

SAS[®] IT Resource Management 3.3: Overview



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SAS® IT Resource Management 3.3: Overview

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About This Book

Audience

SAS IT Resource Management: Overview is intended to address the needs of the following types of users:

Information Consumers

Information consumers are business people who are interested in the overall performance aspects of IT at a company. They need to access IT intelligence reports from the office as well as from remote locations in order to support decision-making. Information consumers often function as system architects, IT managers, and IT executives.

Performance Analysts

Performance analysts understand how to analyze the IT resource measurement data that is managed by data administrators. They analyze this data in order to best benefit the business and to improve the utilization, availability, and performance of IT enterprise resources. To do this, performance analysts use SAS IT Resource Management to design, create, and share reports. They often function as capacity planners, system administrators, and business analysts.

Data Administrators

Data administrators create the analysis and report-ready data sources used by performance analysts and information consumers for the purposes of IT performance management and capacity planning tasks. They accomplish these tasks by setting up jobs to transform IT performance data measurements into actionable data sources from which IT intelligence is derived. They also create and schedule report jobs so that resulting reports are rendered and made accessible in report galleries. Data administrators often function as IT performance managers and capacity planners.

Prerequisites

Prerequisites for using SAS IT Resource Management are:

- An operating environment that includes SAS IT Resource Management software.
- A user ID and password with permissions that are appropriate for that user's use of IT Resource Management functions.
- Depending on your role, you might need direct access to the SAS technologies upon which SAS IT Resource Management is built and which are installed with this solution. If you have questions about this, contact your system administrator.

Recommended Reading

- The "Administering SAS Enterprise Guide" chapter in *SAS Intelligence Platform: Desktop Application Administration Guide*
- *SAS Data Integration Studio: User's Guide*
- *SAS IT Resource Management: Administrator's Guide*
- *SAS IT Resource Management: Reporting Guide*
- *SAS IT Resource Management: Gallery Manager User's Guide*
- *SAS IT Resource Management: Migration Guide*
- *SAS Intelligence Platform: Overview*
- *SAS Management Console: Guide to Users and Permissions*

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Chapter 1

About SAS IT Resource Management

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What Is SAS IT Resource Management?

SAS IT Resource Management is an IT performance management and capacity planning solution that enables the analysis of any IT data source. The solution creates an integrated IT performance data warehouse, delivers and applies the advanced analytic capabilities of SAS to that warehouse for the purposes of IT performance management and capacity planning, and renders the IT intelligence to optimize the IT infrastructure. In addition, the solution leverages the IT performance data warehouse and the SAS product capabilities that are included in the solution for purposes beyond the scope of IT performance management, such as IT financial management or IT service management. With SAS IT Resource Management, IT departments can manage and plan the usage of their resources to provide a stable yet scalable IT environment for current and future operations.

In today's competitive business environment, superior IT operations is a competitive essential. To achieve this superiority, the IT department must deliver enough information about the performance and capacity of IT resources to allow the business's decision makers to understand and evaluate their current consumption of IT. Concurrently, the IT department must solicit information from the leaders of the business about the IT usage and anticipated demands that directly affect the IT infrastructure. As such, the communication of IT performance and capacity information must be in a language and format that is suitable for its intended purpose and audience. IT performance management and capacity planning software facilitates this communication so that the IT

department can plan and implement adjustments to the IT infrastructure. This ensures that the business remains competitive and responsive to its customers.

SAS IT Resource Management renders the results of its IT analysis in reports that communicate many topics of interest, including the following:

- IT performance measurements and analysis over any time period
- comparative performance of IT resources over multiple time periods (for baseline, peak, seasonal, and change analysis)
- peak period identification and analysis of those periods (single and periodic)
- workload analysis for enhanced business processing
- ranked (top, bottom, and so on) resource consumption, availability, and response time measurements
- correlation of performance measurements for root cause analysis
- operational level agreement analysis (for example availability and response time)
- candidate lists of resources that are appropriate for consolidation and virtualization consideration
- forecasted or predicted IT capacity needs
- exhaust prediction for resources
- compliance to regulatory requirements

Unique to SAS IT Resource Management is its ability to facilitate the previously described IT performance management and capacity planning features and to socialize that information by using an application called Gallery Manager. Gallery Manager 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 as logical containers called galleries.

Domain Intelligence Offered by SAS IT Resource Management

Introduction to SAS IT Resource Management Domain Intelligence

SAS IT Resource Management offers a wide variety of reports that provide analytical intelligence about IT resources, all of which are delivered by Gallery Manager.

Gallery Manager is the single source of performance and capacity information about the IT infrastructure. It is designed to deliver IT Intelligence to any individual in an organization that wants that information. For example, see the following gallery that shows one page of a gallery.

This page consists of nine thumbnail graphs, including two tile charts.

Display 1.1 Example of a Daily Reporting Gallery: ITRM Domain Intelligence Gallery

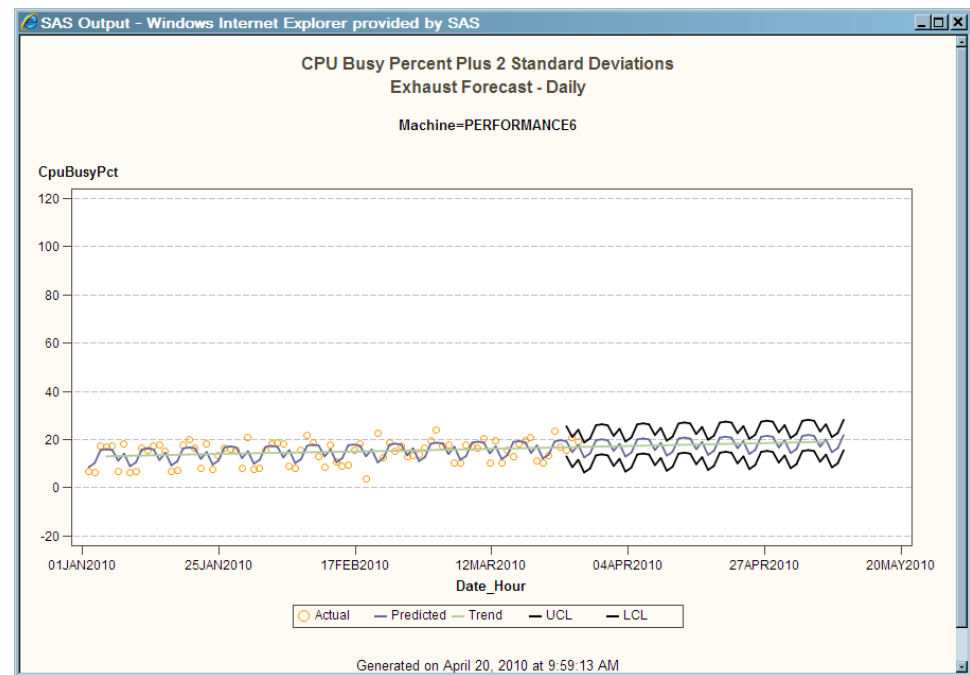


Each of the reports shown in a gallery has a particular value to individuals throughout an organization. The selection of a report type to communicate an IT domain intelligence fact is best made by understanding both the message and the target audience. More than 4,000 unique reports are supplied with SAS IT Resource Management. Each of these reports can be used as is, or copied and edited to satisfy the unique needs of an organization.

Charts to Communicate Forecasts, Predictions, and Analytical Results

Using Charts to Present Analytic Results

SAS IT Resource Management delivers sets of supplied reports that communicate trends, forecasts, predictions, and analytical results. It also delivers SAS analytical calculation and illustration capabilities as well as specific implementations of these capabilities for IT performance management and capacity planning. One such example of these special implementations is the exhaust forecast chart. This type of chart calculates and graphs the amount of time that is predicted for a particular aspect of an IT resource to reach a threshold.

Display 1.2 CPU Busy Percent plus Two Standard Deviation

Example of Using Forecast Charts with Microsoft System Center Operations Manager Data

As illustrated in the preceding exhaust forecast chart, the actual measurements (shown as yellow points) are used to create a forecast for the CPU Busy Percent with 2 Standard Deviations (shown in the purple line). This purple line indicates the variations over the reported time period (in this case, a span of four months) and the forecast (for the next two months). Next, this chart shows the trend line (the green smooth line on the chart). Finally, the upper and lower confidence boundaries are presented as an indication of the accuracy of the predicted and forecasted values presented on the chart.

Using Forecast Charts for Performance Management and Capacity Planning

A primary job function of the capacity manager is to appropriately size the IT enterprise to accommodate the needs of the business that it services in terms of the availability and performance of IT resources. Successfully performing this task requires the capacity planner to:

- provide sufficient resources to run the business
- allocate adequate resources to accommodate business growth and innovation
- eliminate excessive IT resource capacity (as well as the IT personnel effort, physical space, and resources to power that equipment) and the costs that are associated with it

Exhaust reports are an excellent means to accomplish this task. Exhaust reports are possible through the delivery of SAS statistics and advanced analytic capabilities with SAS IT Resource Management. For any IT element for which a fixed capacity exists (such as CPU, disk, memory, bandwidth, and so on), exhaust reports are essential. These reports can predict, with adequate lead time to respond, the exhaustion of those IT resources. Exhaust reports can also be used to anticipate the obsolescence of resources from the IT enterprise. SAS analytics can forecast and predict any aspect of the IT data available from the SAS IT Resource Management solution.

The forecast chart is configured to accommodate the amount of time that will be required to procure, install, and configure additional components to meet the demand for this server to ensure that the IT enterprise sustains the business that it supports.

The preceding example used data from a server to illustrate exhaust reporting. IT performance data from Windows and UNIX systems is derived from many sources. SAS IT Resource Management supports adapters for many of them, including those from HP, BMC, Microsoft, Demand Technology, and many UNIX operating system providers. Therefore, a consolidated IT performance data warehouse, such as the one delivered by SAS IT Resource Management, enables this data to be analyzed in a coordinated and consolidated fashion. SAS IT Resource Management also delivers special key metric summarizations of this data that present the most common measurements for these systems across the multiple adapters that deliver them. This facilitates long-term trending and analysis for and across all systems that are represented in the IT data warehouse.

For more information about key metric summarizations, see “What Are Key Metrics?” in the “Data Model Appendix” in *SAS IT Resource Management: Administrator's Guide*.

