path to which the information map is written. If the user specifies a value for the SAS macro variable OVERRIDEMAPPATH, the information map is written to that metadata location. The metadata folder that you plan to use should already exist, and permissions should be set so that the appropriate users can read from and write to that path.

For example, a job that contains one or more Information Map transformations is deployed as `DT_Perf_Sentry_1_System_Information_Map.sas`. In this case, the following SAS program can be used to create the same map but in the specified overridden location:

```sas
%LET overrideMapPath=/User Folders/My Name/My Folder;
%INCLUDE 'DT_Perf_Sentry_1_System_Information_Map.sas';
```

**Note:** If the deployed job contains multiple Information Map transformations, this overridden location is used for all such transformations.

---

**Overriding Locations in the Exception Transformation**

For the Exception transformation, you can override these locations:

- the input library from which the input table is read
- the output library to which any output tables are written
- the SAS Content Server path to which report content is written

For the input and output libraries, you can override the library that was previously specified in metadata by predefining a SAS library with the same matching libref. Input and output libraries should already exist, and the input library should contain the appropriate input table. In addition, permissions should be set so that the appropriate users can read from and write to the appropriate locations.

If you specify a value for the SAS macro variable OVERRIDEREPOSITORYFOLDERPATH, the report content is written to that location.
in the SAS Content Server repository. You can specify any or all of these override locations. The required SAS Content Server repository path should already exist. In addition, permissions should be set so that the appropriate users can read from and write to that path.

For example, you might have a job that contains an Exception transformation that is deployed as `DT_Perf_Sentry_1_Exception.sas`. In this case, the following program could be used to override the input and output SAS libraries and the SAS Content Server path to which report content is written.

Note: In this example, the job is defined in metadata to read a table from a SAS library with libref AGG4534 and to write exception tables to a SAS library with libref EXP1305. As a result, the two LIBNAME statements cause the job to read from and write to the specified alternate locations instead.

LIBNAME AGG4534 BASE "c:\users\me\datamarts\DTPerf1\DTPerfSentry1\Alternate";
LIBNAME EXP1305 BASE "c:\users\me\datamarts\DTPerf1\Exception\Alternate";
%LET overrideRepositoryFolderPath=%str(/SASContentServer/repository/default/sasdav/My Alternate Location);
%INCLUDE 'DT_Perf_Sentry_1_Exception.sas';

Note: If the deployed job contains multiple Exception transformations, these overridden locations, if specified, are used for all such transformations. To override the location of exception output tables, make sure that you do not accidentally overwrite output tables from multiple transformations.

Overriding Locations in the Performance Report Transformation

You might want to separate report content that is targeted to different groups of report consumers. To do so, you can override these locations in the Performance Report transformation:

• the metadata folder path from which information maps are used as input
• the SAS Content Server path to which report content is written

If you specify a value for the SAS macro variable `OVERRIDE MAPPATH`, the information map is read from that metadata location. If you specify a value for the SAS macro variable `OVERRIDE REPOSITORY FOLDERPATH`, the report content is written to that location in the SAS Content Server repository. You can specify one or both of these override locations.

For example, you might have a job that contains one or more Performance Report transformations and that is deployed as `DT_Perf_Sentry_1_System_Daily_Reporting.sas`. In this case, the following SAS program uses the same information map name, but it looks for the information map in the specified overridden location. In addition, any report content that would have been written to the SAS Content Server repository path that is defined in the metadata for the transformations is written to the specified overridden repository path instead. The required SAS Content Server repository path should already exist. Permissions should be set so that the appropriate users can read from and write to that path.

%LET overrideMapPath=/User Folders/My Name/My Folder;
%LET overrideRepositoryFolderPath=%str(/SASContentServer/repository/default/sasdav/My Alternate Location);
/sas dav/My Alternate Location
\%INCLUDE 'DT_Perf_Sentry_1_System_Daily_Reporting.sas';

*Note:* If the deployed job contains multiple Performance Report transformations, these overridden locations, if specified, are used for all such transformations.
Statistics

SAS IT Resource Management can calculate the following statistics:

- count
- geometric mean
- harmonic mean
- maximum
- mean
- minimum
- number missing
- population coefficient of variance
- population standard deviation
- population variance
- range
- sample coefficient of variance
- sample standard deviation
- sample variance
- sum
- uncorrected sum of squares
- weighted geometric mean
- weighted harmonic mean
- weighted mean
- weighted population coefficient of variance
- weighted population standard deviation
- weighted population variance
- weighted sample coefficient of variance
- weighted sample standard deviation
- weighted sample variance
- weighted sum
• weighted uncorrected sum of squares

Other Calculations

SAS IT Resource Management can calculate these values:

• Percentile, which is calculated on an input analysis column.  
  Note: Each requested percentile for a given analysis column must use the same  
  precision of granularity, that is, it must specify the same rounding.

• Percent Change, which is calculated as the period-to-period change of a statistic or a  
  percentile within a class combination.

• Moving Average, which is an arithmetic mean computed on a subset (the N-most  
  recent points) of data instead of the entire population of data. The moving average is  
  based on a statistic or percentile.

• Moving Standard Deviation, which is a standard deviation computed on a subset (the  
  N-most recent points) of data instead of the entire population of data. The moving  
  standard deviation is based on a statistic or percentile.

• Rank, which is calculated on a class, an ID, or a statistic. You can specify ranking for  
  class, ID, statistics, percentiles, percent change, and moving statistics columns.
Appendix 12

Open-Source System Management Tools

Overview

Many system administrators have begun to use open-source system management tools. Starting with SAS IT Resource Management 3.4, the solution provides documentation to gather and analyze measurements for these tools. Open-source system management tools reduce costs, increase flexibility, and provide quick and easy deployment. However, these tools do not offer the robust support that proprietary system management tools offer. In addition, many open-source tools are designed to run on Linux exclusively. Also, system administrators who work with open-source system management tools must have a good knowledge of scripting languages.

This document provides information about how SAS IT Resource Management 3.4 and later can work with several open-source system management tools. The SAS IT Resource Management RRDtool adapter can be used for processing the RRDs that contain the data that is collected from these system management tools. Perl scripts are used to update RRDs with the collected system management data. The primary focus is on the netstat and vmstat tools. However, the iostat, mmon, Nagios, Xymon, and Zenoss tools are also briefly discussed.

Preparing the Servers

Preparing the SAS IT Resource Management Server

The SAS IT Resource Management server requires Perl to be installed and the RRDtool to be accessible. You can either install the RRDtool adapter directly or use the RSH/SSH host command to connect to an RRDtool remotely. You must also enable XCMD both in the SAS Workspace Server and in batch mode. For more information about the RRDtool command and the RSH/SSH command, see “RRDtool — Accessing Raw Data” on page 421 and “RRDtool Staging and Duplicate-Data Checking Parameters” on page 512.

Preparing the Data Collection Server

The data collection server is the machine that is used to collect data into an RRD from the open-source system management tools. This machine does not have to be the SAS IT Resource Management server. The data collection server requires the installation of both Perl and RRDtool. (However, a remote installation of RRDtool can be used.)

Perl scripts that collect the data and write it to RRDs are available. The RRDs can be made available for processing on the SAS IT Resource Management server through a shared network-based file system. You can also copy the RRDs with the file transfer protocol (FTP) or the secure copy protocol (SCP). Sample Perl scripts are available for both netstat and vmstat data sources. The scripts are at a location that is based on the operating environment.
Collecting the Performance Data

Performance Data Sources
For correct processing by SAS IT Resource Management, measurements that are collected from open-source system management tools must be written to an RRD file. For netstat and vmstat data sources, sample Perl scripts are available. These scripts capture measurements and load them into an RRD file. The scripts can be modified to capture additional performance metrics. (The scripts are examples and can be used as a starting point when working with other performance data sources such as iostat.) Open-source system management tools such as nmon and Nagios data sources have free post processing tools that create RRDs. Some other open-source tools such as Xymon create RRDs for itself as well as for netstat and vmstat data sources.

Working with the Netstat Tool
The netstat command-line system monitor tool can be used to display network statistics. This tool is available on operating systems that are based on Windows NT and most types of UNIX operating systems. Information about network connections, routing tables, interface statistics, masquerade connections, and multicast memberships is available. The sample Perl script that is provided displays network statistics using the netstat -s command. The script captures the network TCP statistics and loads them to an RRD file. If that file does not exist, the script creates it. You must update the rrdloc value in the script to the path where your RRD files are located.

Figure A12.1 TCP Network Statistics Displayed Using the Netstat -s Command
Working with the Vmstat Tool

The vmstat command-line system monitor tool can be used to display virtual memory statistics. This tool is available on most types of UNIX operating systems. Information about processes, memory, paging, block IO, traps, and CPU activity is available. The sample Perl script that is provided displays various event counters and memory statistics using the vmstat –s command. The script captures the memory statistics and loads them to an RRD file. If that file does not exist, the script creates it. You must update the rrdloc value in the script to the path where your RRD files are located.

Figure A12.2  Virtual Memory Statistics Displayed Using the Vmstat -s Command

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7802896</td>
<td>total memory</td>
</tr>
<tr>
<td>7654580</td>
<td>used memory</td>
</tr>
<tr>
<td>5011864</td>
<td>active memory</td>
</tr>
<tr>
<td>2130460</td>
<td>inactive memory</td>
</tr>
<tr>
<td>148316</td>
<td>free memory</td>
</tr>
<tr>
<td>437164</td>
<td>buffer memory</td>
</tr>
<tr>
<td>2433564</td>
<td>swap cache</td>
</tr>
<tr>
<td>16777208</td>
<td>total swap</td>
</tr>
<tr>
<td>1252</td>
<td>used swap</td>
</tr>
<tr>
<td>16775956</td>
<td>free swap</td>
</tr>
<tr>
<td>1676002</td>
<td>non-nice user cpu ticks</td>
</tr>
<tr>
<td>839</td>
<td>nice user cpu ticks</td>
</tr>
<tr>
<td>1119736</td>
<td>system cpu ticks</td>
</tr>
<tr>
<td>45041181</td>
<td>idle cpu ticks</td>
</tr>
<tr>
<td>370844</td>
<td>IO-wait cpu ticks</td>
</tr>
<tr>
<td>8232</td>
<td>IRQ cpu ticks</td>
</tr>
<tr>
<td>74579</td>
<td>softirq cpu ticks</td>
</tr>
<tr>
<td>0</td>
<td>stolen cpu ticks</td>
</tr>
<tr>
<td>3314054</td>
<td>pages paged in</td>
</tr>
<tr>
<td>8600173</td>
<td>pages paged out</td>
</tr>
<tr>
<td>132</td>
<td>pages swapped in</td>
</tr>
<tr>
<td>430</td>
<td>pages swapped out</td>
</tr>
<tr>
<td>147729975</td>
<td>interrupts</td>
</tr>
<tr>
<td>176659003</td>
<td>CPU context switches</td>
</tr>
<tr>
<td>1375469093</td>
<td>boot time</td>
</tr>
<tr>
<td>497266</td>
<td>forks</td>
</tr>
</tbody>
</table>

Working with the Iostat Tool

The iostat command-line system monitor tool can be used to display operating system storage input and output statistics. This tool is available on most types of UNIX operating systems. Information about CPU utilization, device utilization, and the network file system is available.

Figure A12.3  Device Utilization Statistics Displayed Using the Iostat -x Command

<table>
<thead>
<tr>
<th>Device</th>
<th>iop/s</th>
<th>wcpug/s</th>
<th>r/s</th>
<th>w/s</th>
<th>see/s</th>
<th>usec/s</th>
<th>avgu/s</th>
<th>avgw/s</th>
<th>avge/s</th>
<th>avgg/s</th>
<th>avgs/s</th>
<th>avgt/s</th>
<th>uutil</th>
</tr>
</thead>
<tbody>
<tr>
<td>sda</td>
<td>5.40</td>
<td>72.28</td>
<td>26.94</td>
<td>8.05</td>
<td>1550.89</td>
<td>641.68</td>
<td>77.25</td>
<td>0.74</td>
<td>26.18</td>
<td>6.10</td>
<td>17.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sdb</td>
<td>0.11</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.31</td>
<td>0.00</td>
<td>5.17</td>
<td>0.00</td>
<td>2.99</td>
<td>6.96</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Working with the nmon Tool
The nmon system monitor tool can be used to display key performance statistics. It can be operated in an online mode for real-time monitoring or in capture mode for processing at a later time. This tool is a free, downloadable tool that is available for the AIX and Linux operating systems. Information about CPU, memory, disks, adapters, networks, NFS, kernel statistics, file systems, and top processes is available. Workload Manager and Workload Partitions are also available on the AIX operating system. A post-processing tool named nmon2rrd is available at no cost. Nmon2rrd creates an RRD file and generates graphs using RRDtool.

Working with the Nagios Tool
The Nagios Core system monitor tool can be used to display key performance statistics for the entire IT infrastructure. This is a free, downloadable tool available on most Linux operating systems. Information about system metrics, network protocols, applications, services, servers, and network infrastructure is available. A Nagios addon project named Nagiosgraph is available to create an RRD file and generate graphs using RRDtool. Support is provided by an enterprise-class solution that is built on Nagios Core, called Nagios XI.

Working with the Xymon Tool
The Xymon system monitor tool can be used to monitor servers, applications, and networks. This free, downloadable tool from SourceForge is available on most types of UNIX operating systems. It collects this information and presents it in a frequently updated web page, displaying the status of all the systems. Much of the information is stored in RRDs. It can generate many RRDs, including both vmstat and netstat RRDs. The RRDs can be processed directly by the SAS IT Resource Management RRDtool adapter. This type of processing eliminates the need to develop custom Perl scripts. Support is provided by means of mailing lists.