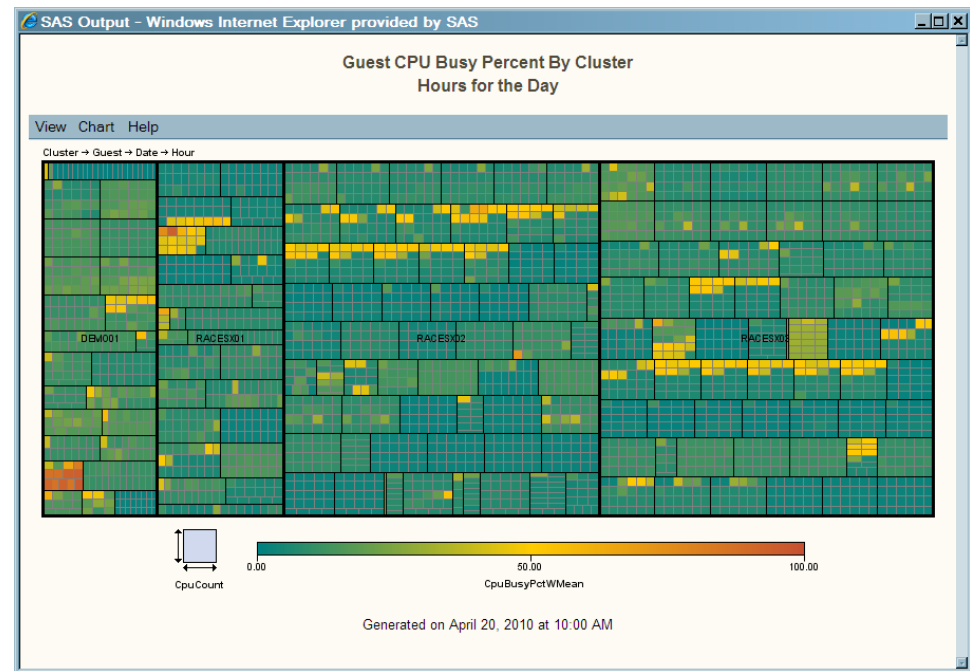
Charts to Evaluate Data from a Large Number of Resources

Using Tile Charts

Tile charts are rectangular maps. (Tile charts are sometimes referred to as *treemaps*.) They enable you to view a large quantity of hierarchical data in a limited space. Each unique category combination is represented by a rectangular tile whose size and color are determined by response variables. These tiles are placed in a hierarchical arrangement. You can drill down into a tile to view it in more detail. You can also link to reports that are associated with tiles.

Using Tile Charts for Performance Management and Capacity Planning

To maximize the performance and capacity of any IT environment, you can create a consolidated IT performance data warehouse and provide the tools to analyze and statistically enrich the data within it. Given this premise, tile charts are ideal for use by performance managers and capacity planners to provide both a first glance and a detailed view that enables the evaluation of large volumes of data. The scenarios that illustrate the value of this report technique include the evaluation of large volumes of data for outlying measurements that are likely indicators of issues that need to be addressed in the IT infrastructure. Tile charts have been used by SAS IT Resource Management customers for consolidating and initializing servers, balancing workloads, creating high availability resource groups in support of critical business processing, orchestrating and defining the cloud, network tuning, and so on.

Display 1.3 Guest CPU Busy Percent by Cluster

Tile charts are used by performance managers and capacity planners to evaluate data from a large number of resources that would otherwise be extremely difficult to work with. In the preceding display, the size of each tile shows the CPU count and the color indicates the CPU Busy Percent weighted mean. This provides an overall status of the VMware environment from a cluster perspective for a period of time. You can drill down to view the guests that are allocated to them.

From this single image, the performance manager can identify the utilization issues that need attention. These issues are easily identifiable because they are represented on the tile chart by boxes with the most intense colors (oranges and reds). Starting with this one quick view, the performance manager can prioritize issues.

Achieving benefits from virtualization technologies lies within the implementation, measurement and management of the clusters, hosts and guests that are established in that environment. By effectively managing the virtual infrastructure, the perception that virtual machines are established without a corresponding cost can be dispelled. By measuring the utilization, availability and performance of this environment, the anticipated value of virtualization can be proven and opportunities to further increase that value can be identified.

Example of Using the Tile Chart with VMware Guest System Data

In the preceding chart, each box represents a VMware Cluster and the VMware guests that are allocated to the Cluster on a particular day, and for each hour of that day.

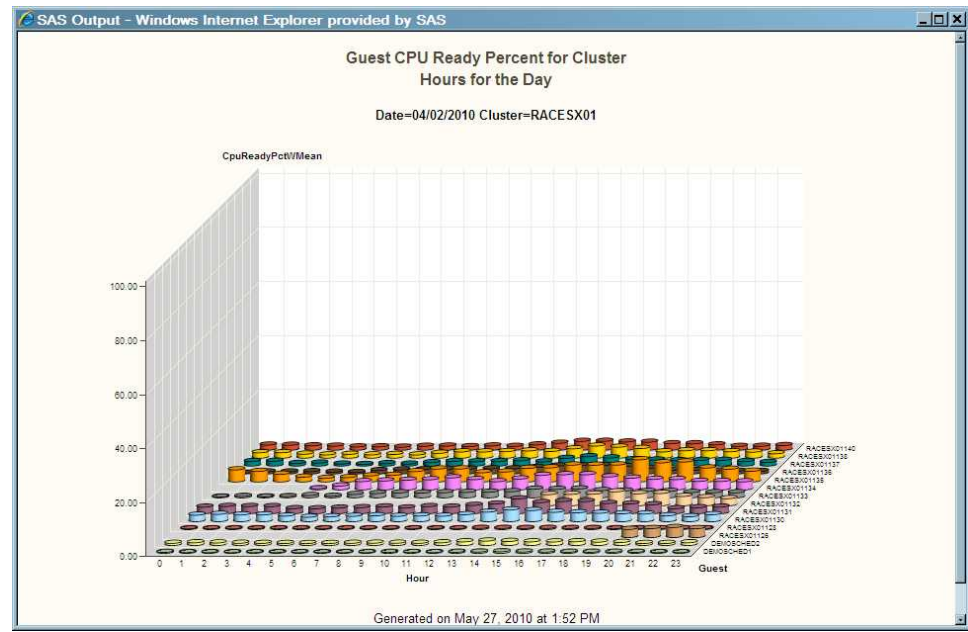
Using Three-Dimensional Bar Charts

Three-dimensional vertical bar charts show the relationships between three variables or statistics.

Using Three-Dimensional Bar Charts for Performance Management and Capacity Planning

Presenting volumes of data from a large quantity of resources with vertical block charts is most useful when the relative magnitude of the bars is more significant than the exact magnitude of any particular bar.

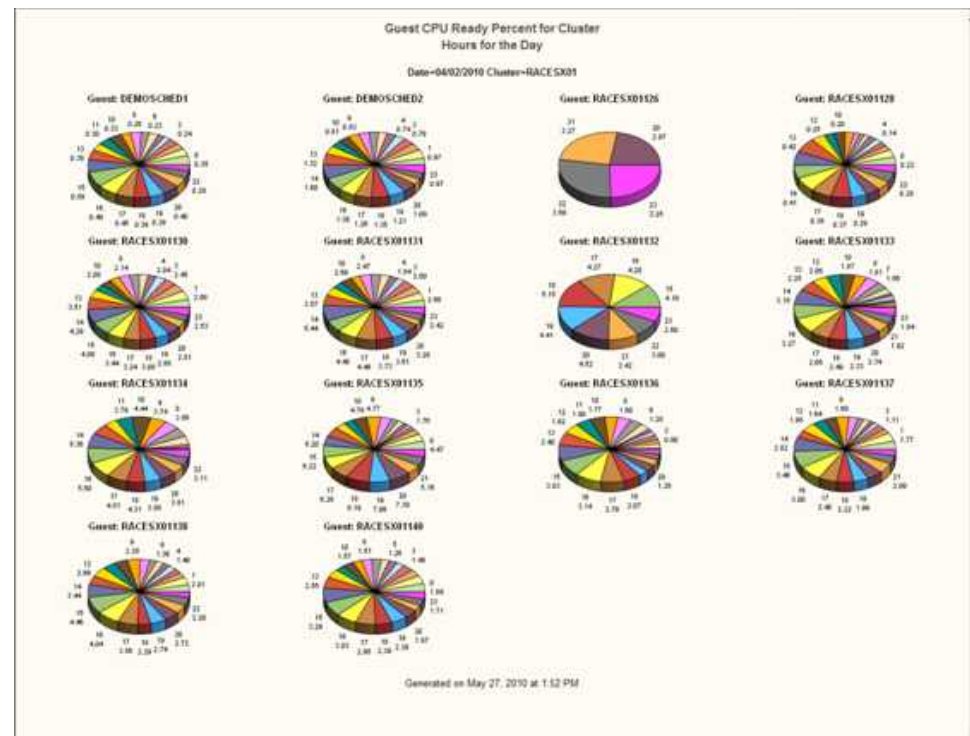
Display 1.4 Three-Dimensional Bar Chart of Guest CPU Ready Percent



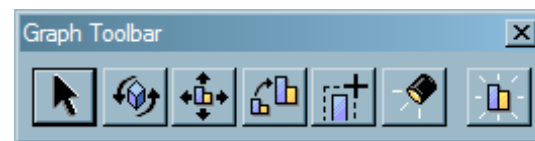
Example of Using Three-Dimensional Bar Charts with VMware vCenter Server Data



In the preceding display, the vertical bar chart shows the CPU Ready Percent for all guests that are allocated to a VMware cluster. In VMware environments, closely monitoring the CPU Ready Percent measurement is critical. This measurement is the percentage of time for which a virtual machine has work that is ready to be performed but for which there is no physical machine ready to process that work. In well-tuned environments, this measurement should never exceed 10%. It should typically be a value of less than 5% in order to ensure that the needs of each of the consumers of virtual resources are satisfied. Any value in excess of this recommendation is cause for additional IT performance evaluation.

For an alternative view of this data, right-click anywhere on the chart to display pie charts for each guest in the cluster. Pie charts create simple, group, or stacked charts that represent the relative contribution of the parts to the whole by displaying data as wedge-shaped "slices" of a circle. Each slice represents a category of data. The size of a slice of the pie represents the contribution of the data to the total chart statistic.

Display 1.5 Pie Charts of Guest CPU Ready Percent

Right-click a pie chart to display the graph toolbar.

Display 1.6 Graph Toolbar

As shown in the preceding display, the graph toolbar provides a button () that enables you to rotate the graph. You can also zoom into the graph by clicking .

The pie charts enable performance and capacity analysts to gain a detailed perspective for a particular measurement that is associated with a designated resource. In the preceding example, if a particular cluster had a guest with a disproportional value for CPU Ready Percent, that value would be easily identifiable in a pie chart view.

Charts for the Detailed Analysis of Resource Measurements

Using Tabular Reports

Tabular reports enable you to generate cross-tabulation tables, also known as *contingency tables*, from your data. Tabular reports are used extensively for communicating performance and capacity information. They typically present measurements in ranked orders to focus the report consumer's attention most appropriately.

Using the Tabular Report for Performance Management and Capacity Planning

For the purposes of IT performance management and capacity planning, tabular reports are good for displaying measurements to view and understand the relationship (cause and effect or correlation) between them. Examples include the analysis of directly related measurements like CPU and Run Queue or Memory and Paging. Tabular reports are also useful for readily identifying suspect performance values that warrant further investigation.

Display 1.7 Tabular Report of RMF Data

SAS Output - Windows Internet Explorer provided by SAS

System CPU Busy Percent and Hardware Msu and Mips by Engine Type
Hours for the Day

Date=04/02/2010 DayOfWeek=Fri Sysplex=DEVAPLEX Machine=DEVA

Hour	Standard Engine CPU Busy Percent Weighted Mean	zAAP CPU Busy Percent Weighted Mean	zIIP CPU Busy Percent Weighted Mean	All Engines CPU Hardware Msu Total	Standard Engine CPU Hardware Msu Total	zAAP CPU Hardware Msu Total	zIIP CPU Hardware Msu Total	All Engines CPU Hardware Mips Total	Standard Engine CPU Hardware Mips Total	zAAP CPU Hardware Mips Total	zIIP CPU Hardware Mips Total	Standard Engine CPU Active Time Total	zAAP CPU Active Time Total	zIIP CPU Active Time Total
23	58.62	9.59	0.00	429.28	412.42	16.86	0.00	3,210.29	3,084.18	126.08	0.03	4:41:23.42	0:11:30.17	0:00:00.17
22	56.58	10.05	0.01	415.70	398.02	17.67	0.01	3,108.70	2,976.53	132.13	0.04	4:31:34.13	0:12:03.28	0:00:00.22
1	34.82	9.93	0.01	262.45	244.98	17.47	0.01	1,962.69	1,832.02	130.63	0.04	2:47:08.84	0:11:55.10	0:00:00.22
9	31.07	21.89	0.42	257.45	218.58	38.49	0.37	1,925.24	1,634.61	287.85	2.78	2:29:08.17	0:26:15.77	0:00:15.22
10	32.03	17.25	0.34	255.98	225.34	30.34	0.30	1,914.29	1,685.12	226.90	2.26	2:33:44.70	0:20:42.11	0:00:12.37
13	29.28	13.43	0.08	229.69	205.99	23.62	0.07	1,717.67	1,540.48	176.66	0.53	2:20:32.90	0:16:07.06	0:00:02.92
8	26.66	12.98	0.22	210.56	187.53	22.83	0.19	1,574.62	1,402.41	170.77	1.44	2:07:57.07	0:15:34.80	0:00:07.89
18	26.15	11.01	0.01	203.32	183.94	19.37	0.01	1,520.46	1,375.54	144.85	0.06	2:05:30.01	0:13:12.94	0:00:00.34
11	23.93	13.07	0.30	191.62	168.37	22.98	0.27	1,432.98	1,259.14	171.86	1.98	1:54:52.76	0:15:40.81	0:00:10.86
20	22.65	9.61	0.00	176.28	159.38	16.90	0.00	1,318.28	1,191.86	126.39	0.03	1:48:44.46	0:11:31.89	0:00:00.17
19	20.89	9.25	0.00	163.24	146.96	16.28	0.00	1,220.78	1,099.02	121.73	0.03	1:40:16.28	0:11:06.36	0:00:00.16
7	18.09	9.74	0.02	144.40	127.26	17.13	0.02	1,079.86	951.65	128.09	0.12	1:26:49.53	0:11:41.20	0:00:00.63
17	17.21	10.34	0.01	139.29	121.08	18.19	0.01	1,041.64	905.49	136.06	0.08	1:22:36.86	0:12:24.80	0:00:00.46
21	17.41	9.34	0.01	138.92	122.49	16.42	0.01	1,038.85	916.01	122.79	0.05	1:23:34.44	0:11:12.15	0:00:00.28
6	17.00	9.41	0.01	136.17	119.61	16.55	0.01	1,018.33	894.47	123.79	0.07	1:21:36.48	0:11:17.67	0:00:00.37
15	16.51	10.73	0.10	135.08	116.12	18.87	0.09	1,010.19	868.36	141.15	0.68	1:19:13.60	0:12:52.67	0:00:03.70
2	16.04	10.55	0.07	131.47	112.85	18.56	0.06	983.17	843.92	138.76	0.48	1:16:59.81	0:12:39.62	0:00:02.64
16	15.71	10.37	0.03	128.75	110.49	18.24	0.02	962.80	826.25	136.37	0.18	1:15:23.08	0:12:26.52	0:00:00.98
4	15.56	10.06	0.00	127.14	109.44	17.70	0.00	950.81	818.43	132.36	0.02	1:14:40.27	0:12:04.55	0:00:00.11
0	15.34	9.05	0.01	123.83	107.91	15.92	0.01	926.06	806.96	119.04	0.06	1:13:37.47	0:10:51.64	0:00:00.31
14	14.14	11.65	0.02	119.97	99.46	20.49	0.02	897.17	743.81	153.20	0.16	1:07:51.77	0:13:58.64	0:00:00.87
12	12.80	10.64	0.01	108.78	90.05	18.72	0.01	813.48	673.45	139.98	0.05	1:01:26.62	0:12:46.30	0:00:00.25
3	12.69	9.31	0.00	105.62	89.24	16.37	0.00	789.84	667.37	122.45	0.02	1:00:53.34	0:11:10.31	0:00:00.08
5	6.65	9.35	0.00	63.20	46.75	16.44	0.00	472.59	349.64	122.93	0.01	0:31:54.02	0:11:12.95	0:00:00.08

For Systems having activity on multiple Engine types
Sorted in descending order by All Engines CPU Hardware Mips Total
The Msu and Mips values reported here are hardware based using CPU time in conjunction with a hardware service unit factor and an Msu to Mips conversion factor
Generated on May 05, 2010 at 12:33:00 PM

Example of Using a Tabular Report with IBM System Management Facility RMF - System Data

The preceding tabular report shows the available CPU Busy, hardware millions of instructions per second (MIPS), hardware millions of service units per second (MSUs), and CPU Active Time for all engine types that are available on a particular mainframe system for each hour of the day. The report includes standard, System z Integrated Information Processor (ZIIP), and System z Application Assist Processor (ZAAP) engine types. The report is sorted by All Engines CPU Hardware Mips Total. It presents the consolidation of key metrics data that is fundamental to managing the CPU performance and capacity of an IBM mainframe system.

The System CPU Busy Percent measurements that were used to create this report came from RMF data. SAS IT Resource Management obtains RMF data through MXG. For other sources of data that are made available to SAS IT Resource Management through

MXG, see Appendix 2, “Supported Adapters,” in *SAS IT Resource Management: Administrator's Guide*.

SAS IT Resource Management accommodates the analysis of mainframe and special-purpose processors as well as the unique applications that operate on these systems. SAS IT Resource Management can provide an analysis of the eligible Java work (that is, work that can be performed on a lower cost special-purpose engine) so that the cost advantages of implementing special-purpose engines can be explored. In the preceding report, the MSU values are calculated using appropriate CPU active times (based on the type of processor) with a hardware service unit factor that corresponds to the CPU model on which the resource is consumed. The MIPS values in the report are calculated from the resulting MSU values by multiplying with an MSU-to-MIPS conversion factor that also corresponds to the CPU model.

SAS IT Resource Management adapters enhance the value of IT mainframe performance measurements by providing mainframe processor performance data in the following formats:

- MIPS that accommodate the needs of the performance manager and capacity planner who assess the availability of mainframe resources
- MSUs that accommodate the capacity planner and IT financial analyst who need to determine how best to accommodate business demand for mainframe resources
- CPU time-expended measurements that are most appropriate for detailed system performance analysis.

IBM Large System Performance Reference (LSPR) tables are owned by and available from IBM. They are used as reference information to enable the calculation of MIPS and MSUs from the expended CPU time. Hardware MSUs are used in the physical engine type calculations for systems and logical partitions (LPARs). Software MSUs are used for application measurements.

Note: SAS and IBM worked together as partners to understand and create methods to accommodate full-capacity and subcapacity machines. This methodology includes the adjustment of machine model numbers for full-capacity machines to calculate the most accurate MIPS and MSU values.

For more information, see “How MSU and MIPS Columns Are Included in Staged Tables for the SMF Adapter” in the “Working with MXG Code to Stage Data” section of Appendix 2, “Data Sources Supported by SAS IT Resource Management Adapters” in the *SAS IT Resource Management: Administrator's Guide*.

Charts for Cumulative Analysis

Using Stacked Bar Reports

Stacked bar reports show the relative magnitude of data by displaying bars of varying height. Each set of color-coded segments in a bar represents a category of data. Stacked bar charts are most useful when the relative magnitude of the segments in the bars is as significant or more significant than the exact magnitude of any particular bar. Stacked bar charts display the color-coded segments for each category of data, one on top of the other.

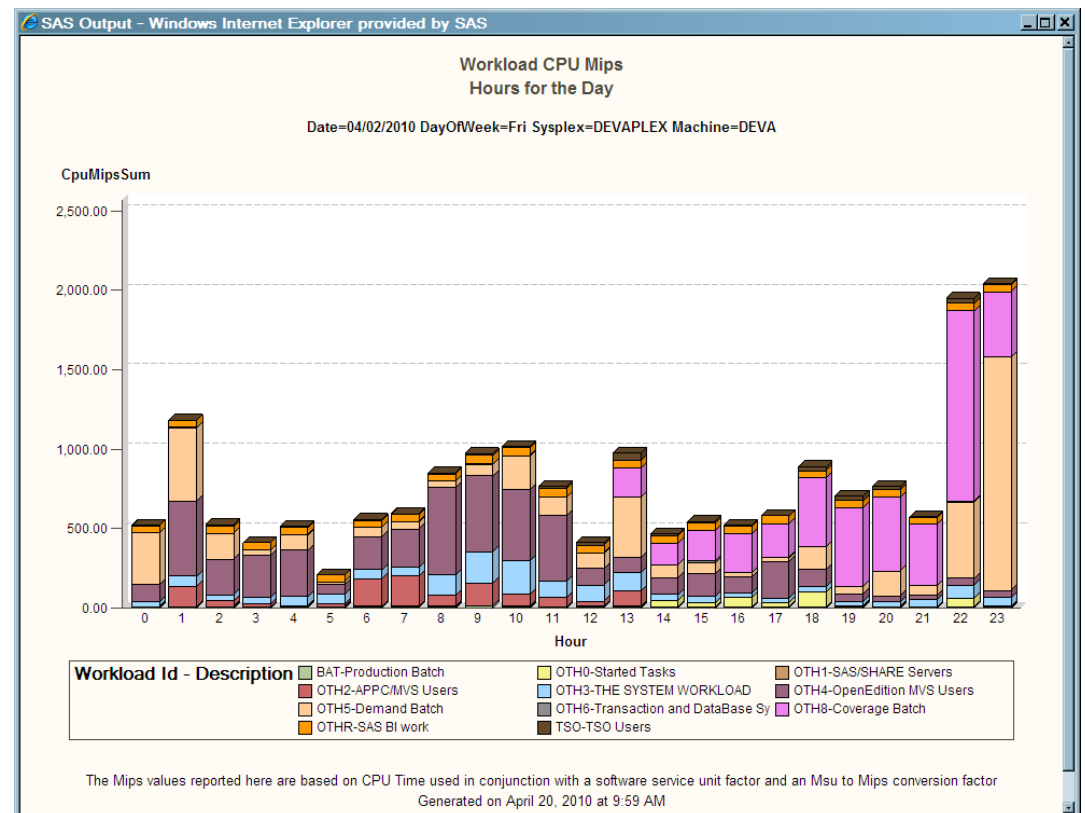
Using the Stacked Bar Report for Performance Management and Capacity Planning

Reports of this type are essential to understanding the allocation of specific resources to workloads for a host system, network component, or virtual system environment. These

reports also help create load-balancing strategies and enable users to adjust their workloads to minimize the use of resources.