Working with the Zenoss Tool
The Zenoss Core product was developed to eliminate the need for multiple tools to perform availability monitoring, performance monitoring, event management, and more. A Zenoss Enterprise product can provide everything that you might need to establish and maintain awareness of the IT infrastructure.

Processing the Collected Performance Data

Consolidation of the Collected Performance Data
In most cases, open-source systems management tools are used to collect performance data that is being collected from multiple servers. As such, it is best to consider a consolidation strategy to simplify the setup of the SAS IT Resource Management RRDtool adapter. For best results, use a shared network-based file system, or copy the RRDs with FTP or SCP.

Tip: Include the host name in the name of the RRDs to help identify the host source. In addition, the RRDs could be in a single directory, which enables the adapter to take advantage of directory-based processing of the raw data.

RRDtool Adapter Overview
The RRDtool adapter reads any RRD that was created with the RRDtool. The adapter creates staged table metadata that is based on the contents of the RRDs. In addition to the staged table metadata, the adapter also creates a basic set of Aggregation and Information Map transformations.
This metadata can be modified as needed to meet your site’s requirements.

The data in an RRD can contain data that is already aggregated. For best results, the data should not be aggregated. This enables SAS IT Resource Management to perform its own aggregation. RRDs that are read with the RRDtool adapter should have data that is stored with a consolidation function (CF) of AVERAGE. In addition, the average should be generated based on one step of data. If so, the data is essentially detail data (or data that is not aggregated). However, if the data in the RRD is consolidated, the adapter can still read it. It has a staging parameter for the CF that you want. If this parameter is blank, then data at all consolidation levels in the RRD is collected.

RRDs can store numeric data only. Character data cannot be stored. Character information can be placed in the name of the RRD. For example, the host name can be stored in RRDs to aid in the consolidation of collected performance data. For example, the name of the RRD can be `hostname_vmstat.rrd`. (In this example, `hostname` is the name of the host for the collected performance data and `vmstat` is the type of performance data.) When the RRDtool adapter reads the data, it stores the path and filename in a column called filename. You can then create computed columns based on the filename. For example, you can create these columns:

- a column named host with an expression of `scan(filename, 1, "_")`
- a column named type with an expression of `scan(filename, 2, ".")`

**The RRDtool Adapter Data Model**

There is no data model for the RRDtool adapter.

The adapter reads the header information from the RRD and, based on its contents, creates metadata for the appropriate staged table, aggregation table, and information map. The Adapter Setup wizard, when used with the RRDtool adapter, creates jobs that contain transformations for a staged table, a set of aggregation tables, and a set of information maps.

**The RRDtool Adapter Staged Table**

To create a staged table from the Adapter Setup wizard or the New Staged Table wizard, you must specify the following information:

- **Rawdata**: specify a directory that contains RRD files or a single RRD file.
- **rrdtool executable**: specify the executable for accessing RRDs.
- **Consolidation Function (CF)**: specify the value of the consolidation function for which you want to collect the data. If it is left blank, columns are created in the staged table for all the CFs in the RRD.

*Note*: The staged table is named RRDstage.

For information about using the Adapter Setup wizard, see “Using the Adapter Setup Wizard” on page 259. For information about using the New Staged Table wizard, see “Create Staged Tables” on page 121.

For every staging table, a set of common datetime-related columns is included. In addition to these columns, there are columns for the metrics that are found in the RRDs. The process reads the header information from each RRD and gets a list of all the data sources (DSs or metrics). It also looks for the CF that the user requested. A column is added to the staging table with these attributes and values:

- **External Name**: specify as the name of the DS in the RRD.
- **Name**: specify as the name of the DS in the RRD.
- **Description**: specify as the name of the DS in the RRD.
• Type: specify as N.
• Length: specify as 8.
• Format: specify as NLNUM16.2.

If the requested CF is not in the RRD, then an error is displayed. If the user left the CF option blank, then each DS is combined with all the CFs. A column is added to the staging table with these attributes and values:

- **External Name**: specify as DSName:CFValue (for example: active_mem:AVERAGE).
- **Name**: specify as DSName_cfCFValue (for example: active_mem_cfAVERAGE).
- **Description**: specify as DSName_cfCFValue (for example: active_mem_cfAVERAGE).
- **Type**: specify as N.
- **Length**: specify as 8.
- **Format**: specify as NLNUM16.2.

After the staging table metadata is created, you can edit the metadata to remove columns, add new columns, or change the attributes of existing columns. When editing the metadata, make sure that the **External Name** field is correct. It must match the DS name from the RRD. In addition, if the CF option is set to blank, then it must also have a :CFValue after the DS name. If the CF option is not set to blank, then the **External Name** field should be set to the DS name. The staging code relies on the value in the **External Name** to match the data from the RRD with the staging table column. The following display shows the stage table RRDstage columns based on the memory statistics collected from the vmstat command-line system monitor tool.

**Figure A12.4 vmstat RRDstage Stage Table**

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Column</th>
<th>Description</th>
<th>Type</th>
<th>Length</th>
<th>Format</th>
<th>External Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>active_mem</td>
<td>active_mem</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>active_mem:AVG</td>
</tr>
<tr>
<td>2</td>
<td>buffer mem</td>
<td>buffer mem</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>buffer_mem:AVG</td>
</tr>
<tr>
<td>3</td>
<td>dirty mem</td>
<td>dirty mem</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>dirty_mem:AVG</td>
</tr>
<tr>
<td>4</td>
<td>free mem</td>
<td>free mem</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>free_mem:AVG</td>
</tr>
<tr>
<td>5</td>
<td>proc mem</td>
<td>proc mem</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>proc_mem:AVG</td>
</tr>
<tr>
<td>6</td>
<td>active swap</td>
<td>active swap</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>active_swap:AVG</td>
</tr>
<tr>
<td>7</td>
<td>buffer swap</td>
<td>buffer_swap</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>buffer_swap:AVG</td>
</tr>
<tr>
<td>8</td>
<td>dirty swap</td>
<td>dirty_swap</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>dirty_swap:AVG</td>
</tr>
<tr>
<td>9</td>
<td>free swap</td>
<td>free_swap</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>free_swap:AVG</td>
</tr>
<tr>
<td>10</td>
<td>proc swap</td>
<td>proc_swap</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>proc_swap:AVG</td>
</tr>
<tr>
<td>11</td>
<td>active_csw</td>
<td>active_csw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>active_csw:AVG</td>
</tr>
<tr>
<td>12</td>
<td>buffer_csw</td>
<td>buffer_csw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>buffer_csw:AVG</td>
</tr>
<tr>
<td>13</td>
<td>dirty_csw</td>
<td>dirty_csw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>dirty_csw:AVG</td>
</tr>
<tr>
<td>14</td>
<td>free_csw</td>
<td>free_csw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>free_csw:AVG</td>
</tr>
<tr>
<td>15</td>
<td>proc_csw</td>
<td>proc_csw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>proc_csw:AVG</td>
</tr>
<tr>
<td>16</td>
<td>active_ireq</td>
<td>active_ireq</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>active_ireq:AVG</td>
</tr>
<tr>
<td>17</td>
<td>buffer_ireq</td>
<td>buffer_ireq</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>buffer_ireq:AVG</td>
</tr>
<tr>
<td>18</td>
<td>dirty_ireq</td>
<td>dirty_ireq</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>dirty_ireq:AVG</td>
</tr>
<tr>
<td>19</td>
<td>free_ireq</td>
<td>free_ireq</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>free_ireq:AVG</td>
</tr>
<tr>
<td>20</td>
<td>proc_ireq</td>
<td>proc_ireq</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>proc_ireq:AVG</td>
</tr>
<tr>
<td>21</td>
<td>active_iscsw</td>
<td>active_iscsw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>active_iscsw:AVG</td>
</tr>
<tr>
<td>22</td>
<td>buffer_iscsw</td>
<td>buffer_iscsw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>buffer_iscsw:AVG</td>
</tr>
<tr>
<td>23</td>
<td>dirty_iscsw</td>
<td>dirty_iscsw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>dirty_iscsw:AVG</td>
</tr>
<tr>
<td>24</td>
<td>free_iscsw</td>
<td>free_iscsw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>free_iscsw:AVG</td>
</tr>
<tr>
<td>25</td>
<td>proc_iscsw</td>
<td>proc_iscsw</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>proc_iscsw:AVG</td>
</tr>
<tr>
<td>26</td>
<td>active🌔</td>
<td>active🌔</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>active🌔:AVG</td>
</tr>
<tr>
<td>27</td>
<td>buffer🌔</td>
<td>buffer🌔</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>buffer🌔:AVG</td>
</tr>
<tr>
<td>28</td>
<td>dirty🌔</td>
<td>dirty🌔</td>
<td></td>
<td>N</td>
<td>8</td>
<td>NLNUM16.2</td>
<td>dirty🌔:AVG</td>
</tr>
</tbody>
</table>
| 29 | free🌔        | free

**RRDtool Adapter Aggregation Table**

You can use the Adapter Setup wizard to create aggregation table metadata. You can choose day, week, month, key metrics, and shift aggregations. Based on these selections, the Adapter Setup wizard creates the appropriate aggregation tables for the RRDtool adapter.
The tables created by the wizard can be modified to meet your site’s requirements.

The aggregation tables are based on the staged table that was created. Each aggregation table has the standard columns (TimePeriod, CompletedDay, LastUpdated, and ContribCount). The class columns are all character columns, in addition to the needed date columns. For each metric, a weighted mean statistic column is created using duration as the weight column. Duration is the only statistics column that has only a SUM statistic. In addition to the statistics columns, there are also some standard date rank columns that are created, depending on the aggregation table. No join columns are created by default. Only class, ID, statistic, and rank columns are created. The following display shows the aggregation table DayRRD columns based on the memory statistics collected from the vmstat command-line system monitor tool.

Figure A12.5 vmstat DayRRD Aggregation Table

Additional Resources

The following table lists the tools that pertain to handling open-source system management tools:

Table A12.1 Open-Source Tools and Documentation Resources

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>iostat</td>
<td>iostat tool</td>
<td><a href="http://linux.die.net/man/1/iostat">http://linux.die.net/man/1/iostat</a></td>
</tr>
<tr>
<td>Tool</td>
<td>Description</td>
<td>Location</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Nagios</td>
<td>Nagios IT Infrastructure monitoring tool</td>
<td><a href="http://www.nagios.org/">http://www.nagios.org/</a></td>
</tr>
<tr>
<td>nmon</td>
<td>nmon tool</td>
<td><a href="http://nmon.sourceforge.net/pmwiki.php">http://nmon.sourceforge.net/pmwiki.php</a></td>
</tr>
<tr>
<td>Perl</td>
<td>Perl programming language</td>
<td><a href="http://www.perl.org/">http://www.perl.org/</a></td>
</tr>
<tr>
<td>RRDtool</td>
<td>RRD tool</td>
<td><a href="http://oss.oetiker.ch/rrdtool/index.en.html">http://oss.oetiker.ch/rrdtool/index.en.html</a></td>
</tr>
<tr>
<td>Xymon Monitor</td>
<td>Xymon system for monitoring servers and networks</td>
<td><a href="http://xymon.sourceforge.net/">http://xymon.sourceforge.net/</a></td>
</tr>
<tr>
<td>Zenoss</td>
<td>Zenoss Open Source Monitoring and Systems Management</td>
<td><a href="http://community.zenoss.org/index.jspa">http://community.zenoss.org/index.jspa</a></td>
</tr>
</tbody>
</table>
Appendix 13
Deploying Jobs in Batch Mode

Overview of Using a Command Line to Deploy Jobs

You can deploy jobs in batch mode by using a command-line deployment tool. This tool enables you run an Ant script to deploy jobs through a simple command-line interface. You can create a manifest file that contains one or more paths and pass that file into the deployment script along with the appropriate parameters. Use other software to schedule the job for execution. For more information, see Scheduling in SAS.

Note: You cannot use this command-line tool to deploy a job that resides on a z/OS system. Jobs that are to be deployed on UNIX servers should not have blanks in the job name. In addition, the batch deployment feature does not work when the host name contains a space or hyphen (-) character.

To deploy jobs using this command-line tool, perform the following steps:

• Review the prerequisites.
• Modify the Ant script XML on page 694.
• Modify the manifest file on page 694.
• Execute the command on page 695.

Review the Prerequisites

These are the prerequisites for deploying jobs using the command tool:

• This command line tool requires Ant, a popular scripting tool. If you do not already have Ant on your system, you can download it at http://ant.apache.org/bindownload.cgi.

  Note: The Ant executable directory (Ant/bin) must be in your path.

• The files that are necessary to deploy jobs from the command line are distributed at [SASHome]/SASITResourceManagementClient/3.8. Make a copy of the original versions of these files before editing them.

Even though the command line itself is run from a client Windows machine, the jobs to be deployed might be on a Windows or UNIX server machine.

To use the command-line tool to deploy jobs, you need to obtain certain site-related information such as server addresses, passwords, and other information. The following three tables (installation properties, connection properties, and deployment information) show lists of the properties for which you should obtain values.
**Table A13.1  Installation Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>InstallRoot</strong></td>
<td>The physical location where SAS products were installed</td>
<td>C:\Program Files \SASHome</td>
</tr>
<tr>
<td><strong>ConfigRoot</strong></td>
<td>The physical location where the SAS server tier is configured</td>
<td>C:\SAS\Config\Level1</td>
</tr>
<tr>
<td><strong>PlatformVJR</strong></td>
<td>The physical location of the SAS Versioned JAR Repository plug-in directory</td>
<td>${InstallRoot} \SASVersionedJarRepository\eclipse</td>
</tr>
<tr>
<td><strong>WorkingDirectory</strong></td>
<td>The physical location of the most recent copy of the sas.etl.migration.batch JAR directory. Examine your copy of the Platform VJR for the most recent version in the plugins list.</td>
<td>${PlatformVJR} \plugins \sas.etl.migration.batch_&lt;your-installed-version&gt; Note: You are required to edit this field and supply a correct value.</td>
</tr>
<tr>
<td><strong>PickList</strong></td>
<td>The SAS Data Integration Studio picklist for batch migration</td>
<td>${InstallRoot} \SASDataIntegrationStudio\4.7\plugins \sas.etl.migration.batch\picklist</td>
</tr>
<tr>
<td><strong>SASLauncher</strong></td>
<td>The SAS launcher JAR</td>
<td>${PlatformVJR} \plugins \sas.launcher.jar</td>
</tr>
<tr>
<td><strong>DISLocation</strong></td>
<td>The root location for SAS Data Integration Studio</td>
<td>${InstallRoot} \SASDataIntegrationStudio\4.7</td>
</tr>
<tr>
<td><strong>ITRMLocation</strong></td>
<td>The root location for SAS IT Resource Management client</td>
<td>${InstallRoot} \SASITResourceManagementClient\3.8</td>
</tr>
</tbody>
</table>

**Table A13.2  Connection Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>metaserver</strong></td>
<td>Metadata server address</td>
<td>(none)</td>
</tr>
<tr>
<td><strong>metaport</strong></td>
<td>Metadata server port</td>
<td>8561</td>
</tr>
<tr>
<td>Property</td>
<td>Value</td>
<td>Default</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>metauser</td>
<td>Metadata server user name</td>
<td>(none)</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> This name can be a SAS internal account.</td>
<td></td>
</tr>
<tr>
<td>metapass</td>
<td>Metadata server password</td>
<td>(none)</td>
</tr>
<tr>
<td>metarepository</td>
<td>Metadata repository name</td>
<td>Foundation</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> The repository must be the repository that is the required metadata store for a SAS Metadata Server. Each metadata server has one foundation repository. (If you performed a custom installation, then you might have assigned a name other than Foundation.)</td>
<td></td>
</tr>
<tr>
<td>metaserverid</td>
<td>Metadata ID of the application server. (The ID should be in 8.8 format, such as <code>A5GIT9NP.AS000002</code>. )</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> This is the top-level application server object.</td>
<td></td>
</tr>
<tr>
<td>servermachine</td>
<td>Application server address</td>
<td>(none)</td>
</tr>
<tr>
<td>serverport</td>
<td>Application server port</td>
<td>8591</td>
</tr>
<tr>
<td>username</td>
<td>Application server user name</td>
<td>(none)</td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> This name cannot be the name of a SAS internal account. It must be a user name that is recognized by the operating system.</td>
<td></td>
</tr>
<tr>
<td>password</td>
<td>Application server password</td>
<td>(none)</td>
</tr>
<tr>
<td>batchserver</td>
<td>Batch server name to use for deployment</td>
<td>SASApp - SAS DATA Step Batch Server</td>
</tr>
</tbody>
</table>
Modify the Ant Script XML

To prepare the Ant script, perform the following steps:

1. Locate the deployITRMJobs.xml Ant script. This script is deployed by default in the SASHome/SASITResourceManagementClient/3.8/batchdeploy directory.

   **TIP** For best results, create a copy of the file to configure so that the original script retains the default settings.

2. Open your copy of deploySASJobs.xml. Update the script with the values that you obtained for the prerequisite information that was listed in the three previous tables.

3. Save the values and close the deploySASJobs.xml script.

Modify the Manifest File

After you prepare the Ant script, you must create the manifest file that lists the jobs that you want to deploy. The manifest file should be formatted as a standard text file, but name and extension do not matter. The file that you create must match the manifest file specification in the XML script that you previously modified.

Each line of the manifest file is deployed individually. A line can specify a folder or a specific job to deploy.

**Note:** This specification is for a folder in metadata or a complete path (folder and object name) to a location in metadata.

- If you specify a folder, all of the jobs within that folder are deployed. The folder path should be completely specified. This is an example of a completely specified path: /
If you specify a job, only the matching job is deployed (if it exists). The specification should include the complete folder and job path, such as `/Shared Data/SAS IT Resource Management/IT Data Marts/MyDTMart/DT Perf Sentry 1/DT Perf Sentry 1 Staging`.

You can also deploy jobs recursively by adding the argument `-r` to the end of the line. When recursion is enabled, all subdirectories of the given directory are deployed in the same manner as the given directory.

**Execute the Command**

After you modify the Ant script XML to reflect your system and user settings, and the manifest file to specify the jobs to deploy, you can execute the `deployITRMJobs` batch file from the command line.
Appendix 14

Working with SAS Visual Analytics in SAS IT Resource Management

About SAS Visual Analytics

SAS Visual Analytics Administration and Reporting is included in the SAS IT Resource Management solution. For information about accessing and using SAS Visual Analytics,
see the SAS Visual Analytics: User's Guide. SAS Visual Analytics includes the SAS Visual Analytics Hub, Administration, and Designer workspaces, as well as the in-memory SAS LASR Analytic Server. (The Explorer component of SAS Visual Analytics is not included with SAS IT Resource Management.)

SAS IT Resource Management customers can use SAS Visual Analytics Administration and Reporting to visually explore SAS IT Resource Management data. Customers can design and create reports. They can also view and interact with those reports on the web or on a mobile device such as a tablet. SAS Visual Analytics Administration and Reporting provides access to the SAS LASR Analytic Server, which is an in-memory engine specifically designed for analytic processing in a scalable manner.

A SAS Visual Analytics environment can be distributed or non-distributed (that is, it can consist of one or multiple machines).

- In a distributed environment, the SAS LASR Analytic Server runs on multiple machines and each machine has very large amounts of memory. Distributed environments take advantage of co-located data that is stored on Hadoop, Greenplum, or Teradata. This allows for parallel data loading.
- In a non-distributed environment, the SAS LASR Analytic Server runs on a single machine.

**How to Work with SAS Visual Analytics**

To work with SAS Visual Analytics, perform the following tasks:

1. Register users as a member of the Visual Analytics Data Administrators or as a Visual Analytics Users group on the SAS Metadata Server. (A user should be registered as only one of these identities, not both.) For information about performing this task, see “How to Register Users on the SAS Metadata Server” on page 699.

   The duties and abilities of the Visual Analytics Data Administrator and the Visual Analytics User differ in these ways:

   - A Visual Analytics Data Administrator has the authority to start the SAS LASR Analytic Server.
   - A Visual Analytics User has the ability to perform all tasks (other than starting the SAS LASR Analytic Server) that are associated with SAS Visual Analytics.

   *Note:* For best results, a user does not need to be registered as an individual Visual Analytics User. Instead, the person should be a member of the Visual Analytics Users group. Assigning users to this group minimizes setup and maintenance efforts.

2. Authorize the registered users to work with SAS Visual Analytics. To load data in SAS Visual Analytics and view the reports, users must have authorization that allows them to access the LASR library. For information about performing this task, see “How to Set Up a User with the Authorization to Work with the SAS LASR Analytic Server” on page 700.

3. SAS IT Resource Management source data and its required formats must be accessible to the SAS Visual Analytics environment. Users must provide this accessibility. For information about performing this task, see “How to Access Source Data for SAS Visual Analytics” on page 700.

4. [Optional] You can automate the loading of the data into the public SAS LASR Analytic Server. For information about performing this task, see “How to Automate
the Loading of SAS IT Resource Management Data into the Public SAS LASR Analytic Server” on page 701.

5. [Optional] You can launch the ITRM Report Center from the SAS Visual Analytics environment. For information about performing this task, see “How to Launch ITRM Report Center from the SAS Visual Analytics Environment” on page 702.


How to Register Users on the SAS Metadata Server

Before accessing the features of SAS Visual Analytics, a user must be registered on the SAS Metadata Server. To register as a user, perform the following steps:

1. Identify or create an account with which the user can access the SAS Metadata Server.

2. Log on to SAS Management Console as an administrator (for example, sasadm@saspw).


4. On the General tab, enter a name for the user.

5. For a new or existing user, click on the Groups and Roles tab. Add direct memberships for the new user:
   - If the user does not perform administrative tasks, move the Visual Analytics Users group to the Member of list.
   - If the user performs administrative tasks, move one or more of the following groups to the Member of list:
     - Visual Analytics Data Administrators (for suite-level administrative tasks)
     - Visual Data Builder Administrators (for data preparation tasks)
     - SAS Administrators (for platform-level administrative tasks)

6. On the Accounts tab, click New to add login information.
   a. Enter the user ID for the account from step 1. It is not necessary to store a password.
      Windows Specifics
         Enter the user ID in a fully qualified format (userID@domain.extension, domain\userID, or machine\userID).
   b. Select the DefaultAuth authentication domain. Click OK.
      Note: If you know that web authentication has been set up, select the web authentication domain instead.

7. In the New User Properties window, click OK.

Note: For more information about how to set up SAS Metadata Roles for users who want to work with SAS Visual Analytics, see Chapter 1, “Getting Started” in SAS
How to Set Up a User with the Authorization to Work with the SAS LASR Analytic Server

To load the data and view reports in SAS Visual Analytics, a user must be able to access the LASR library. To do this, perform the following steps:

1. In SAS Management Console, navigate to Folders ⇒ Shared Data ⇒ SAS Visual Analytics ⇒ Public ⇒ LASR.
2. Right-click the LASR folder, and select New ⇒ Folder.
3. Enter ITRM as the name of the folder. Click Finish to create the new ITRM folder.

Note: The ITRM folder is then loaded with SAS packages that contain SAS Visual Analytics reports.

How to Access Source Data for SAS Visual Analytics

SAS IT Resource Management data requires access to SAS IT Resource Management formats. If the data was originally created from an adapter based on MXG, it requires the MXG formats. The source data and the required formats must be accessible to the SAS Visual Analytics environment.

If the SAS IT Resource Management and SAS Visual Analytics environments are on different machines (including different operating systems), move the data and the formats from one environment to the other. You can do this by creating a transport file.

If you need to move the SAS IT Resource Management formats, create a transport file from the catalog called SASHELP.ITMS_FORMATS.

If you need to move the MXG formats, create a transport file from the catalog called LIBRARY_FORMATS.

1. Use PROC CPORT to create the transport file that resides in the SAS IT Resource Management environment.
2. Use PROC CIMPORT to import that data to the SAS Visual Analytics environment.

To use the SAS IT Resource Management formats catalog, navigate to the sasv9_usermods.cfg file for the SAS Application Server. This file can be found on the SAS Application Server at the following locations:

Windows Specifics
<config-dir>\Lev1\<application-server-context>

UNIX Specifics
<config-dir>/Lev1/<application-server-context>

z/OS Specifics
<config-dir>/Lev1/<application-server-context>

Then, update the sasv9_usermods.cfg file using these statements:

-set FMTLIB "SASEnvironment/SASFormats/itmsformats"
-insert fmtsearch (FMTLIB.itms_formats)
To access data that was sourced from MXG adapters such as SMF, you need MXG formats. Add the following statement:

```
-set MXGFMT '<formatlib>'
```

where `<formatlib>` is the path to the MXG format library that you created and to which you imported the SAS IT Resource Management and possibly the MXG formats. (This library is sometimes referred to as MXG.MXG.FORMATS.)

**Note:** The MXGSRC configuration setting that is usually seen in SAS IT Resource Management configuration files is not needed in this case.

Add the following macro call to `appserver_autoexec_usermods.sas` (located in the same folder) on the SAS Visual Analytics server:

```
%RMMXGINI;
```

**Note:** The `%RMMXGINI.sas` macro code, along with code for the five SAS IT Resource Management macros that work with SAS Visual Analytics, should be added to the `SASEnvironment/sasmacro` location. For more information about these macros, see “SAS Visual Analytics Macros” on page 728.

---

**How to Automate the Loading of SAS IT Resource Management Data into the Public SAS LASR Analytic Server**

You can automate the loading of SAS IT Resource Management data into the public SAS LASR Analytic Server. This approach uses a drop box and is an alternative to registering, staging, and loading tables. The drop box is periodically scanned by a scheduled task. The task loads any table to memory that has not already been loaded.

In general, this approach requires the following steps:

1. Place the SAS IT Resource Management data in a designated host folder (specified during installation), which functions as a drop box. The location of the host folder is shown on the **Extended Attributes** tab of the Visual Analytics Public LASR library.

2. Locate the AutoLoad.sas program. To do so, navigate to `C:\SAS\Config\Lev1\Applications`. In the folder where SAS Visual Analytics is configured, find the `VisualAnalyticsAdministrator` folder. For example, for SAS Visual Analytics, the AutoLoad.sas program would be here:

   `C:\SAS\Config\Lev1\Applications\SASVisualAnalytics\VisualAnalyticsAdministrator`.

3. Copy the AutoLoad.sas program from its configured location and revise it to point to your designated host folder.

4. Create a script to run the revised AutoLoad.sas program.

5. Schedule the script to run according to your needs.

The data that is placed in the drop box is loaded according to the schedule.

**Note:** The automated data loading feature is supported by the predefined Public LASR Analytic Server and the SAS Visual Analytics Public LASR library. These objects are established when SAS Visual Analytics is configured.
For more information about automatic loading of data, see the *SAS Visual Analytics: Administration Guide* and the *SAS Visual Analytics: User’s Guide*.

**How to Launch ITRM Report Center from the SAS Visual Analytics Environment**

In SAS deployments where the SAS IT Resource Management solution and SAS Visual Analytics use the same SAS Metadata Server, you can launch ITRM Report Center from the SAS Visual Analytics Hub. To launch ITRM Report Center from the SAS Visual Analytics Hub, select **Open ITRM Report Center** from the drop-down list on one of the following sites on the SAS Visual Analytics Hub:

- Home
- More Actions
- Common actions

**Using SAS Visual Analytics Designer with SAS IT Resource Management Data Sources**

**Overview of Using SAS Visual Analytics Designer**

SAS Visual Analytics Designer can create reports that use SAS IT Resource Management data. The resulting visualizations complement the reports that were created using the SAS IT Resource Management reporting processes. Specifically, SAS Visual Analytics reports enable you to view interesting relationships between IT measurements and to work with reports that interact with one another.