Evaluating workload measurements such as transaction counts, I/O and exception rates, response times, and CPU, disk, and memory performance attributes is crucial for ensuring service quality and assessing charges that should be allocated to business units that share computer resources. Stacked charts are useful for understanding the parts of a whole entity, whether that entity is a resource, a segment of time, or any other quantifiable object. Facts that are communicated by stacked charts, along with other data, are effective in determining the proper allocation of resources to the business tasks that must be accommodated. For example, certain business processing must take place in a given time period. Therefore, the resource to accommodate this processing must be available.

Display 1.8 Workload CPU MIPS



Example of Using the Stacked Bar Report with IBM System Management Facility RMF - Workload Data

The presentation of any data in a stacked bar chart enables you to make quick comparative observations. Viewing the resource utilization and workload components of an IT resource over the hours of a day enables the IT performance manager to understand how that resource can best be allocated and used.

In the preceding report, the CPU resource (specified in software MIPS) is segmented by the applicable active workloads defined to the system (typically through the RMF Workload Manager). Workload usage of the resource can be reviewed and analyzed. This analysis enables capacity planners to understand exactly how much of the resource is being used by workloads and when those resources are being used.

Charts for Time-Based Resource Analysis

Using Line Plots

Line plots connect data points with straight lines. Points are connected in the order in which they occur in the input data set. From an IT perspective, line plots are most often used to show a particular aspect of IT performance over a designated period of time.

Line plots show the mathematical relationships between multiple numeric variables by revealing trends or patterns of data points.

Using Line Plots for Performance Management and Capacity Planning

Line plots are used extensively for the purposes of performance management and capacity planning. They are a quick and easy way to understand variations on a single metric or comparative cause and effect relationships between multiple variables. For example, the CPU utilization of a resource over the course of an hour, day, week, or month can yield valuable information about the business cycles that are being accommodated by that resource. These facts are essential to planning for the capacity of that device. Similarly, evaluating the relationship between CPU utilization and system run queues, as well as memory utilization and paging rates, yields facts that can help capacity planners configure resources that can best accommodate assigned workloads.

Establishing and understanding the utilization and availability profiles of resources and sets of resources is useful for managing the performance and capacity of those machines. This type of time-based analysis enables you to readily identify exceptions to anticipated performance activities.

For example, at 9:00 a.m. resource utilization increases to accommodate the beginning of the work day, and you can observe user login activity. You can observe a decrease in utilization around noon when employees are at lunch. This observation is followed by another peak that ends around 5:00 p.m. when the work day ends. Overnight, peaks and valleys in utilization illustrate batch processing activities, routine system maintenance work such as backups, and lulls that are associated with business inactivity. Viewing this behavior over long periods of time and over various periods of time (days, weeks, quarters, or months) enables IT profiles to be characterized. These profiles provide information that is useful in the following ways:

- planning for future capacity needs
- identifying abnormal activities such as a security intrusion
- considering cost-based initiatives such as virtualization or the allocation of resources to accommodate work forces around the globe
- examining IT utilization, availability, and performance in relation to business cycles

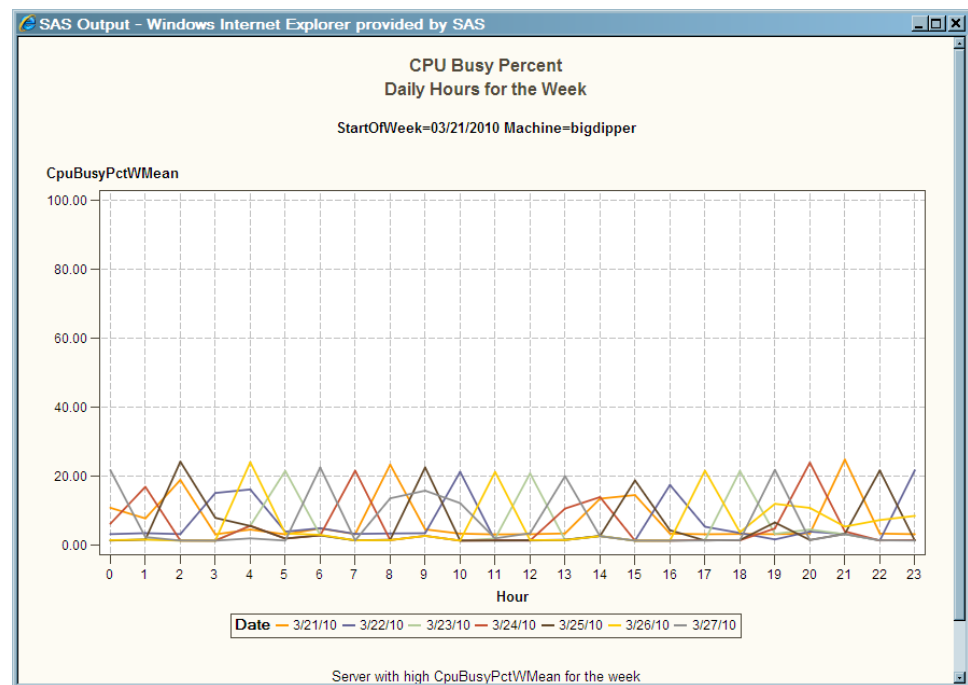
Business cycles and the performance and capacity of IT systems all change over time. The good news for IT performance managers is that these changes can be analyzed and reported on over different time periods. This information enables IT performance managers to make the correct and best IT business decisions. For example, performance measurements of a particular resource can be analyzed over time to assess its performance, utilization, and availability. From this assessment, the IT response to business events, economic drivers, or natural weather occurrences can be analyzed. If necessary, adjustments to the configuration of IT enterprise can be identified to accommodate these occurrences in the future.

Example of Using Line Plots with HP Performance Agent Data

In the following example, the CPU utilization of a particular UNIX machine is being evaluated. SAS IT Resource Management can obtain UNIX data through the following adapters:

- System Activity Reporter (SAR)
- HP Performance Agent (HP Perf Agent)
- HP Reporter
- BMC Performance Manager for Servers (BMC Perf Mgr)

Display 1.9 CPU Busy Percent

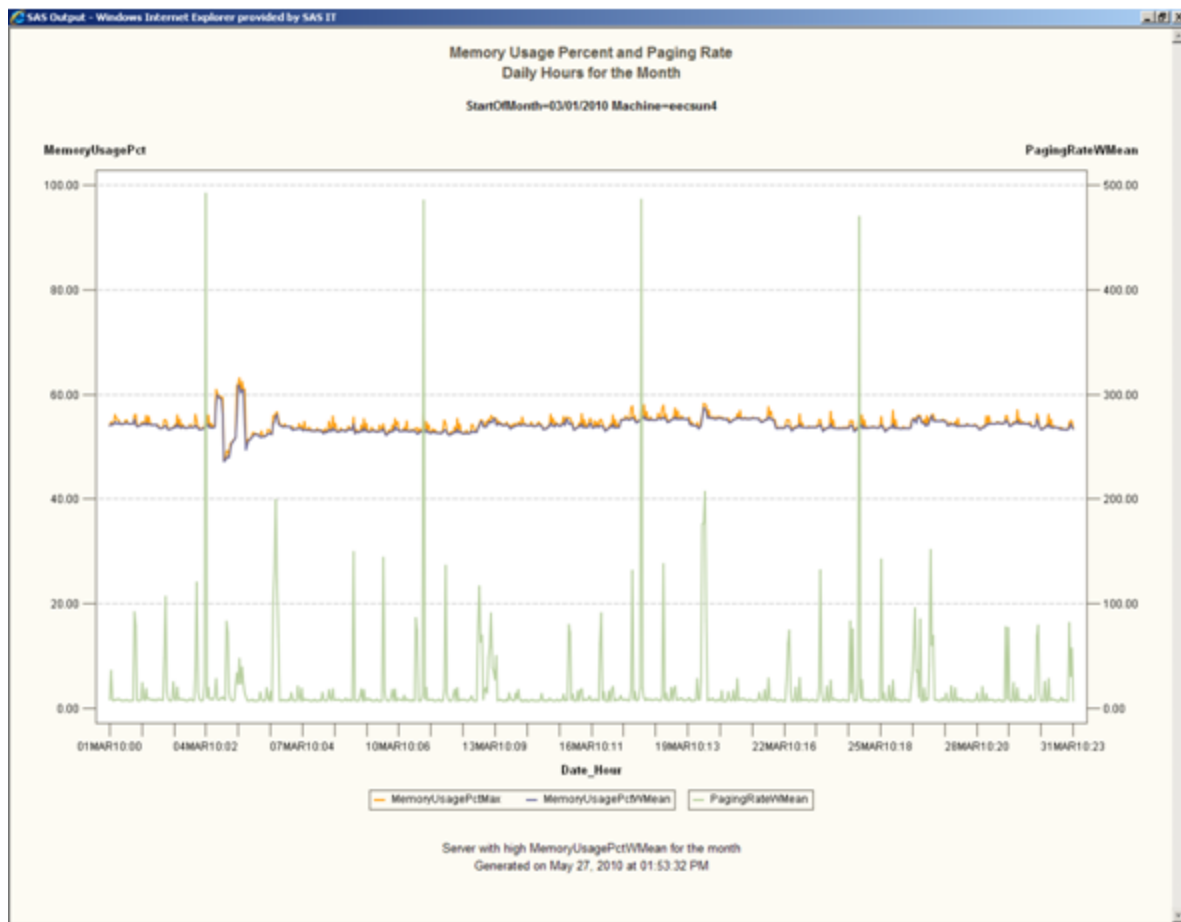


This chart shows the CPU Busy activity of a machine for the hours of the day over the course of a week. Analysis of this type facilitates load balancing and redistribution of workload activities as well as the overall capacity planning function.

An IT performance data warehouse benefits UNIX environments because it is the single best method to accommodate the many resource, enterprise systems management, and freeware monitoring tools that are used to measure the performance and manage the availability of these systems.

Using Line Plots with Multiple Vertical Columns for Performance Management and Capacity Planning

Comparing the three lines on the following graph provides a perspective that shows how seemingly small variations in the maximum and mean memory measurements for a particular UNIX device relate to the paging rates that are associated with that device. This long-term (monthly) analysis can prompt more detailed memory analysis activity to ensure that the system is configured with an adequate quantity of memory for the processing allocated to this device.

Display 1.10 Memory Usage Percent and Paging Rate

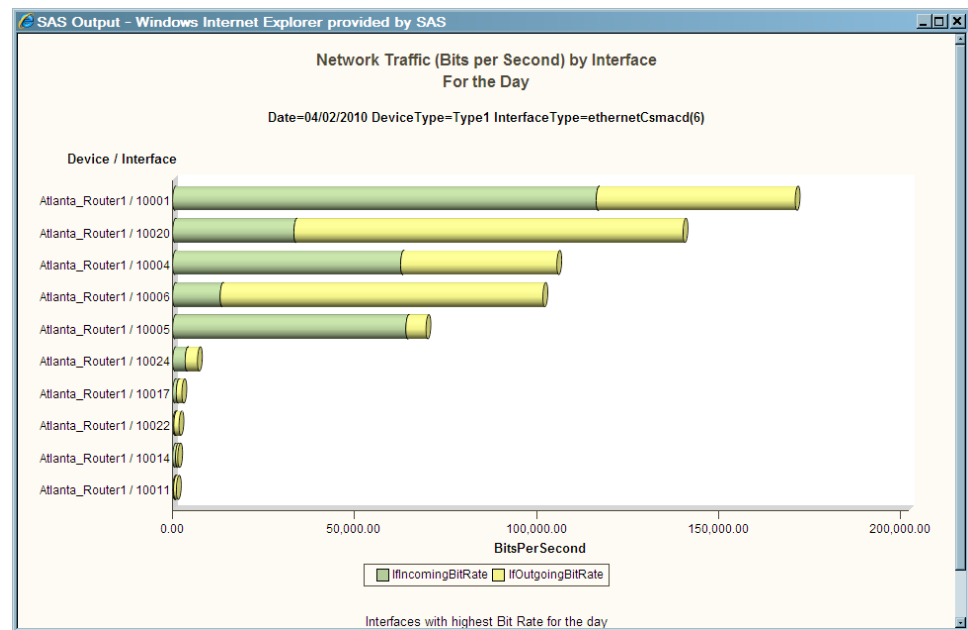
Charts for Comparative Analysis

Using Horizontal Bar Charts

Horizontal bar charts show the relative magnitude of data by displaying horizontal bars of varying length.

Using Horizontal Bar Charts for Performance Management and Capacity Planning

Horizontal bar charts illustrate the comparative volume of a measurement, typically over a time period. From a performance management and capacity planning perspective, bar charts are used for comparative analysis and to get a good perspective on the measurements being analyzed. You might consult these charts to prioritize issues or to quantify their severity.

Display 1.11 Network Traffic

Example of Using Horizontal Bar Charts with Simple Network Management Protocol Data

The one element of the IT infrastructure that is common across large portions of the enterprise is the network. The best source of information that can be used to measure the performance and to assess the health of that network is a repository of Simple Network Management Protocol (SNMP) data.

The preceding chart shows the network interfaces that have the highest incoming and outgoing bit rates over the course of a day. Charts of this type establish an understanding of what is normal and expected activity with respect to network traffic. Deviations to measurements of this type and the trends associated with them should be more thoroughly analyzed.

SAS IT Resource Management provides a reference table that identifies the type of devices that are charted. (For example, in the preceding chart, the reference table was used to determine that the device measurements pertained to the traffic on a Type1 device.)

For information about this lookup table, see “Working with the ITMS_SNMP_DeviceType Lookup Table” topic in the “Accessing Raw Data for SNMP” section of Appendix 2, “Data Sources Supported by SAS IT Resource Management Adapters” in the *SAS IT Resource Management: Administrator's Guide*.

SNMP measurements are essential for understanding the status and components of a network and the devices that are serviced by the network. These measurements can show the status of the network's routers, hubs, and switches as well as the status of the network's links and interfaces. Network administrators and performance analysts must be able to understand the behavior and error rates that are associated with network devices over time. In that way, they can identify and replace faulty hardware components that contribute to the overall degradation of the network. SNMP also communicates the utilization status and highlights instances where thresholds that were established for that utilization have been exceeded. All of this information, and its analysis, is used to best allocate traffic to the network and to tune its flow across individual network components.

SAS IT Resource Management enables you to import MIB definitions that can be used to create the metadata for SNMP staged tables.

Prior releases of SAS IT Resource Management used the repository of SNMP data that was created by the HP Network Node Manager and the Tivoli NetView snmpColDump utility. Newer releases of the HP and Tivoli network management system products do not support the snmpColDump utility. Accordingly, SAS IT Resource Management now supports data collection of SNMP data from a round-robin database to which the data is written. As a convenience for our customers, SAS IT Resource Management continues to support the collection of SNMP data from the repository created by the HP and Tivoli snmpColDump utility.

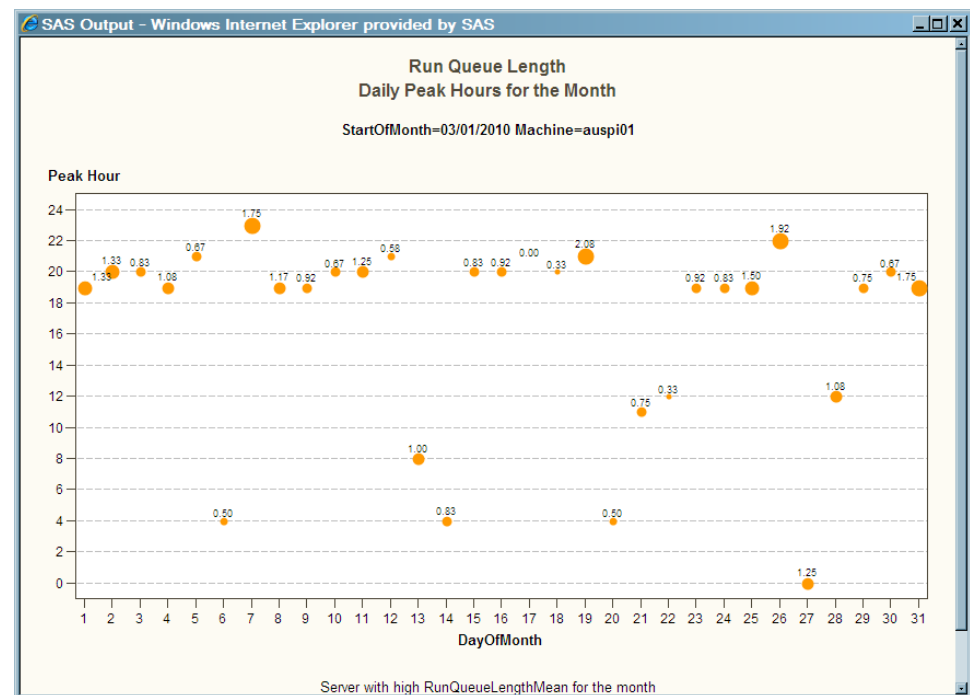
For information about the support that is provided for these two data sources, see the “Accessing Raw Data for SNMP” section of Appendix 2, “Data Sources Supported by SAS IT Resource Management Adapters” in the *SAS IT Resource Management: Administrator's Guide*.

Charts for Multi-Perspective Analysis

Using Bubble Plots

Bubble plots display information from several perspectives to illustrate the relationships of those perspectives.

Display 1.12 Run Queue Length



Example of Using Bubble Plots with Microsoft System Center Operations Manager

In the preceding display, Run Queue Length measurements from Microsoft System Center Operations Manager for a particular machine is evaluated for each day of the month and each hour of the day. This analysis enables performance managers to understand when Run Queue Lengths are at their peak so that systems can be sized or work can be prioritized and allocated or reallocated to alternate devices.

Gallery Manager

About the Gallery Manager

Gallery Manager is a Web-based application that enables performance analysts and information consumers to access, filter, and manage galleries of report content. These galleries are stored on the SAS Content Server.

The following display shows the wizard that enables you to create a gallery.

Display 1.13 Create Gallery Wizard

Create Gallery [X]

Gallery Details Step 1 of 4

Steps << Specify the name, description, and location for the gallery.

Gallery Details

Primary Filters

Secondary Filters

Summary

Name: * Sample Reports for the eecsun4 Machine

Description: Sample reports provided by SAS IT Resource Management for the eecsun4 Machine.

Location:

- My Galleries
 - DEVA Machine Galleries
 - DEVA Machine CPU Reports
 - DEVA Machine Reports
 - Sample Reports (Selected)
 - Sample Reports

Status: Private ?

Previous Next Cancel Finish

You can manage your galleries by copying them into gallery folders that you created. You can distribute galleries by e-mail to colleagues. Gallery Manager also provides you with the ability to keep selected galleries or gallery folders as Favorites. For a complete description of the features and functions of Gallery Manager, see *SAS IT Resource Management: Gallery Manager User's Guide*.


Viewing Galleries

About Viewing Galleries

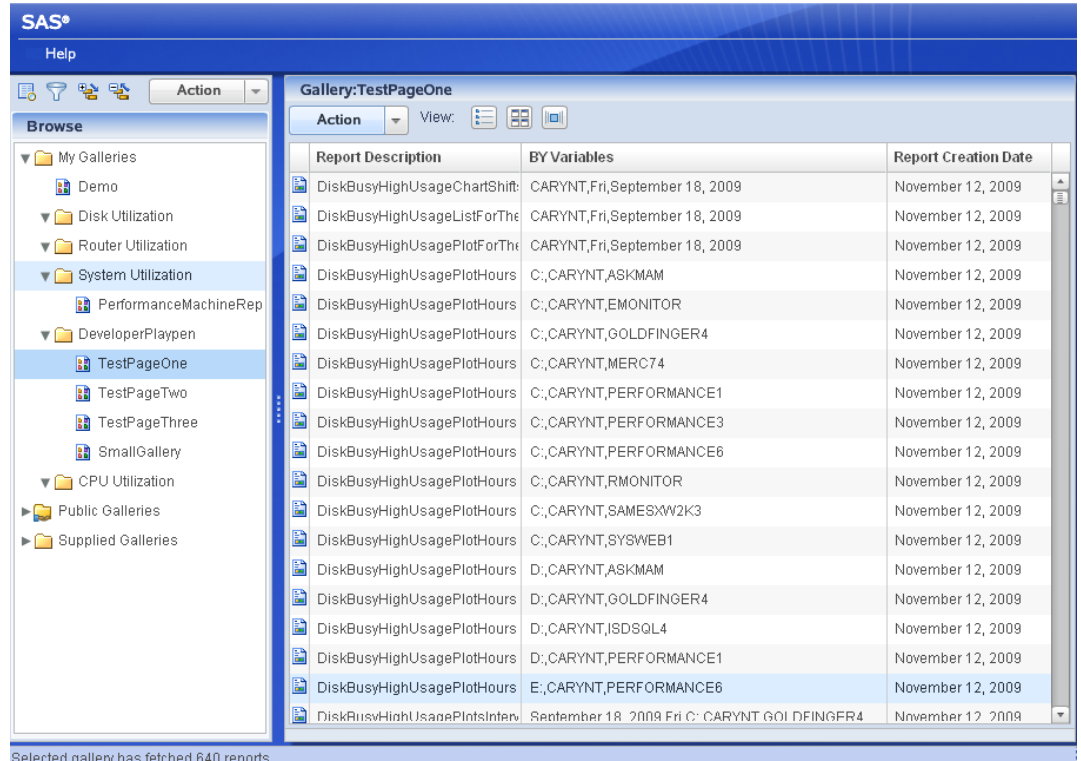
Gallery Manager provides three methods of viewing your galleries:

- table view
- thumbnail view
- flow view

Viewing Galleries with the Table View

When you access a gallery, you can click the table view icon () to the reports as rows in a table, as shown in the following display.