For illustration, the following examples use data created by the SAS IT Resource Management adapter for VMware vCenter to highlight some of the IT domain intelligence that is possible with SAS Visual Analytics. For information about accessing these report examples, see “**Importing VMware SAS Visual Analytics Reports into SAS IT Resource Management**” on page 722.

This appendix features a scenario where one or more users performed the following tasks:

- The SAS IT Resource Management Adapter Setup wizard was used to create an IT data mart for VMware vCenter. (The Adapter Setup wizard is available in the SAS IT Resource Management client.)
Ten days of vCenter data were processed into that IT data mart to produce day- and detail-level aggregation tables for several domain categories of interest.

**Figure A14.1  IT Data Mart for VMware vCenter**

- The SAS LASR Analytic Server was started and the tables that were produced by SAS IT Resource Management were loaded into the SAS LASR Analytic Server. The following image shows the DetailGuestSysByCluster table being loaded into the public LASR location.
Figure A14.2  Loading a Table into the SAS LASR Analytic Server

Note: Macros supplied by SAS IT Resource Management can also be used to load data into the SAS LASR Analytic Server. For more information about these macros, see “Macros for SAS Visual Analytics Integration” on page 629.

- SAS Visual Analytics Designer was used to create reports that use the SAS IT Resource Management data that was loaded into the public LASR location. The following reports were created and are discussed in detail here:
  - CPU Utilization Trends on page 709
  - Utilization and Data Store Capacity on page 713
  - CPU Utilization for Latest Date on page 717

SAS Visual Analytics Report Attributes

Types of SAS Visual Analytics Report Attributes
The following attributes are commonly associated with SAS Visual Analytics reports:

- input data source on page 705
- category on page 706
- measures on page 707
- data source filter on page 707
- report object interactions on page 708

Input Data Source
All of the reports that are shown in this appendix use one or more aggregation tables from the IT data mart for the VMware vCenter domain categories. The following tables were used:

- DetailGuestSysByCluster
- DayGuestSysByCluster
- DayClusterStorage

The DetailGuestSysByCluster and DayGuestSysByCluster aggregation tables include Cluster, Host, and Guest resource columns. The DayGuestSysByCluster aggregation table contains the Date column in the classification list, resulting in a summarization at
the day level. The table that is selected depends on the granularity (the level of data summarization) that is needed for the report.

The DayClusterStorage aggregation table includes the Cluster column in its classification list. Including this column enables measurements to be correlated with the two GuestSysByCluster tables.

**Category**

A *category* in SAS Visual Analytics is a data item whose distinct values are used to group and aggregate measures. All of the report illustrations use one or more categories from the input data source. In addition, a hierarchy category is created. The Resources hierarchy uses the Cluster, Host, and Guest classification columns. Using the Resources hierarchy category enables the user to drill down from the VMware Cluster to the hosts in that cluster and to the guests in those hosts to view measurements.

*Figure A14.4*  Using SAS Visual Analytics to Create a Hierarchy Category

The following categories are used in the report illustrations:

- Cluster
- Host
- Guest
- Resources (Hierarchy)
  - Cluster
  - Host
• Guest
• Datastore
• Date
• Datetime

**Measures**
In SAS Visual Analytics, a *measure* is a data item whose values can be used in computations. All of the report illustrations use one or more of the measurements from the input data sources. The following measurements are used:

• CpuUsedMsec
• CpuBusyPct
• CpuGHz
• EffectiveCpu
• MemoryUsagePct
• NetworkUsageRateKB
• DiskUsageRateKB
• CapacityGB
• Frequency (a measure that is derived by SAS for certain graph types)

*Note:* In some cases, a report includes multiple input data sources in order to acquire the set of measurements that it needs.

**Data Source Filter**
Two reports use a data source filter to subset the amount of data that is available in the reports.

The DayDateDescRank and D_DayDateDescRank columns are numeric columns that are available in day- and detail-level aggregation tables, respectively. (These columns are used to rank the dates in the table.)

The rank value represents the relative value of the date in the table. For example, a table with 10 days of data has DayDateDescRank values between 1 and 10, where the value 1 represents the most recent date in the table. Specifying $\text{DayDateDescRank} = 1$ in a data source filter enables the user to subset the values in the report to the last date of data. Thus, users can refresh their data source without requiring a change to the filter. Using a data source filter enables you to specify a filter that applies to all report objects in all sections of the report.
**Report Object Interactions**

All reports in this illustration use object interactions between report objects in the same or different sections of the report. For more information about interactions, see the *SAS Visual Analytics: User’s Guide*.

Creating object interactions enables users to interact with one report object that dynamically updates the other objects in the report. The following image illustrates the interactions view from one report that shows three report objects and a section named *Related Measurements*. It shows the following interactions:

- A filter interaction from the bar chart to the time series plot
- A brush interaction between the bar chart and the crosstab table
- A derived interaction from the crosstab table to the time series plot
- A section link between the bar chart and the *Related Measurements* section located in the same report
The CPU Utilization Trends report analyzes the CPU utilization of VMware clusters, hosts, and guests over an 8-day period. A data source filter was used to subset the data from the DetailGuestSysByCluster aggregation table.

The report contains a pie chart, a treemap, two bar charts, a list table, and a time series plot. Each of these reports offers VMware CPU utilization views over designated time periods.

The intelligence that is gathered by viewing the CPU Utilization Trends report for the VMware infrastructure enables you to understand how the CPU utilization of guests contributes to the CPU utilization of hosts and clusters. This insight is essential for VMware capacity planning activities and directly influences how virtual workloads are best allocated to VMware clusters – especially in high-availability VMware environments.
Interactions that are defined between the four charts, the table, and the plot enable filtering to occur. The filter results in dynamic updates to the report objects as you interact with the objects in the report. The following sections discuss the measures for each object and the interactions between them.

When you open the report for viewing, the pie chart and the treemap that are located on the first row of the report show CPU utilization at the cluster level. Each slice in the pie chart represents the utilization for one cluster (for all dates). Each tile in the treemap represents the count of CPUs in each cluster and the CPU utilization for one date (for all clusters). The two bar charts on the second and third rows of the report show CPU utilization for all hosts and for all guests, respectively. The list table and time series plot that are located on the bottom row of the report show the utilization for all resources in the hierarchy.

Figure A14.7  CPU Utilization Trends Report

The following section discusses the interactions that are defined for the report.

Interactions were created between the graphs and the table that allow for filtering to occur as you interact with the graphs. The following two images show the interactions.

The first image shows the defined interactions on the Interactions tab. The objects were manually arranged to show a clear view of the defined interactions.
The second image includes the derived interactions. These images show that the pie chart and the treemap behave like top-level controls.

**Figure A14.8** Defined CPU Utilization Trends Interactions

**Figure A14.9** Derived CPU Utilization Trends Interactions
By selecting a slice of the pie chart, you apply a cluster filter to all of the reports that interact with this chart. Likewise, by selecting a particular date tile, you apply that date filter to all reports that interact with the treemap. Similarly, selecting a bar at the host level applies a host filter to the guest bar chart as well as to the list table and time series plot that are at the bottom of the report. Selecting a bar at the guest level applies that filter to the list table and the time series plot.

Click on a slice in the pie chart to update the other report objects dynamically. For example, the following display shows that the blue slice from the pie chart is selected. Because the pie chart selection corresponds to VIRTUAL DESKTOPS 2, the other report objects are dynamically updated with the incoming filter. The Properties tab for Bar Chart for Guest (the yellow bar chart) shows that the filter VIRTUAL DESKTOPS 2 has been applied.

Figure A14.10  CPU Utilization Trends with the Cluster Virtual Desktops 2 Selected

Similarly, selecting a particular date from the treemap further filters all of the report objects except the pie chart. This same downstream behavior occurs for the host- and guest-level bar charts as well as the crosstab report. On the Properties tab for the time series plot, the following selections were made:

- Cluster VIRTUAL DESKTOPS 2 in the cluster pie chart
- Host VIRTDESK15 in the host bar chart
- Guest VMWTON181X64 in the guest bar chart
- Date 03APR2014 in the treemap
Utilization and Data Store Capacity

The Utilization and Datastore Capacity report analyzes the data storage capacity for clusters and the CPU, memory, disk, and network usage for guests for a single day at a time.

The report contains a pie chart, a bar chart, a treemap, and two list tables. The pie chart shows the number of guests in the selected cluster, and the bar chart shows the number of guests in the selected host. Selections in the pie chart or the bar chart as well as the drop-down list control filter for the Date field are used to filter the measurements of interest.
The intelligence that is gathered by viewing the Utilization and Datastore Capacity report consists of these items:

- the current day allocation of guest systems to hosts and clusters in the VMware infrastructure
- the allocation of storage to each cluster
- the computing performance of guest systems based on memory and CPU utilization and disk and network usage rates

This report enables VMware administrators to assess the day-to-day performance of the VMware infrastructure. Using this report, VMware administrators can quickly identify over- or underused guest systems based on their computing performance and capacity.

The following image shows the defined and derived interactions of the Utilization and Datastore Capacity report:

- selecting a cluster in the pie chart results in a dynamic filter for all other report objects
- selecting a host in the bar chart filters the treemap and the list table that contain guest measurements
- selecting a tile in the treemap dynamically updates the guest list table
The following image shows the **Properties** tab for the treemap. The **Incoming Filters** list shows that the following filters were selected:

- the specified date for the report is 04/01/2014
- Cluster VIRTUAL DESKTOPS 3 in the cluster pie chart
- Hosts in the host bar chart
  - VIRTDESK20
  - VIRTDESK23
  - VIRTDESK19

Filters are applied to the tiles in the treemap and to the rows in the two list tables.
The following image also shows a data tip on the treemap that contains the name of the selected guest and additional measures that were added as data tip values.

While interacting with reports, you can enlarge any report object to get a clearer view of the measurements. For example, you might want to expand the treemap that contains all guests within the cluster before any filters are applied.
**CPU Utilization for Latest Date**

The CPU Utilization for the Latest Date report analyzes the CPU utilization of VMware clusters, hosts, and guests over a 24-hour period. In this example, a data source filter was used to subset the data from the DetailGuestSysByCluster aggregation table. For more information, see “Data Source Filter” on page 707.

The report contains two sections. The first section of the report shows a bar chart, time series plot, and crosstab table. The second section of the report contains two dual-axis time series plots that show related measurements. The CPU and memory usage percent and the disk and network usage rates are measurements that are most relevant at the guest level.

The intelligence that is gathered by viewing the VMware Cluster CPU utilization in the **CPU Utilization** section is the amount of CPU that is used by each cluster, host, or guest (observed at each level of the hierarchy). The value for CpuUsedMSec is available as the height of each bar and the position of each line and as a column in the crosstab table.
The intelligence that is gathered by viewing the VMware Cluster CPU Utilization in the Guest Measurements section is the CPU busy and memory usage percent measurements and the disk and network usage rates for the guest that was selected.

Interactions within the report and between report sections enable you to drill down from cluster to host to guest. You can also link to another section of the report that shows additional measurements at the guest level. The following image shows the interactions between the report objects in this section as well as the link to the Guest Measurements section.
If you click any bar in the bar chart, the brush interaction highlights the measurements for the corresponding bar in the crosstab. This image shows that the cluster VIRTUAL DESKTOPS 2 is highlighted.
If you double-click on a bar, you can drill down into the bar chart. Similarly, you can double-click on a line to drill into the time series plot. The following image shows the hosts for the VIRTUAL DESKTOPS 2 cluster.

You can continue to drill down into the guest level. The following image shows that the bar for the VIRTDESK14 host is selected and that the bar for the VMWWIN8189 guest is highlighted. It also shows that you can interact with a bar and select the action to move to another section within the report.
When you double-click on a bar for a guest and then select the section link, the report is redirected to the Guest Measurements section with the incoming filter applied. This section contains two dual-axis time series plots. The first plot shows the CPU busy and memory usage percent measurements for the guest that was selected. The second dual-axis time series plot shows the corresponding disk and network usage rates. The Properties tab shows the filters that were applied from the section link.

Figure A14.22 CPU Utilization for the Latest Date

Figure A14.23 Dual-Axis Plots
Importing VMware SAS Visual Analytics Reports into SAS IT Resource Management

What SAS Visual Analytics Reports Are Supplied?

The following SAS Visual Analytics report examples are available for importing into SAS IT Resource Management:

- Cluster Storage Measurements for the Month
- CPU Utilization for the Latest Date
- CPU Utilization Trends for the Week
- Guest CPU Utilization Plot Intervals for the Day
- Guest Memory Utilization
- Guest to Host Allocation and Zombie Guests
- Storage Utilization for Cluster, Host, and Guest
- Utilization and Datastore Capacity for the Day

The following input source tables are required to view the preceding list of SAS Visual Analytics reports:

- DAYHOSTSYSBYCLUSTER
- DAYGUESTSYSBYCLUSHST
- DAYCLUSTERSTORAGE
- MONTHHOSTSTORBYCLUSTER
- MONTGHUESTSTORBYCLUSTER
- DAYGUESTSYSBYCLUSTER
- DAYHOURGUESTSYSBYCLUSTER
- DETAILGUESTSYSBYCLUSTER
- MONTHCLUSTERSTORAGE

How to Import Supplied VMware SAS Visual Analytics Reports into SAS IT Resource Management

VMware SAS Visual Analytics report examples are available here: `<SASHome>\SASITResourceManagementDataTier\3.8\VAReportSASPackages`. To access them and import them into SAS IT Resource Management, perform the following steps:

1. In the Folders tab of SAS Management Console, navigate to /Shared Data/SAS Visual Analytics/Public/LASR.
2. Right-click LASR and select New to create a new folder called ITRM.
3. After the ITRM folder is created, you can import the SAS package file that contains the reports. To do so, right-click the new ITRM folder. From the menu, select Import SAS Package to launch the Import from SAS Package wizard.
4. On the first page of the wizard, specify the following location of the files to be imported: `<SASHome>\SASITResourceManagementDataTier\3.8\VAReportSASPackages`.

5. On the next page, make sure that the reports that you want to import are selected.

6. On the Libraries page of the wizard, select the default LASR library as the target library as shown in the following display.

   ![Figure A14.24 Target Library for Importing Reports](image)

   *Note:* You can also create a new library for your SAS Visual Analytics reports by using the New Library wizard in SAS Management Console. For information, see “Using SAS Management Console to Create a Library” on page 727.

7. Click **Finish** to view the Summary page. If the information that is presented on that page is satisfactory, click **Next** to import your SAS Visual Analytics reports. Then click **Finish** to return to SAS IT Resource Management.
After the SAS Import Package wizard is finished processing, the newly imported reports can be accessed in the `Reports` folder in the `ITRM` folder, as shown in the following display.

*Figure A14.25  Imported SAS Visual Analytics Reports*

Note: If your client tier and data tier are located on different machines, copy the SAS package file (`Itrdatatier_VMWARE_Supplied_ITVAREportDefinitions.spk`) from the data tier to the client machine and then import it.

**How to Access the Imported SAS Visual Analytics Reports**

To access the imported SAS Visual Analytics reports, the following tasks must be accomplished. Invoke SAS Management Console and click the `Folders` tab to proceed.

1. By default, Visual Analytics Data Administrators and Visual Analytics Users have minimum-level access to the `LASR` folder and its contents. To verify this, right-click the `LASR` folder and select `Properties`. Click the `Authorization` tab to view the permissions for the Visual Analytics Data Administrators or Visual Analytics Users.
2. A user account must exist. The user should be a member of the Visual Analytics Data Administrators or the Visual Analytics Users groups. The user should also have Read and Write privileges to the LASR library.

For example, if you set up sasdemo as a user, that user would have to be a member of the Visual Analytics Data Administrators or Visual Analytics Users groups. Right-click the user (in this case, sasdemo) and select **Properties**. Under the **Groups and Roles** tab, the following display shows that the sasdemo user is a member of the Visual Analytics Data Administrators group.
How to Access the Source Data for the SAS Visual Analytics Reports

To access the source data for the SAS Visual Analytics reports, perform the following steps:

1. Make sure that the SAS LASR Analytic Server is running. To do this, execute the %RMVASTRT macro. (This macro starts the SAS LASR Analytic Server.)

Alternatively, navigate to http://your-machine-name:7980/SASVisualAnalyticsAdministrator. As shown in the following display, you can select the corresponding server to start.
2. Invoke the %rmvaload macro to load the multiple tables of data at time onto the LASR Analytic Server.

   Note: For more information about the %RMVASTRT and %RMVALOAD macros, see “Macros for SAS Visual Analytics Integration” on page 629.

3. View the reports using SAS Visual Analytics Hub or Viewer, which is located here: http://your-machine-name:7980/SASVisualAnalyticsHub.

Using SAS Management Console to Create a Library

Log on to SAS Management Console and click the **Plug-ins** tab. Then perform the following steps:

1. In the **Data Library Manager** folder, right-click **Libraries** and select **New Library**.

2. On the first page of the New Library Wizard, navigate to the **High-Performance Analytics** folder and select **SAS LASR Analytic Server Library**.

3. On the next page, specify the name, location, and the description of the library.

4. On the next page, enter **ITRM** for the **Libref** and **Server tag**.

5. On the next page, assign the LASRs server that is associated with the library, as shown in the following display.
6. On the next page, by default, Visual Analytics Data Administrators and Visual Data Build Administrators user groups will be available as shown in the following display.

7. Click **Finish** to create the new library.

8. After the new library is created, specify it in the **Target** field of the Libraries page of the Import SAS Package wizard.

---

**SAS Visual Analytics Macros**

Beginning with SAS IT Resource Management 3.4, the solution provides five macros that enable you to process your IT data in a SAS Visual Analytics environment:
• %RMVASTRT, which starts the SAS LASR Analytic Server
• %RMVALOAD, which loads one or more tables onto the SAS LASR Analytic Server
• %RMVASTOP, which stops the SAS LASR Analytic Server
  Note: When the SAS LASR Analytic Server is stopped, all of the loaded LASR tables are unloaded from the SAS LASR Analytic Server.
• %RMVATBL, which registers a SAS LASR table in the SAS Metadata Repository
• %RMVAUNLD, which unloads one or more tables from the SAS LASR Analytic Server

For more information about these macros, see “Macros for SAS Visual Analytics Integration” on page 629.

For more information about SAS Visual Analytics, see the SAS Visual Analytics: User’s Guide.
Appendix 15

Working with the VMware Adapter

---

VMware vCenter - Accessing Data

- About VMware vCenter
- VMware Data Collection Process
- VMware Data Collection Level
- Overview of Limiting the Data in the Events and Tasks Staged Table
- Limiting the VMware Data in the Events Table
- Limiting the VMware Data in the Tasks Table
- VMware Statistics Tables

Working with the VMware Lookup Table

- Overview of VMware Data Collection Jobs
- How Does the VMware Data Acquisition Job Work?
- Preserving Information about the VMware Environment
- When Should the VMware Data Acquisition Job Run?

Enabling Access to the VMware vCenter Server Appliance (vCSA) Postgres Database

- Introduction to Enabling Access to the vCSA Postgres Database
- How to Enable Remote Access to the PostgreSQL Server and Collect Raw Data for Input to SAS IT Resource Management

---

VMware vCenter - Accessing Data

About VMware vCenter

The SAS IT Resource Management adapter for VMware vCenter reads data from these relational databases:

- an ORACLE, Microsoft SQL Server or, for VMware vCenter releases prior to 5.5, an IBM DB2 database on a UNIX or Windows operating system
- beginning with VMware 5.0, and for the VMware vCenter Server Appliance on Linux, Oracle for the external database or PostgreSQL for the embedded database
The VMware vCenter Server is installed on a Microsoft Windows server. Beginning with VMware 5.x, it can be deployed by using the VMware vCenter Server Virtual Appliance (vCSA) to a virtual machine that operates under Linux.

• For VMware installations on Microsoft Windows, SAS IT Resource Management recommends that the VMware vCenter server be installed with an external database. The external database can be one of these databases: Oracle database, Microsoft SQL Server database, or (for VMware vCenter releases prior to 5.5) an IBM DB2 database.

• For vCSA deployments to a virtual machine that operates under Linux, SAS IT Resource Management recommends that the VMware vCenter server be installed with an external Oracle database.

• VMware vCSA also supports an embedded Postgres database option. The embedded Postgres database is implemented by VMware as a closed system to which access instructions are not documented. Though not recommended by VMware, it is possible to use the IT Resource Management Adapter for VMware vCenter to read data from the vCenter Postgres database.

Note: For information about this using an embedded Postgres database, see “Enabling Access to the VMware vCenter Server Appliance (vCSA) Postgres Database” on page 738.

VMware Data Collection Process

VMware data collection intervals determine the duration for which statistics are aggregated, calculated, rolled up, and archived. The data collection level determines the amount of data gathered and which counters are available for reporting. The Data Collection Interval along with the data collection level determines how much statistical data is gathered and stored in the database.

VMware Data Collection Level

VMware enables you to control the amount of data that is gathered and the counters that are available by using the data collection level (also known as the statistics levels). This level is set in the vSphere client and can be a value between 1 and 4. The SAS IT Resource Management adapter for VMware vCenter is designed to process the data collected using a data collection level of up to 3. (The adapter also operates as expected with a data collection level of 4.)

CAUTION: Data collection level should not be set to a value less than 3. If the data collection level is less than 3, then some of the values in the supplied SAS IT Resource Management data model will be missing.

Data Collection Level 3 satisfies the requirements of all the reports that are supplied by VMware. The adapter stages and processes the 5-minute frequency (1 Day) Data Collection Interval of VMware measurements that are made available in the vCenter database. (SAS IT Resource Management processes only the vCenter 5-minute frequency data. This ensures that the statistics that are calculated are as statistically valid as possible.)

VMware might average the statistics multiple times while these values are rolled up to higher collection intervals. The SAS IT Resource Management solution accounts for that possibility. For example, the statistic CPU usage is rolled up by computing the average CPU usage for a time period according to the following formulas:
- past_week_CPU_usage=Average(past_day_CPU_usage)
- past_month_CPU_usage=Average(past_week_CPU_usage)
- past_year_CPU_usage=Average(past_month_CPU_usage)

*Note:* SAS IT Resource Management does not provide an option to process only summarized measurements from the vCenter database as an alternative to working from the more granular 5-minute frequency measurements.

---

**Overview of Limiting the Data in the Events and Tasks Staged Table**

**TIP** Users should take care when staging the VMware Tasks and Events tables due to the potentially huge amount of data that exists in the input database for these tables.

The table in the vCenter database contains data for the Events staged table. This data consists of a record for each event that is the result of a task or alarm in vCenter. The table in the vCenter database contains data for the Tasks staged table. This data consists of a record for each task (power on or off of a virtual machine, alarm created, and so on) that occurs in vCenter. To limit the potential for large amounts of data for these two tables, you can do either one of the following precautions:

- Define a datetime range for which data should be loaded for each of these staged tables.
- Specify the last number of days for which data should be loaded for each of these tables.

---

**Limiting the VMware Data in the Events Table**

If the Events staged table is added to a VMware vCenter staging job, perform one of the following two procedures:

- To define a datetime range for which data should be loaded for each of these staged tables, edit the generated code for the staging job by adding the following code:

```plaintext
%let ITRM_LoadEventsFromDate = <start-datetime>;
%let ITRM_LoadEventsToDate = <end-datetime>;
```

The following code is an example of how to specify the datetime range.

```plaintext
%let ITRM_LoadEventsFromDate = 12APR2010:00:00;
%let ITRM_LoadEventsToDate = 13APR2010:00:00;
```

By setting these two macro variables to a valid datetime range, the staging job would load data for the Events table that falls within the specified range.

- You can specify the last number of days for which data should be loaded for each of these tables. To do so, edit the generated code for the staging job by adding the following code:

```plaintext
%let ITRM_LoadEventsForDays = <number-of-days>;
```

The following code is an example of how to specify the last number of days for which data should be loaded.

```plaintext
%let ITRM_LoadEventsForDays = 3;
```

By setting this macro variable to a valid positive integer, the staging job loads data for the Events table for the last number of days that you specified. In the preceding example, the staging job populates the Events staged table with data for the past three days.
Note: Specify the values for these macro variables in Coordinated Universal Time (UTC). (UTC time is the same as Greenwich Mean Time (GMT).)

Limiting the VMware Data in the Tasks Table

If the Tasks staged table is added to a VMware vCenter staging job, perform one of the two following procedures:

• To define a datetime range for which data should be loaded for each of these staged tables, edit the generated code for the staging job by adding the following code:

```sas
%let ITRM_LoadTasksFromDate = <start-datetime>;
%let ITRM_LoadTasksToDate = <end-datetime>;
```

The following example shows how to specify datetime range.

```sas
%let ITRM_LoadTasksFromDate = 12APR2010:00:00;
%let ITRM_LoadTasksToDate = 13APR2010:00:00;
```

By setting these two macro variables to a valid datetime range, the staging job would load data for the Tasks table that falls within the specified range.

• You can specify the last number of days for which data should be loaded for each of these tables. To do so, edit the generated code for the staging job by adding the following code:

```sas
%let ITRM_LoadTasksForDays = <number-of-days>;
```

The following code is an example of how to specify the last number of days for which data should be loaded.

```sas
%let ITRM_LoadTasksForDays = 3;
```

By setting this macro variable to a valid positive integer, the staging job loads data for the Tasks table for the last number of days that you specify. In the preceding example, the staging job populates the Tasks staged table with data for the past three days.

Note: Specify the values for these macro variables in Coordinated Universal Time (UTC). (UTC time is the same as Greenwich Mean Time (GMT).)

VMware Statistics Tables

The SAS IT Resource Management VMware adapter accesses the VPX_HIST_STAT1 view and creates a SAS data set that contains the vCenter statistics for the past day.

Working with the VMware Lookup Table

How to Set Up the VMware Lookup Table

The VMware adapter includes a SAS data table that enables you to provide memory specifications for the hosts in your environment. These measurements are used in the supplied High Availability and Distributed Resource Scheduler reports. This table is located by default in the SASHELP library and contains no data. If you want to use this table to provide memory information, perform the following steps:

1. Locate, or create, the IT data mart that you want to use for staging VMware data.
2. Locate the **Administrative** folder. Right-click the library within that folder. (The library is called **Admin nnnnn**, where *nnnnn* is a random number that was generated when the IT data mart was created.)

Select **View Libname**.

3. Select the entire LIBNAME statement in the displayed box. Then right-click the LIBNAME statement and select **Copy**.

4. Launch an interactive session of SAS. Use the **Paste** function to paste the LIBNAME statement into an Editor window.

5. Submit the LIBNAME statement.

6. In the Explorer window, locate the SAS data table called ITMS_VMware_HostMemory by drilling down into the SASHELP library.

7. Use the **Copy** and **Paste** functions to copy this table to the **Admin nnnnn** library.

8. Now you can edit the table that you copied to the **Admin nnnnn** library. To do so, use VIEWTABLE to add and update rows. (To access VIEWTABLE, double-click the table in the Explorer window.)

The ITMS_VMware_HostMemory lookup table has the following six columns:

- **Cluster**
  the name of the cluster.