Display 1.14 Table View of a Gallery

























SAS®
Help

Browse

- My Galleries
 - Demo
 - Disk Utilization
 - Router Utilization
 - System Utilization
 - PerformanceMachineRep
 - DeveloperPlaypen
 - TestPageOne**
 - TestPageTwo
 - TestPageThree
 - SmallGallery
 - CPU Utilization
 - Public Galleries
 - Supplied Galleries


Gallery:TestPageOne

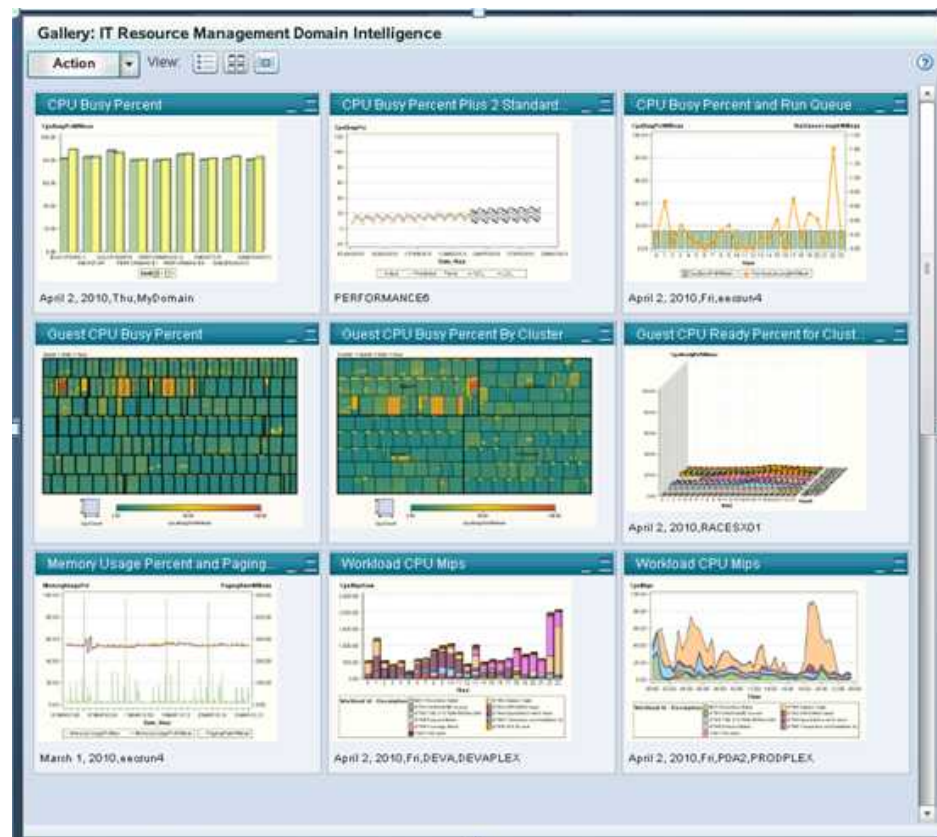
Action View:   

Report Description	BY Variables	Report Creation Date
 DiskBusyHighUsageChartShift	CARYNT,Fri,September 18, 2009	November 12, 2009
 DiskBusyHighUsageListForThe	CARYNT,Fri,September 18, 2009	November 12, 2009
 DiskBusyHighUsagePlotForThe	CARYNT,Fri,September 18, 2009	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,ASKMAM	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,EMONITOR	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,GOLDFINGER4	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,MERC74	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,PERFORMANCE1	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,PERFORMANCE3	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,PERFORMANCE6	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,RMONITOR	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,SAMESXW2K3	November 12, 2009
 DiskBusyHighUsagePlotHours	C:,CARYNT,SYSWEB1	November 12, 2009
 DiskBusyHighUsagePlotHours	D:,CARYNT,ASKMAM	November 12, 2009
 DiskBusyHighUsagePlotHours	D:,CARYNT,GOLDFINGER4	November 12, 2009
 DiskBusyHighUsagePlotHours	D:,CARYNT,ISDSQL4	November 12, 2009
 DiskBusyHighUsagePlotHours	D:,CARYNT,PERFORMANCE1	November 12, 2009
 DiskBusyHighUsagePlotHours	E:,CARYNT,PERFORMANCE6	November 12, 2009
 DiskBusyHighUsagePlotsInterv	September 18, 2009 Fri C: CARYNT GOLDFINGER4	November 12, 2009

Selected gallery has fetched 640 reports


Viewing Galleries with the Thumbnail View

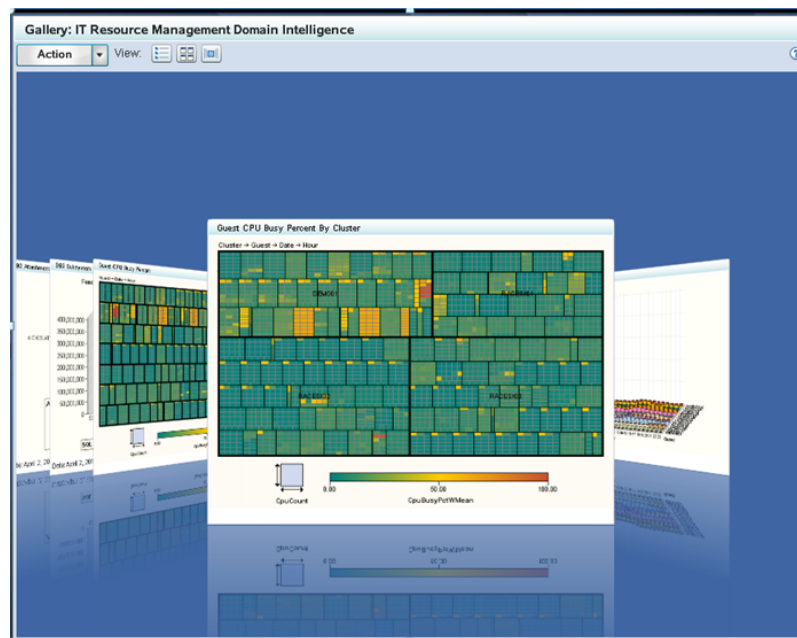
When you access a gallery, you can click the thumbnail view icon () to display smaller images of the reports that are in that gallery. As shown in the following display, the reports are arranged in a 3 x 3 grid.

Display 1.15 Example of a Gallery Showing the Thumbnail View

You can double-click a thumbnail image to generate a larger version of the report that is easier to view.

Viewing Galleries with the Flow View

When you access a gallery, you can click the flow view icon () to view the reports by leafing through them as if they were pages in a book. As shown in the following display, the reports are displayed as a horizontal stack.

Display 1.16 Cover Flow View of a Gallery

Each stack contains ten reports. You can navigate between the first and tenth report by clicking each page as if it were a page in a book. (Clicking a report on the right side of the Gallery pane moves that report into the center of the pane. The report that was previously in the center part of the pane is moved to the left side of the pane. You can leaf through the stack of reports from either the left or right side of the pane.) When you come to the end of a set of reports, you must use the horizontal scroll bar to click the **Next** button to launch the next set.

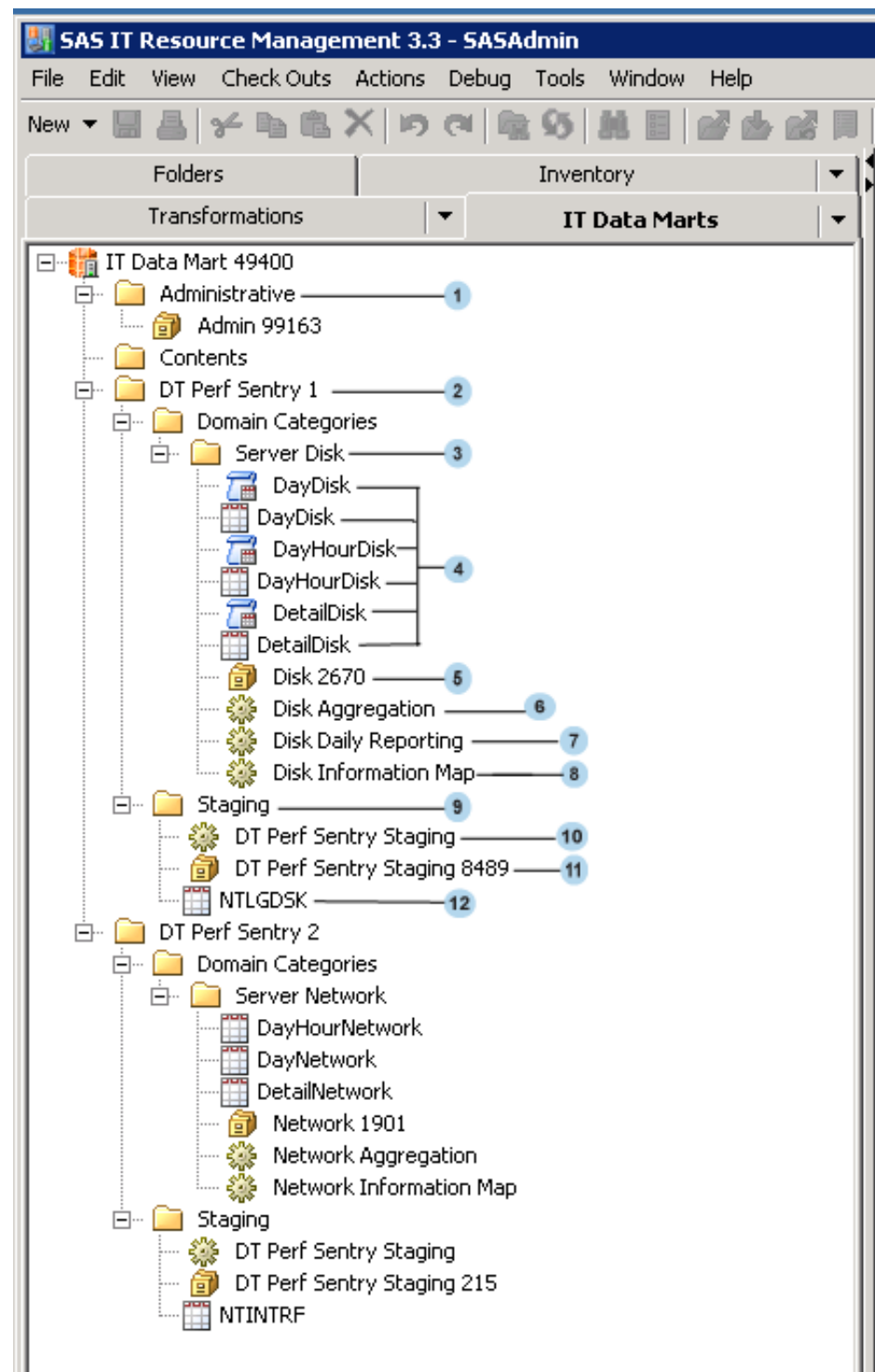
Chapter 2

Working with SAS IT Resource Management

About the IT Data Mart	21
What Are Adapters?	23
How Does SAS IT Resource Management Work?	24
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About the IT Data Mart

At the center of SAS IT Resource Management are IT data marts. IT data marts enable SAS IT Resource Management to store and access IT data as well as the jobs and processes that manipulate, analyze, and report on this data. The collection of IT data marts form the IT performance data warehouse from which domain intelligence is derived.