- **Host**
  the name of the host.

- **EsxHostTotalRam**
  the total amount of physical RAM in the ESX host machine that is seen by VMware ESX.

- **EsxHostSystemRam**
  the total amount of RAM that is allocated to the VMkernel. This amount does not include virtualization overhead. This amount is the fixed amount of RAM that is available based on the host's total RAM.

- **EsxHostVirtualMachinesRam**
  the amount of physical memory that is available for virtualization. This value is calculated by subtracting the Service Console memory (if applicable) and the System Memory from the total amount of RAM in the host.

- **EsxHostServiceConsoleRam**
  the total amount of RAM that is configured for the Service Console (if applicable).

The value in the cluster column should be the name of the cluster. The value in the host column should be the name (or the IP address if your site references hosts by address only) of the host for this observation. (Case matters. The names in the Host column should match the names in vCenter up to the first period. For example, Machine.abcd.efg.company.com should be listed as Machine.) You can also update this table programmatically if it has the correct columns, as described previously.

When this table is populated and you run the staging code, the following columns in the HostSystem staged table have with the correct values from the lookup table:

- **EsxHostTotalRam**
- **EsxHostSystemRam**
• EsxHostVirtualMachinesRam
• EsxHostServiceConsoleRam

If values for the memory metrics are not provided for a cluster and host, then those variables are set to missing values for that cluster and host. If the lookup table does not exist in the ADMIN library or is empty, then all values for the four mentioned memory variables are set to missing.

Note: If the lookup table does not exist in the ADMIN library or is empty, the High Availability and Distributed Resource Scheduler supplied reports that depend on the EsxHostTotalRam, EsxHostSystemRam, EsxHostVirtualMachinesRam, and EsxHostServiceConsoleRam metrics cannot provide useful reports.

How to Populate the VMware Lookup Table

The Virtual Center (vSphere Client) contains information that can be used to load the VMware lookup table. To populate the VMware lookup table, perform the following steps:

1. Log on to the VMware vSphere Client.
2. In the menu bar, select Inventory ⇒ Host & Clusters. The name of each cluster is displayed in the left panel next to the symbol .
3. For each cluster that is listed, perform steps 4 and 5.
4. Click the + to expand the contents of the cluster. All the hosts that are associated with that cluster are listed.
5. For each host that is listed, perform the following steps:
   a. Click the name of the host. The page containing the host details opens in the right pane. In the right pane, click the Configuration tab.

   Figure A15.1 Host Details Page of VMware vSphere Client

   b. In the Hardware section, click Memory. The four memory values are displayed. Enter the four values for the appropriate host in the VMware lookup table as follows:

   • Copy and paste the Total value into the EsxHostTotalRam column.
   • Copy and paste the System value into the EsxHostSystemRam column.
   • Copy and paste the Virtual Machines value into the EsxHostVirtualMachinesRam column.
• Copy and paste the Service Console value into the EsxHostServiceConsoleRam column.

Note: EsxHostServiceConsoleRam is applicable only to VMware versions prior to vSphere 5.1, which was when the ESXi architecture was released.

VMware Data Acquisition Jobs

Overview of VMware Data Acquisition Jobs

Staging jobs for SAS IT Resource Management adapters are typically run once a day. However, the VMware vCenter adapter requires the ability to run staging jobs more frequently than once a day. The reason for this frequency is that staged VMware data must include information about the mapping of a guest (virtual machine) to a host (physical machine). As virtual machines are moved from host to host, the VMware database is updated with the current location of the virtual machine. The VMware database stores only the most recent guest-to-host mapping information. Those mappings must also be stored, along with some of the corresponding data, in a table for use as source tables in the nightly run of the VMware staging transformation. The VMware Data Acquisition transformation provides this functionality.

How Does the VMware Data Acquisition Job Work?

Like all other transformations, the VMware Data Acquisition transformation is contained in a job. When the VMware Data Acquisition job runs, it extracts a subset of VMware data from a database. The target table that is created by executing the VMware Data Acquisition transformation is read in to the VMware vCenter staging transformation. Unlike the staged tables created by other staging transformations, the target table is not purged when the VMware Data Acquisition job is executed. The VMware Data Acquisition staging transformation prompts for the following information:

• Raw data input library includes two fields (Library Metadata Path and Libref) that specify the SAS library metadata path and the corresponding libref for the appropriate adapter database. You can enter the library metadata path and the corresponding libref. Alternatively, you can click Browse and select the library metadata object from a dialog box that also populates the libref field with the corresponding libref. This parameter does not have a default value.

Note: For VMware Data Acquisition, this parameter supports only libraries with engine types of ODBC, OLE DB, Oracle, and SQLSVR.

• Age limit for data acquisition table (in days) specifies the number of days that data is kept in the data acquisition table that populates the staged tables. The default value is 7.

The target table that is created is a staged table. It should be used as input to the VMware vCenter staging transformation. When this staged table is read in to the VMware vCenter staging transformation, it is merged with other VMware tables by the VMware vCenter staging transformation. This merge occurs during the nightly staging run for that adapter.

The VMware Data Acquisition staged table has its own library. The Adapter Setup wizard creates the two staging libraries—one for the VMware Data Acquisition table, and the other library for the other VMware vCenter staged tables. (If created by the Adapter Setup wizard, then these tables and libraries reside in the Staging folder of the
Preserving Information about the VMware Environment

The VMware DataAcquisition staged table is written from the VMware Data Acquisition staging job. It contains useful information about the topology of the VMware environment when the VMware Data Acquisition staging job was run. The topology of the VMware environment includes the names and IDs of each guest, and the host and cluster to which each guest belongs.

You might want to preserve this information over a period of time. If so, you can instruct the VMware Data Acquisition staging job to create a separate data set to contain this information—the VMwareTopologyDimensionTable. To specify the creation of the VMwareTopologyDimensionTable, add the following line to the generated code (or deployed job code) for the VMware Data Acquisition staging job:

```r
%let CreateTopologyDimensionTable = YES;
```

The table is stored in the same staging library as the DataAcquisition staged table that is written from the VMware Data Acquisition staging job. The VMwareTopologyDimensionTable can be registered in the metadata so that it is available along with the other staging tables.

*Note:* Schedule the VMware Data Acquisition staging job to run as often as necessary to capture the information about the movements of guests between hosts and clusters in the VMware environment.

You can use this table as required at your site. The table is not used by the VMware staging code.

When Should the VMware Data Acquisition Job Run?

The VMware Data Acquisition job should be scheduled to run whenever it is necessary to capture the movements of virtual machines across physical machines in your VMware environment. If your environment changes rapidly, then the VMware Data Acquisition job might need to run as frequently as once an hour. However, if the virtual machines in your environment do not move between hosts as often, then the VMware Data Acquisition might need to run only once per day. This scheduling is dependent on, and should be arranged according to, the needs of your site.

For information about deploying jobs, scheduling jobs to run in batch mode, and redeploying jobs, see “Jobs That Process IT Data” on page 365.

Enabling Access to the VMware vCenter Server Appliance (vCSA) Postgres Database

Introduction to Enabling Access to the vCSA Postgres Database

**Background**

SAS IT Resource Management provides access to external vCenter databases through SAS Access to Oracle and SAS Access to Microsoft SQL Server engines. These engines access the vCenter database in Read-Only mode and copy the tables and views that are
needed by SAS IT Resource Management. Customers typically configure SAS IT Resource Management to access their operational vCenter external databases directly through some create mirrored copies of the vCenter database.

Note: Even for very large vCenter databases, SAS Read-Only access can copy the necessary tables in only few minutes.

Starting with vSphere 5.0U1, vCSA provides an option to use vPostgres (a VMware-flavored PostgreSQL) as its embedded database implemented as a closed system. For that reason, VMware publishes no guidance on how the vCenter Postgres database can be accessed directly or mirrored. In exploring the vCSA embedded PostgreSQL database however, the SAS IT Resource Management team discovered a method that, though not sanctioned by VMware, enables the adapter to connect to the vCSA vPostgres server.

How to Enable Remote Access to the PostgreSQL Server and Collect Raw Data for Input to SAS IT Resource Management

Enabling Remote Access to the PostgreSQL Server
To connect to the database remotely, perform the following steps:

1. Modify the Postgres configuration to allow remote access.
2. Modify VMware's firewall to allow incoming Postgres connections.
3. Create the read-only Postgres user.
4. Check the database connection.

CAUTION: These procedures are not supported by VMware. However, the instructions were successfully tested using VMware 6.5 and 6.0. They also work using VCSA 5.5.

Modify the Postgres configuration to allow remote access.

1. To enable your IP to connect to the PostgreSQL server, enter this command:
   ```bash
   vim /storage/db/vpostgres/pg_hba.conf
   ```
   Then, add the following code to the bottom of that file:
   ```
   host all all 1.2.3.4/24 md5
   ```
   In this code, replace 1.2.3.4/24 with the actual IP address or range of addresses (for example, 192.168.1.0/24). Alternatively, replace 1.2.3.4/24 with the server instance or ITRM server from which you want to access the database and run the SAS IT Resource Management adapter.

2. To ensure that the listen_addresses directive is properly configured, enter this command:
   ```bash
   vim /storage/db/vpostgres/postgresql.conf
   ```
   Note: If this directive is not present, then add the following code to the file:
   ```
   listen_addresses = '*'
   ```

3. To restart Postgres to apply changes, enter this command:
   ```bash
   /etc/init.d/vmware-vpostgres restart
   ```
   If the Postgres service does not restart properly, you can access the database connection errors by using the PGAdmin tool. For information about possible error
messages, navigate to “Connection errors” at this location: https://www.pgadmin.org/svnrepo/pgadmin3-1.20/docs/en_US/_build/html/connect-error.html#connect-error.

To start (not restart) the Postgres Services, use following commands:

```
/opt/vmware/vpostgres/9.4/bin
sudo -u vpostgres ./pg_ctl -D /storage/db/vpostgres status
sudo -u vpostgres ./pg_ctl -D /storage/db/vpostgres stop -m fast
sudo -u vpostgres ./pg_ctl -D /storage/db/vpostgres start
```

**Modify VMware’s firewall to allow incoming Postgres connections.**

4. Enter this command:

```
vim /etc/vmware/appliance/firewall/vmware-vpostgres
```

Then make sure that this file contains the following code:

```json
{
    "firewall": {
        "enable": true,
        "rules": [
            {
                "direction": "inbound",
                "protocol": "tcp",
                "porttype": "dst",
                "port": "5432",
                "portoffset": 0
            }
        ],
    },
    "internal-ports": {
        "rules": [
            {
                "name": "server_port",
                "port": 5432
            }
        ]
    }
}
```

5. To reload the firewall, enter this command:

```
/usr/lib/applmgmt/networking/bin/firewall-reload
```

**Create the read-only Postgres user.**

6. Log on to Postgres as the superuser account.
   
   • For the 6.0 database version, enter this command:
     
     `/opt/vmware/vpostgres/9.3/bin/psql VCDB -U postgres`
   
   • For the 6.5 database version, enter this command:
     
     `/opt/vmware/vpostgres/9.4/bin/psql VCDB -U postgres`

7. Create the role and grant the minimum necessary privileges by using the following SQL statements:
create role "vcenterVA_RO1" login password 'my_password';
GRANT CONNECT ON DATABASE "VCDB" TO "vcenterVA_RO1";
GRANT USAGE ON SCHEMA vc TO "vcenterVA_RO1";
GRANT SELECT ON ALL TABLES IN SCHEMA vc TO "vcenterVA_RO1";

8. As an alternative to the previous step, you can use the randomly generated password for your database user. To do so, navigate to `/etc/vmware-vpx/vcdb.properties`.

In this file, you can find the database user name `vc` and its password.

Figure A15.2  Example Showing the User Name and Password

![Image of vcdb.properties file]

Check the database connection.

After the previous steps are completed successfully, use the PGAdmin tool to check the database connection. To do so, perform the following steps:

9. Open PGAdmin and register the new server to establish a new connection to the database.

10. Specify values in the Name and Host fields. (Enter the user name and password that you used when creating the Postgres user in the previous list of steps.)

11. Deselect the Store Password check box.
Register the New Server

**Note:** Attempting to connect from an external machines or an IP address cannot work without modification to postgresql.conf and pg_hba.conf. For information about making the required modifications, see “Modify VMware's firewall to allow incoming Postgres connections.” on page 740. For information about possible error messages, navigate to “Connection errors” at this location: https://www.pgadmin.org/svnrepo/pgadmin3-1.20/docs/en_US/_build/html/connect-error.html#connect-error.

**Collecting Raw Data for Input to SAS IT Resource Management**

**Note:** You can access the vCenter Server Appliance Postgres database for use by SAS IT Resource Management in the same way it accesses these vCenter external databases. For more information, see “VMware vCenter - Accessing Data” on page 731.

To configure access to VMware raw data in PostgreSQL Server database, perform the following steps: you must obtain information about the database. Then you can configure ODBC on the SAS server and create the SAS library for the VMware raw data.

1. Configure ODBC on the SAS server.
2. Create the VMware Rawdata SAS Library.
3. Create a New External Database Server.
Configure ODBC on the SAS Server

1. Navigate to the Drivers tab of the ODBC Data Source Administrator. Verify that the PostgreSQL Server ODBC driver, PostgreSQL ANSI(x64), is available.

   Figure A15.4 List of ODBC Installed Drivers

   ![List of ODBC Installed Drivers](image)

   An ODBC driver allows ODBC-enabled programs to get information from ODBC data sources. To install new drivers, use the driver's setup program.

2. Configure the data source.

   a. a) On the System DSN tab, click Add to open the Create new Data Source window. Select PostgreSQL Server.

      Figure A15.5 Create the New Data Source

      ![Create the New Data Source](image)
Note: The Unicode version of the driver does not work with the SAS IT Resource Management adapter.

b. Click Finish to create the new data source. The setup screen for the new data source appears.

c. As shown, below, enter the appropriate information in the following fields:
   • Database
   • Server
   • User Name
   • Password

d. Click Test to verify your entries. Correct any entries that are incorrect. When the “Connection successful” message appears in the information box, proceed to create the VMware raw data SAS library.

Create the VMware Rawdata SAS Library

To create the VMware raw data library, you must first create an ODBC library.

5. Log on as the unrestricted user to SAS Management Console connected to your SAS server. Invoke the New Library Wizard to create a new ODBC Library.

Figure A15.6 New Library Wizard

6. Provide the following information. (Click Next to navigate through the wizard.)
   • Enter a name for the database server (for example, VMware).
   • Enter the library name as VMware.
   • Select the SAS Application server.
   • Enter vmware in the libref field.

7. Click Advanced Options. Click Other Options to add any database-specific options. Then, click OK.
8. On the next screen, click **New** to create a new database server.

**Create a New External Database Server**

9. On the New Server Wizard page, enter a name for the database server (for example, *Vmware*).

**Figure A15.7  New Server Wizard**

10. On the next page, enter the server properties as shown on the following display.

**Figure A15.8  Server Properties Page of the New Server Wizard**

11. On the next page, specify the ODBC data source. (This name should be one that you specified when configuring the ODBC library.)
12. Click **New** to specify the name of the authentication domain. Click **OK**.

**Figure A15.10  New Authentication Domain**

13. On the next page, review the settings that you entered. Click **Finish** to create the new Database Server.
14. On the next page, review the settings and revise as necessary. Click **Finish** to create the new library.

**Specify a New Authentication Domain**

15. Select **User Manager** and choose the user for whom you want to add the new authentication domain.

   *Note:* The new authentication domain can be added for a group, if needed.

16. Select the **Account** tab and click **New** to display the **Edit Login Properties** window.

   As shown below, enter the **User ID** and **Password** credentials along with the **Authentication Domain**.

   **Figure A15.12  Edit Login Properties**

17. Click **OK** to complete the specification of the authentication domain. The library **VMware** is now available. It can be used to specify the **Rawdata** field when you set up a VMware IT Data Mart.
Recommended Reading

- *SAS IT Resource Management 3.8: Overview*
- The "Administering SAS Enterprise Guide" chapter in *SAS 9.4 Intelligence Platform: Desktop Application Administration Guide*
- *SAS IT Resource Management 3.8: Reporting Guide*
- *SAS IT Resource Management 3.8: Report Center Guide*
- *SAS IT Resource Management 3.8: Migration Guide*
- *SAS 9.4 Intelligence Platform: Overview*
- *SAS 9.4 Management Console: Guide to Users and Permissions*

For a complete list of SAS publications, go to [sas.com/store/books](http://sas.com/store/books). If you have questions about which titles you need, please contact a SAS Representative:

SAS Books
SAS Campus Drive
Cary, NC 27513-2414
Phone: 1-800-727-0025
Fax: 1-919-677-4444
Email: sasbook@sas.com
Web address: [sas.com/store/books](http://sas.com/store/books)
Recommended Reading
Index

Special Characters
%RMDELPVT macro 586
%RMDUPCHK macro 590
equation 594
notes 593
options 592
required arguments 591
syntax 590
%RMDUPDSN macro 594
equation 594
notes 594
required arguments 594
syntax 594
%RMDUPINT macro 595
equation 595
notes 595
syntax 595
%RMDUPUPD macro 596
equation 596
notes 595, 596
syntax 595
%RMMSBMCP macro 596
options 597
required arguments 597
syntax 596
%RMMSDTPS macro 598
options 599
required arguments 599
syntax 598
%RMMSSCOM macro 604
%RMMSNSNMP macro 608
options 609
required arguments 609
syntax 608
%RMPROINT macro 610
equation 614
notes 611
options 610
required arguments 610
syntax 610
%RMRUNETL macro 615
options 616
required arguments 615
running an overall job 385

syntax 615

A
access command 479
adapter and domain category
specifications 551
Adapter Setup wizard 43
about 257
accessing and navigating 259
advantages of 258
aggregation jobs and objects created by
creating jobs 260
creating metadata for aggregation tables 283
deploying and running jobs created by 147
determining if reporting jobs will be
created by 283
domain categories 287
generating jobs 366
information map filters created by 322
information map jobs and objects
created by 282
information map objects created by 320
IT data processing 366
jobs created for domain categories 525
jobs types created by 273
libraries created by 285
log file created by 286
naming conventions 258
naming information map filters 322
naming information map objects 321
purpose of 4
renamed Quick Start wizard 16
reporting jobs and objects created by
283
staging jobs and objects created by 277
steps to complete 259
storing generated objects 275, 368
storing information map objects 321
adapter-based subfolders 54
adapters 16, 65
external names 136
MXG based, filerefs for 386
staging data 74
staging parameters for 489
supported 397
template tables 75
types of 66, 397
Admin library 53
age limit, for data acquisition table 479
aggregating staged tables 11
aggregation concepts 549
jobs created by Adapter Setup wizard 279
table groups and time periods 550
wizards 44, 148
aggregation table wizards 44
aggregation tables 145
adding columns 186
cloning 184
computed columns in 135
creating metadata with Adapter Setup wizard 147
creating metadata with aggregation wizard 148
creating with New Aggregation Table through Templates wizard 182
deleting filters from 205
deleting from Aggregation transformation 189
deleting from IT data marts 190
editing 191
erasing 190
generating physical aggregation table 149
indexing 195
libraries for 286
modifying 191
properties 149
publishing 194
purging data from process flow diagram 194
purging data on IT Data Marts tab 194
renaming 195
setting up Aggregation transformation in process flow diagram 157
simple 145
summarized 145
Aggregation transformation 11, 16
Aggregation transformation filters 202
accessing ITRM Options tab 203
defining 203
deleting 204
Expression Builder and 206
modifying 205
Aggregation transformations 11, 198
creating metadata with aggregation wizard 148
deleting aggregation tables from 189
deleting from jobs 202
properties 198
renaming 202
setting up in process flow diagram 157
aggregations
key metrics 562
naming conventions 573
tips for working with 652
aggregations by time period 279, 280
Aggregations through Template 44
aging
options for summarized aggregation tables 162
specifying criteria 163
analysis columns
creating statistics for 165
applications data sources 68, 399
architecture 9
ASG TMON2CIC adapter, customizations 454
ASG TMON2CIC staging parameters 489, 490
ASG TMONDB2 staging parameters 491
ASG TMONDB2 V5 staging parameters 492
ASUMCICX
customizations for the CICS domain category 452
customizations for the DB2 domain category 452

B
backing up SAS Metadata Repository 28
backup process 640
backups
data 641
metadata 641
process 640
reports 642
SAS Metadata Repository 26
Base SAS sessions
browsing metadata repository from 28
Basic Properties pane 39
batch jobs 379
batch maintain table command
eamples 94
for UNIX 96
for Windows 95
for z/OS 96
options 92
syntax 92
batch mode
deploying jobs for 21
BMC Mainview IMS staging parameters 493
BMC Perf Mgr
extracting raw data 410
preparing raw data 410
raw data 410
staging parameters 494
Windows domain category 551

C
CA TMS
staging parameters 495
CA TMS adapter
customizations for the Jobs domain category 453
case-sensitive delimiter string 484
change management 34
character data, gathering with snmpwalk 488
Checkout tab 34
Checkouts tree 39
class columns 480
class columns, for summarized aggregation tables 164
client
See SAS IT Resource Management client
client tier 9
client tier components 392
collecting raw data 10
collectors 16
columns
See also computed columns
computed 178
deleting from indexes 197
deleting from staged tables 132
external names of columns in staged tables 136
importing into staged tables 131
in staged tables 133
in template tables 79
labeling 548
modifying properties in staged tables 132
removing join columns 178
specifying join columns 176
specifying ranking for 173
computed columns 99, 178
adding 178
adding to a table 101
adding to staged tables 131
deleting 181
in aggregation tables 135
in data model 548

D
data acquisition table
age limit for 479
data administrators
architecture and basic principles for 9
data base adapters
accessing raw data 431
data columns
adding to staged tables 130
data marts
See also IT data marts
archiving 651
deleting 60, 61, 652
managing 651
storing 651
tips for working with 651
data model 548
adapter and domain category
specifications 551
aggregation key and ranked metrics 550
aggregation table groups and time periods 550
features 548
staging and aggregation concepts 549
data row 488
data sets, control 539
data sources 66, 397
supported adapters 397
user-written 74, 405
data, backing up 641
database adapters
duplicate-data checking 432
preparing for staging 431
date values
National Language Support (NLS) 15
datetime values
National Language Support (NLS) 15
debug 482
debugging 647
  additional execution-time 649
    Java objects for 650
  standard execution-time 649
default duration 480
delimiter characters 480
delimiter in raw data 481
delimiter string 481
delimiter type 488
deploying jobs 377
  adding locations for 21
  allocating raw data file externally 386
  created by Adapter Setup wizard 288
  redeploying 383
  redeploying all jobs on server 384
desktop 35
detail aggregated tables 281
detail aggregation tables 280
detail tables 11
detail-level data 16
documentation 13
domain categories 287
  jobs created by Adapter Setup wizard 525
  specifications 551
DT Perf Sentry
  accessing raw data 414
  Exchange domain category 552
  extracting raw data 415
  preparing raw data for staging 414
  Server domain category 552
  staging parameters 498
DT Perf Sentry with MXG
  staging parameters 500
duplicate-data checking 481, 538
  control data sets for 539
  examples 543
  implementing 541
  implementing macros for 540
  overview 537
  user-written staging code 543
duplicate-data report 538
duration
  default 480
  duration, presummarization 485

E
endfile 482
existing users, adding 19
Expression Builder 206
  accessing 101
    IT Formulas tab 101
  external filename 482
  external names
    changing for table or variable 137
  for MXG adapters 138
  of staged tables and columns 136
  per adapter 136
  viewing for columns 137
  viewing for tables 137

F
filerefs for MXG based adapters 386
filters
  Aggregation transformation filters 202
  deleting from aggregation tables 205
  information map filters 322, 323
  selecting for summarized aggregation tables 161
Folders tree 38
formats
  National Language Support (NLS) 15
formulas 99
  accessing 100
  consequences of changing 105
  copying 103
  creating 100, 102
  creating with New Formula wizard 102
  deleting 104
  in data model 549
  modifying 104
  renaming 106
  usage 99
FTP 482
future data 483

G
galleries 4
  groups of users, adding 18
  guessing rows 483

H
header row 484, 489
Help 14
host 482
HP Perf Agent
  domain categories 553
  raw data 419
  staging parameters 502
HP Reporter
  domain categories 553
  staging parameters 503
HP Reporter adapter
  duplicate-data checking for 542

I
IBM DCOLLECT
staging parameters 504
IBM EREP
staging parameters 506
IBM SMF
staging parameters 507
IBM SMF custom tables 447
IBM TPF
staging parameters 509
IBM VMMON
staging parameters 510
icons, for objects 47
ID columns
for summarized aggregation tables 164
ID variables
allowing duplicates 479
idvar 484
IMACEXCL
customizations for the CICS domain category 452
customizations for the DB2 domain category 452
IMACINTV
customizations for Jobs domain category 452
IMACOWT
customizations for the CICS domain category 453
customizations for the DB2 domain category 453
IMACSHFT
customizations for RMF 451
IMACSPIN
customizations for Jobs domain category 452
IMACUOW
customizations for the CICS domain category 453
customizations for the DB2 domain category 453
IMACWORK
customizations for RMF 451
importing columns into a staged table 131
indexes 153, 195
accessing 196
creating 196
deleting 198
deleting columns from 197
indexing aggregation tables 195
renaming 198
information map filters 323
accessing 323
adding 325
benefits of 323
created by Adapter Setup wizard 322
deleting 327
modifying 326
naming 322
information map jobs, created by Adapter Setup wizard 282
information map objects
generated by Adapter Setup wizard 320
naming 321
storage by Adapter Setup wizard 321
Information Map Parameters tab 324
Information Map transformations 310
accessing properties of 312
creating 312
deleting from jobs 318
errors running 332
modifying 316
properties 310
specifying 312
user-specified 312
information maps 308
accessing in SAS Information Map Studio 329
benefits of using 308
creating 309
creating with SAS Information Map Studio 330
deleting 319
deleting items in 330
error opening or accessing data from 331
generating 12
lengthy processing time 331
modifying items in 330
naming conventions 576
not appearing in IT Data Mart folder 331
permissions for 18
renaming items in 330
SAS Information Map Studio 328, 655
storage of 309
testing 330
tips for working with 655
troubleshooting 331
updati ng from a template 319
input file parameters 484
installation and configuration 656
insufficient disk space 142
int 484
intermediate control data sets 539
intermediate staging view 488
Inventory tree 38
IT data
jobs for processing 365
processing with Adapter Setup wizard 366
processing without Adapter Setup wizard 369
IT Data Mart folder
information maps not appearing in IT data mart objects  53
accessing  52
creating  52, 58
deleting  60
IT data marts  16, 51
contents of  53
IT data marts tree  38
deleting tables from  373
deleting tables with contents  374
pursuing tables from  375
IT Formulas tab  101
IT Resource Management (ITRM)  10
IT Data Marts tab  38
pursuing data from aggregation tables  194
IT Data Mart wizard  52
populating  53
promoting  63
IT Data Marts  38
pursuing tables of  62
renaming  62
storage location  52
IT Data Marts tree  38
pursuing tables from  373
pursuing tables from aggregation tables  194
IT Formulas tab  101
IT Resource Management (ITRM)  10
ITRM  4
See SAS IT Resource Management (ITRM)
ITRM Options tab  203
Properties dialog box  203
ITRM Report Center  4
itrmusers group  18
J
JES  484
JES log on  40
job deployment, adding locations for  21
job deployment, creating  260
job failure, recovering  640
job properties  41
jobs  28
See also Adapter Setup wizard
adding an existed staged table to  128
adding transformations to  372
created by Adapter Setup wizard  273
created by Adapter Setup wizard, for
domain categories  525
creating  370
creating with Adapter Setup wizard  260
deleting  371
deleting Aggregation transformations from  202
L
libraries created by Adapter Setup wizard  285
library for temporary work space  485
locating data  135
locale  15
logon  32
log files created by Adapter Setup wizard  286
LSPR tables  458
working with  458
M
machine name  485
macros  583
Maintain Staged Tables wizard 44
about 84
using across all IT data marts 91
using to update tables within an IT data mart 85
working with 84
maintaining staged tables about 91
in batch mode 91
management information base (MIB) definitions 429
memory client and server issues 28
SAS IT Resource Management metadata server 28
memory issues client 28
memory management server 28
metabrowse command 28
metadata 24
accessing ITRM metadata 27
backing up 641
backing up and restoring SAS Metadata Repository 26
browsing repository from Base SAS sessions 28
creating for aggregation tables 147
creating with Adapter Setup wizard 147
creating with aggregation wizard 148
exploring SAS Data Integration Studio metadata repository 27
generating for transformations 369
supplied 25
system authentication when logging on to SAS Metadata Repository 26
metadata repository
See also SAS Metadata Repository from Base SAS sessions 28
SAS Data Integration Studio 27
metadata server
See also SAS Metadata Server logging on to 26, 32
memory issues 28
Microsoft Office products 6, 13
middle tier 9
middle-tier components 392
migration wizard 24
minimum number of files 485
MIPS and MSU columns
calculation dependencies 457
calculations 467
including in staged tables 457
initializing 458
preparing 458
staging methodology 463
MS SCOM
Server-Based domain categories 554
staging parameters 511
MS SCOM adapter
duplicate-data checking for 542
preparing raw data 436
multi-tier processing 9
MXG
accessing raw data 405
code 450
MXG adapters
external names for 138
filerefs for 386