Figure 2.1 Example of an IT Data Mart with Numbered Explanations

- 1 Admin library that was generated for MY IT Data Mart
- 2 Folder that is generated for the first instance of running the Adapter Setup wizard for the DT Perf Sentry adapter
- 3 Folder that contains objects related to the Server System domain category for DT Perf Sentry

- 4 Tables and information maps for the aggregations that are connected with the Server System domain
- 5 Library that contains all aggregation tables that are connected with the Server System domain
- 6 Job that generates the aggregation tables that are connected with the Server System domain
- 7 Job that generates reports that are connected with the Server System domain
- 8 Job that generates information maps that are connected with the Server System domain
- 9 Folder that contains the staging library, tables, and job that are connected with DT Perf Sentry
- 10 Staging job for DT Perf Sentry
- 11 Library that contains all staged tables that are populated by the DT Perf Sentry Staging job
- 12 Staged table that is populated by the DT Perf Sentry Staging job

In the preceding figure, the IT data mart called MY IT Data Mart also contains metadata for two instances of the DT Perf Sentry adapter:

- DT Perf Sentry 1, the first instance of using the Adapter Setup wizard for DT Perf Sentry
- DT Perf Sentry 2, the second instance of using the Adapter Setup wizard for DT Perf Sentry

For more information about IT data marts, see Chapter 4 “About the IT Data Mart” in the *SAS IT Resource Management: Administrator's Guide*.

What Are Adapters?

An adapter is a collection of SAS IT Resource Management processes that start with raw IT data sources and end with sets of reports that deliver the domain intelligence about the resource from which that raw IT data was generated.

Raw data about an IT resource is represented using measures and formats that are specific to the software that collected it. In order for the data to be processed into statistics about an enterprise's IT resources, the raw data must be read, interpreted, and possibly converted into a more standard form. It can then be loaded into staged tables in preparation for subsequent aggregation and reporting. The raw data about an IT resource is generated by the logging mechanism of that resource or by a system management utility that works with that data.

For those sources of data that are not natively supported by SAS IT Resource Management, a User-Written Adapter capability is provided. User-written adapters support the creation of processes to manage those sources by fully leveraging the staging, aggregation, information map, and reporting capabilities that are delivered with the solution.

For a list of the adapters that SAS IT Resource Management supports, see Appendix 2, “Supported Adapters,” in *SAS IT Resource Management: Administrator's Guide*.

How Does SAS IT Resource Management Work?

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 data that is vital to the management of the IT infrastructure. For data sources that are supported by SAS IT Resource Management, the Adapter Setup wizard guides the user through a series of specific choices that describe how that data is to be aggregated, analyzed, and reported on.

The following steps are necessary to gather and analyze data using SAS IT Resource Management:

1. Collect and stage the raw data about a resource.

IT performance data is information about IT resources, such as hardware, operating system software, virtual systems, networks, Web servers, databases, and applications. Raw (or unprocessed) data about the usage, availability, or performance of these resources is generated by the logging mechanisms that are inherent to IT resources or is created by the Enterprise Systems Management tools that are used to manage the IT infrastructure. All of the data that is managed and analyzed by SAS IT Resource Management is first staged. The adapter's staging code performs functions such as reading the raw data source, normalizing measurement units, separating into tables based on domain categories, generating computed columns, and checking for and managing duplicate data. Staging is performed by SAS IT Resource Management transformations that are set up in SAS Data Integration Studio.

For a list of the adapters that SAS IT Resource Management supports, see Appendix 2, “Supported Adapters,” in *SAS IT Resource Management: Administrator's Guide*.

2. Aggregate the staged tables.

After the raw data is staged, it can be input to the aggregation step. Aggregation transformations can generate simple aggregation or summarized aggregation tables. Simple aggregations read data from the staged table and append that new data to an existing table without undergoing any summarization. Summarized aggregations read data from a staged table and then categorize and aggregate that data according to the specifications of the aggregation transformation. Aggregation transformations are created, updated, and deployed for execution using the SAS IT Resource Management client.

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

3. Generate information maps.

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 analysis and report-ready references for all data fields that are used to create and view reports. Information maps can be used in SAS Enterprise Guide and SAS Enterprise Business Intelligence applications such as SAS Web Report Studio and SAS BI Dashboard. They generate reports that provide domain intelligence about the data that is available for each adapter.

4. Define and run reports.

SAS Enterprise Guide, described below, generates reports by using information maps or by directly accessing data in SAS tables. The business friendly information maps that are provided by SAS IT Resource Management are the recommended data sources for all reporting activity.

In SAS Enterprise Guide, the ITRM gallery task can be selected. When the gallery task is run, it creates a report definition that is stored on the SAS Metadata Server. SAS IT Resource Management Client provides features that enable report definitions to be selected, and creates the jobs that will run these reports.

5. Create galleries.

SAS IT Resource Management provides the Gallery Manager to organize and view collections of reports called galleries. The contents of a gallery are determined by selecting filter values that are available for those reports that are created by SAS IT Resource Management. In the Gallery Manager, performance analysts and information consumers can access the reports that were created by report definitions and stored on the SAS Content Server. They can create filters that subset the available reports, and view the resulting reports on a browser.

Note: The jobs that execute these transformations can run interactively, but more typically they are scheduled to run in batch mode.

In addition, ad hoc reporting is provided through several SAS products. Documentation for these products is available at <http://support.sas.com/documentation/index.html>.

- SAS Enterprise Guide, which is a Windows application, accesses data directly or uses information maps to select and report on data.
- SAS Web Report Studio, which has a Web-based interface, uses information maps to select and report on data.
- SAS BI Dashboard, which is an easy to administer and easy to use Web interface that enables you to use dashboards to monitor key performance indicators that convey how well resources are performing.
- SAS Add-In for Microsoft Office enables SAS functionality to be accessed directly from the menus and toolbars of Microsoft Office products.

Performance analysts and information consumers who frequently work with Microsoft Office products can access the analysis and report-ready data that is created by SAS IT Resource Management.

Note: Reports that are created with SAS Web Report Studio, SAS BI Dashboard, or with stored processes can be viewed on a browser through SAS Information Delivery Portal.

For more detailed information about these tasks, see the *SAS IT Resource Management: Administrator's Guide* and the *SAS IT Resource Management: Reporting Guide*.

Processing with the Adapter Setup Wizard

For supported adapters, the preferred method of setting up the ETL and reporting jobs for IT performance data is to use the Adapter Setup wizard. Alternatively, you can set up the ETL and reporting jobs for IT performance data by specifying the required jobs and transformations manually, outside of the Adapter Setup wizard. For more information

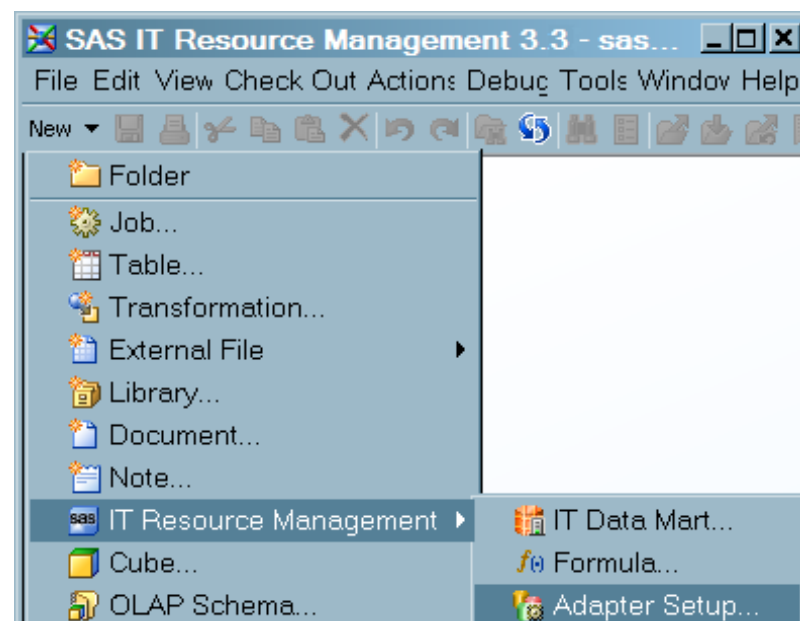
about the ETL processes, see the *SAS IT Resource Management: Administrator's Guide*. For more information about the reporting processes, see the *SAS IT Resource Management: Reporting Guide*.

Data administrators typically specify the ETL and reporting jobs for an adapter by means of the Adapter Setup wizard. The Adapter Setup wizard prompts the data administrator for the appropriate options and parameters and creates the jobs and transformations that are necessary to generate the required reports.

The Adapter Setup wizard automates the processes that are needed to generate reports from IT performance data. It guides you through the steps that set up the jobs that, when run, create the staged tables, aggregation tables, information maps, and report output for a supported input data source.

As shown in the following display, you can access the Adapter Setup wizard from the **New** menu of the SAS IT Resource Management Client toolbar by selecting **IT Resource Management** ⇒ **Adapter Setup**.

Display 2.1 Accessing the Adapter Setup Wizard from the New Menu



To set up the ETL jobs, the Adapter Setup wizard prompts you to specify the IT data mart, the adapter, the location and the format of the input data. In addition, the wizard prompts you for the parameters that specify how the data is delimited or how duplicate data checking is to be performed. (The Adapter Setup wizard uses supplied template tables to create the required staged tables for each adapter.)