N
names
external names for MXG adapters 138
external names of staged tables and columns 136
naming conventions
Adapter Setup wizard 258
aggregations 573
information map filters 322
information map objects 321
information maps 576
ITRM objects 573
object locations and reporting 578
staging 578
National Language Support (NLS) 15
New Aggregation Table through Templates wizard
creating aggregation tables 182
New Formula wizard 43
creating formulas 102
New IT Data Mart wizard 43, 52
creating IT data marts 52
invoking 52
new users, adding 19
normalize datetime 485
number of processors 485
objects created by Adapter Setup wizard 277, 279
icons for 47
naming conventions and location of 573
naming conventions for 573
online Help 14

password 482
PDB 16
percent change
for a statistic 170
specifying for summarized aggregation tables 169
percentiles
specifying for summarized aggregation tables 168, 171
permanent control data sets 539, 540
permissions
for information maps 18
port 482
presummarization duration 485
process flow diagrams
deleting tables from transformations 373
deleting tables with contents 374
purging data from aggregation tables 194
purging tables from transformations 375
setting up Aggregation transformation in 157
process macros 16
processing raw data 11
properties
aggregation tables 149
Aggregation transformations 198
columns in staged tables 132
Information Map transformations 310, 312
job properties 41
staged tables 120
staging transformations 114
table properties 42
User-Written Staging transformation 362
Properties dialog box 39
ITRM Options tab 203
purging
contents of aggregation tables 194
data from aggregation tables from process flow diagram 194
data from aggregation tables, on IT Data Marts tab 194
options specifying for summarized aggregation tables 162
specifying criteria 163
tables from IT Data Marts tree 375
tables from transformations in process flow diagrams 375

QuickStart wizard 16

ranked metrics 550
ranking
deleting rank columns 176
for summarized aggregation tables 172
specifying for a column 173
raw data
adapters and 65
allocating files externally 386
collecting 10
delimiter in 481
input directory 486
input file 486
input library 486
input type 479
processing (staging) 11
staging 110
type 479
rcmd 482
redeploying jobs 383
reduction macros 16
renaming
aggregation tables 195
Aggregation transformations 202
formulas 106
indexes 198
IT data marts 62
items in information maps 330
jobs 375
User-Written Staging transformation 358
report option 486
reporting
naming conventions 578
web-based 13
reporting jobs
created by Adapter Setup wizard 283
reports
backing up 642
defining and generating for summarized data 12
viewing 12
resources
  collecting raw data about 10
restoring SAS Metadata Repository 28
RMFINTRV
  customizations for RMF 451
RDDtool
  staging parameters 512
rdtool executable 486
rdtool fetch end option 486
rdtool fetch start option 487
RSH/SSH host command 487
running jobs 375
  immediately 376
  in batch 379
  running an overall job with
%RMRUNETL macro 385
Runtime Manager pane 41

S
SAP ERP
  staging parameters 513
SAP ERP adapter
  accessing raw data 437
  preparing raw data 437
SAPR3
  Batch Job and Workload domain
categories 555
  Systems, Machines, Tasks, and
Transactions domain categories 554
SAR
  accessing raw data 422
  extracting raw data 423
  preparing raw data 422
SAR domain category 555
  staging parameters 514
sar command
  using 423
SAS Add-In for Microsoft Office 6, 13
  metadata 25
SAS Business Intelligence Platform 5
SAS Data Integration Studio 5, 31, 74, 405
  configuring data extraction jobs 438
  exploring metadata repository 27
  metadata 25
  tips for working with 651
  with plug-ins for 25
  wizards supplied by 45
SAS Enterprise Guide 5
  accessing SAS Metadata Repository 22
  metadata 25
  migrating projects 24
  setting up for data 22
  working with 22
SAS Environment Manager 41
  staging parameters 515
SAS Environment Manager adapter
  accessing raw data 440
SAS EV
  staging parameters 515
SAS Information Delivery Portal 6
SAS Information Map Studio 6, 328, 655
  accessing 328
  accessing information maps in 329
  benefits of 328
  creating information maps 330
  modifying, renaming, or deleting items
  in information maps 330
  overview 328
  testing information maps 330
SAS IT Resource Management
  data model 548
  documentation 13
  logging on to SAS Metadata Server 26
  metadata server memory issues 28
  tips for installing and configuring 656
SAS IT Resource Management (ITRM) 3
  architecture 9
  basic principles and components 10
  components 391
  features 4
  functionality 4
  starting 10, 32
  terminology changes 16
  wizards supplied by 43
SAS IT Resource Management client 31
  features 35
  logging on to metadata server 32
SAS Management Console
  accessing 18, 433
  adding locations for job deployment 21
  adding users and groups of users 18
  creating SAS metadata objects 438
  introduction to 17
  metadata 25
  Schedule Manager 380
  working with 17
SAS Metadata Repository 6
  accessing for SAS Enterprise Guide 22
  backing up and restoring 26, 28
  from Base SAS sessions 28
SAS Data Integration Studio 27
  system authentication when logging on
to 26
SAS Metadata Server
  logging on to 26
  logging on to from SAS IT Resource
Management 26
  memory issues 28
SAS Statistics and Econometric Time
  Series 5
Index

SAS Visual Analytics
  metadata 25
SAS Web Report Studio 6, 13
  metadata 25
Schedule Manager
  scheduling jobs 380
  scheduling
    deploying jobs for 377
    jobs to run in batch 379
    with built-in or third-party scheduler 379
  scheduling jobs
    with Schedule Manager 380
server
  performance metrics 564
server tier 9
server tier components 391
servers
  redeploying all jobs on 384
  simple aggregation tables 44, 145
    creating with Simple Aggregation Table
    wizard 158
  data 16
Simple Aggregation wizard 44
simple aggregations 11
site name 487
SMF
  CICS domain category 559
  DB2 domain category 560
  Jobs, TSO and OMVS domain
    categories 558
  limiting records 456
  RMF domain category 557
SNMP
  accessing raw data 424
  device type lookup table 428
  extracting raw data 425, 426
  Network Activity, Device and Interface
    Data, and System Data domain
    categories 560
  sources of raw data 424
  staging parameters 516
  using HP NNM tools to extract data
    425
  using round-robin tools to extract data
    426
snmpwalk 488
source 487
spin libraries 286
  specifying for ASG TMON2CIC 455
  specifying for IBM SMF 455
Staged Table wizard 45
staged tables 119
  adding a new computed column to 131
  adding a new data column to 130
  adding an existing table to a job 128
aggregating 11
  columns in 133
  computed columns in 134
  creating 121
  creating from template tables 84
  deleting columns in 132
  deleting from a tree view 129
  deleting from jobs 129
  erasing 128
  external names of 136
  IBM SMF custom tables and 447
  importing column from another table
    into 131
library for 286
  modifying 130
  modifying column properties in 132
  properties of 120
  purging content of 130
  task list for 121
  versus template tables 77
staging
  naming conventions 578
  raw data 11
staging and aggregation concepts 549
staging code, user-written 69, 400
See also User-Written Staging
transformation
staging data 110
  columns in staged tables 133
  computed columns in staged tables 134
  external names of staged tables and
    columns 136
  insufficient disk space 142
  methods for 110
  reasons for 110
  staged tables 119
  staging transformations 111
  VMware 135
  with MXG code 450
staging jobs
  adding staging transformations to 115
  created by Adapter Setup wizard 277
staging parameters 478
  ASG TMONC2CIC adapter 489, 490
  ASG TMONDB2 adapter 491
  ASG TMONDB2 V5 adapter 492
  BMC Mainview IMS adapter 493
  BMC Perf Mgr adapter 494
  CA TMS adapter 495
  CSV adapter 497
  DT Perf Sentry adapter 498
  DT Perf Sentry with MXG adapter 500
  duplicate checking 520
  for supported adapters 489
  HP Perf Agent adapter 502
  HP Reporter adapter 503
IBM DCOLLECT adapter 504
IBM EREP adapter 506
IBM SMF adapter 507
IBM TPF adapter 509
IBM VMMON adapter 510
MS SCOM adapter 511
RRDtool adapter 512
SAP ERP adapter 513
SAR adapter 514
SAS Environment Manager adapter 515
SNMP adapter 516
user-written 489, 520
VMware Data Acquisition adapter 517
VMware vCenter adapter 518
Web Log adapter 519
staging transformations 16, 111
adapters and 74
adding to a staging job 115
deleting 119
editing 119
properties of 114
starting SAS IT Resource Management 10, 32
statistics 681
creating for analysis columns 165
deleting 167, 169, 172
percent change calculation for 170
removing percent change calculation for 170
specifying for summarized aggregation tables 165
storing data marts 651
summarized aggregation data 16
Summarized Aggregation Table wizard
creating summarized aggregation tables 160
summarized aggregation tables 44, 145
aging and purging options 162
completing the specification of 182
computed columns 178
creating with Summarized Aggregation Table wizard 160
deleting multiple columns 167, 169,
170, 172, 176, 178
entering general information about 160
ranking 172
removing join columns 178
selecting filters 161
specifying class and ID columns 164
specifying join columns 176
specifying library information 160
specifying percent change 169
specifying percentiles 168, 171
specifying statistics 165
summarized aggregations 11
summarized data
defining and generating reports for 12
summary level data 16
supplied formulas 99

T
table groups 550
table properties 42
tables
See also aggregation tables
adding to transformations 372
deleting from transformation in process flow diagram 374
deleting, with contents, from IT Data Marts tree 374
erasing from transformations 374
purging from IT Data Marts tree 375
purging from transformations in process flow diagrams 375
purging IT data mart tables 62
staged tables 119
tape 482
template tables 65, 75
adapters and 74
columns in 79
computed columns in 83
ITMS properties for 81
locating 76
properties 78
using 84
versus staged tables 77
viewing 78
temporary control data sets 539
temporary work space library 487
terminology changes 16
testing
information maps 330
time periods 550
timestamps 65
timestamp 487
transformations 11, 46
adding tables to 372
adding to jobs 372
Aggregation transformations 11
deleting from jobs 372
erasing tables from 374
generating metadata for 369
purging tables from process flow diagram 375
Transformations tree 38
Tree views 37
deleting staged tables from 129
trees 37
troubleshooting
information maps 331
UNIX system data sources 68, 400
user 482
user groups, adding 18
user-defined formulas 99
creating 100
user-specified Information Map transformations 312
user-written data sources 74, 405
user-written staging code 69, 400, 543
user-written staging parameters 489
User-Written Staging transformation 333
additional generated code 359
Code tab 362
creating 351
deleting from a job 357
Extended Attributes tab 362
General tab 362
modifying 358
Notes tab 362
Precode and Postcode tab 362
properties 362
renaming 358
staging parameters 520
Staging Parameters tab 362
users
adding 19
users, adding 18
UTILEXCL
customizations for the CICS domain category 452
customizations for the DB2 domain category 452

V
viewing

reports 12
template tables 78
VMware
converting to local time 135
Guest and Host Disk, Network, and System domain categories 561
VMware adapter limiting data in staged tables 733
VMware Data Acquisition staging parameters 517
VMware lookup table working with 734
VMware vCenter staging parameters 518

W
Web Log
accessing raw data 430
all domain categories 561
staging parameters 519
web-based reporting 13
Windows system data sources 68, 399
wizards 43
supplied by SAS Data Integration Studio 45
supplied by SAS IT Resource Management 43

Z
z/OS
additional requirements 29
z/OS data sources 67, 398
Gain Greater Insight into Your SAS® Software with SAS Books.

Discover all that you need on your journey to knowledge and empowerment.

support.sas.com/bookstore
for additional books and resources.

SAS® and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ©2013 SAS Institute Inc. All rights reserved.