In order to set up the jobs that generate reports, the Adapter Setup wizard prompts you for information such as:

- the domain categories and time periods for which you want report-ready data to be prepared
- the location of the formulas that are to be used in creating additional fields of data
- the location on the SAS Content Server where the reports and their associated metadata is to be stored.

When you click **Finish**, the ETL and report jobs are created and stored in the IT data mart that you specified. In addition, the wizard generates the metadata for the tables, information maps, report definitions, and libraries that are needed.

The jobs that are created by the Adapter Setup wizard are intended to be deployed for scheduling and executed in batch mode on the operating environment where you created them.

After a report job is deployed, scheduled, and executed, the resulting report output is available for viewing with Gallery Manager. Gallery Manager enables you to access, filter, and manage your report content from a Web browser. For more detailed information about how to work with Gallery Manager, see Chapter 6, "Viewing Reports Using Gallery Manager" in the *SAS IT Resource Management: Reporting Guide*.

Appendix 1

SAS IT Resource Management Resources

SAS IT Resource Management provides many other resources to assist you in using this product and in managing your IT resources.

Online Help

Online Help is available for the user interfaces that SAS IT Resource Management uses. You can access the online Help from within the following SAS products by clicking **Help** on the associated window or pressing the F1 key. To access the user assistance for Gallery Manager, use the cursor to hover over the field in question.

- SAS Data Integration Studio

Online Help consists of the standard help for SAS Data Integration Studio and the field-level help for the additional software that provides support for SAS IT Resource Management.

- Gallery Manager

User assistance consists of field-level help for managing IT resource reports.

- SAS Management Console

- SAS Enterprise Guide

Online Help consists of the standard help for SAS Enterprise Guide, as well as help for the ITRM gallery task.

- SAS Web Report Studio

- SAS Information Map Studio

To access the help for SAS Add-In for Microsoft Office, on the toolbar for Microsoft Word or Microsoft Excel, select **SAS**. Then, select **SAS Add-In for Microsoft Office**.

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

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

Web-Based Product Documentation

About Web-Based Product Documentation

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

available for SAS IT Resource Management documentation and SAS System documentation.

To access these Web pages, use a frame-capable version of a Web browser such as Microsoft Internet Explorer 6 and later or Mozilla Firefox2 and later.

SAS IT Resource Management Documentation

Information about SAS IT Resource Management is available at: <http://support.sas.com/documentation/online/itsv/>. Along with notes about topics of general interest, this site contains links to the following sets of documents:

- *SAS IT Resource Management: Overview*: Provides an overview of SAS IT Resource Management.
- *SAS IT Resource Management: Administrator's Guide*: Provides a detailed description of the SAS IT Resource Management for data administrators.
- *SAS IT Resource Management: Gallery Manager User's Guide*: Provides a detailed description of the Gallery Manager application, including how to manage and view report galleries.
- *SAS IT Resource Management: Reporting Guide*: Provides a detailed description of the reporting functionality of SAS IT Resource Management for performance analysts and information consumers. It also provides the Report Conversion appendix that describes how to convert your IT Resource Management 2.7 reports for use with the current version of SAS IT Resource Management.
- Installation documentation is available from the Install Center at: <http://support.sas.com/documentation/installcenter/index.html>. It describes how to install and configure the latest software.
- *SAS IT Resource Management: System Requirements* : Provides a list of the requirements for the server tier, middle tier, and client tier for the operating systems supported by SAS IT Resource Management.
- *SAS IT Resource Management: Migration Guide*: Describes how to convert your IT Resource Management environment to the current version of SAS IT Resource Management.
- The Metrics Documentation section of the SAS IT Resource Management documentation Web page provides documentation about Demand Technology Performance Sentry Data Collection Sets for SAS IT Resource Management. It also provides lists of available metrics documentation, including the data model for this version of SAS IT Resource Management, changes from previous versions of SAS IT Resource Management, and ITRM and MXG column mapping. Navigate to this Web page from <http://support.sas.com/documentation/online/itsv/index.html>.
- The Samples of Supplied Reports section provides reports and information about those reports for selected supplied reports.

Note: Information about the previous versions of the SAS IT Resource Management software is also available. Click the tab that corresponds to the version of SAS IT Resource Management documentation that you want to access.

The Web page at <http://www.sas.com/solutions/itresource/> provides access to white papers and articles about many topics that pertain to managing your IT resources.

SAS System Documentation

On <http://support.sas.com/>, you can select **Knowledge Base** to access resources such as Products and Solutions, System Requirements, Install Center, Third-Party Software Reference, Documentation, Papers, Samples and SAS Notes, and focus areas.

The SAS System includes many software products and solutions that are leveraged by SAS IT Resource Management. You can access SAS documentation by using the A-Z index on this Web page: <http://support.sas.com/documentation/index.html>.

Technical Support

If you have questions about or problems with your licensed SAS software, you can explore the multiple resources that are available on the SAS Institute Support Web site at <http://support.sas.com/techsup>. This Web site provides an online mechanism for reporting and tracking problems and questions for Technical Support. These electronic services are available 24 hours a day.

Select **Training and Bookstore** to access links to the SAS bookstore, training information, and the certification program. In addition, you can access information about SAS Global Academic Program and SAS OnDemand for Academics.

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

Training and Consulting Services

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

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

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

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

SAS IT Resource Management E-mail Forum

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

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

- Leave the subject line blank.

- In the body of the message, type the following:

SUBSCRIBE ITMS-L <your first name><your last name>

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

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

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

- Leave the subject line blank.
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Glossary

adapter

specialized software that loads raw IT performance data from diverse data sources into staged tables that can then be input to other processes. Adapters that are supported by SAS IT Resource Management consist of template tables, transformations, and staging code.

aged data

data that is deleted from a level of a table because the data exceeds the age limit.

aggregation

the act or process of grouping data by using an operation that produces a statistic such as a sum, average, minimum, or maximum.

analysis variable

a numeric variable that is used to calculate statistics or to display values. Usually an analysis variable contains quantitative or continuous values, but this is not required.

attribute

a property of an object, component, or other entity. Examples of attributes include name, size, or color.

autoexec file

a file that contains SAS statements that are executed automatically when SAS is invoked. The autoexec file can be used to specify some of the SAS system options, as well as to assign librefs and filerefs to data sources that are used frequently.

availability

See system availability

axis

a line that represents the midpoints (for a discrete axis) or the scale (for a continuous or interval axis) for graphing variable or data values. An axis typically consists of an axis line with tick marks, tick values (or midpoint values), and a label.

backload

to load into a staged table data that is older than the most recently processed data.

batch job

a unit of work that is submitted to an operating system for batch processing. For example, under UNIX, a batch job is a background process; under Windows, a batch job is a task; and under z/OS, a batch job is a set of JCL statements.

batch mode

a noninteractive method of running SAS programs by which a file (containing SAS statements along with any necessary operating system commands) is submitted to the batch queue of the operating environment for execution.

browser

See Web browser

BY group variable

See BY variable

BY variable

a variable that is named in a BY statement and whose values define groups of observations to process.

capacity planning

the process of measuring performance, availability, and workload volume in a particular computing environment and comparing these measurements over time to baseline values. The object of capacity planning is to predict when resources will need to be upgraded.

catalog

See SAS catalog

catalog entry

See SAS catalog entry

chart

a graph in which elements, such as bars or pie slices, represent a view of the data.

class variable

See classification variable

classification variable

a variable whose values are used to group (or classify) the observations in a data set into different groups that are meaningful for analysis. A classification variable can have either character or numeric values. Classification variables include group, subgroup, category, and BY variables.

client

an application that requests either resources or services from a server, possibly over a network.

client tier

the portion of a distributed application that requests services from the server tier. The client tier typically uses a small amount of disk space, includes a graphical user interface, and is relatively easy to develop and maintain.

collector

software that collects raw performance data that is related to IT services. The data collector could be a facility of the operating system, a product that is provided by a third-party vendor, or software that is written by consultants or by SAS IT Resource Management customers. Short form: collector.

continuous values

values of a variable that theoretically could indicate an uncountable number of possible values. For example, a variable for measuring the temperature of water in degrees Celsius can have any value from 0 to 100, even though the thermometer cannot measure temperatures beyond a particular level of decimal precision.

control data set

one of the data sets that the duplicate-data-checking macros maintain and use to determine whether data from a log has already been processed.

CPU normalization

the act or process of taking CPU usage values for CPUs that operate at different speeds and multiplying those values by normalization factors so that the charges assessed for CPU usage are equitable, no matter what type of CPU is used. The normalization factors are based on comparisons to one particular type of CPU that has been specified as the standard for a particular site. CPU normalization is sometimes referred to as processor normalization.

cron

a UNIX utility for executing batch jobs on a periodic basis.

daemon

a process that starts and waits either for a request to perform work or for an occurrence of a particular event. After the daemon receives the request or detects the occurrence, it performs the appropriate action. If nothing else is in its queue, the daemon then returns to its wait state.

data collector

software that collects raw performance data that is related to IT services. The data collector could be a facility of the operating system, a product that is provided by a third-party vendor, or software that is written by consultants or by SAS IT Resource Management customers. Short form: collector.

data type

an attribute of every column in a table or database. The data type tells the operating system how much physical storage to set aside for the column, and specifies what type of data the column will contain. It is similar to the type attribute of SAS variables.

data view

See SAS data view

date and time format

instructions that tell SAS how to write numeric values as dates, times, and datetimes.

date format

in SAS software, the instructions that tell SAS how to write numeric values as date values.

datetime format

in SAS software, the instructions that tell SAS how to write numeric values as datetime values.

datetime value

See SAS datetime value

delimiter

a character that serves as a boundary that separates the elements of a text string.

duplicate data

1) observations that have identical values in all of the BY or CLASS variables. 2) observations that come from the same log. The meaning that is intended is explained when the term is used.

ETL

See extract, transform, load

event-type table

a table in which each observation represents an event. The timestamp on the observation represents the date and time of the event.

exit point

a point in the supplied software where additional code runs (if additional code is provided).

external file

a file that is created and maintained by a host operating system or by another vendor's software application. An external file can read both data and stored SAS statements.

extract, transform, load

a data warehousing process in which data is extracted from outside sources, transformed according to operational and quality needs, and loaded into a target database.

foundation services

See SAS Foundation Services

gallery

a group of reports that are stored on the SAS Content Server and that can be filtered and managed by the Gallery Manager application.

global macro variable

a macro variable that can be referenced in either global or local scope in a SAS program, except where there is a local macro variable that has the same name. A global macro variable exists until the end of the session or program.

graphical user interface

any system that uses graphical objects such as windows, menus, icons, buttons, and check boxes to represent the functions of a software application and to enable the user to interact with the application. By contrast, a command-line interface requires users to interact with the software application by entering text. Many graphical user interfaces use visual metaphors for real-world objects such as file cabinets, folders, rulers, and scissors. Short form: GUI.

GUI

See graphical user interface

host

See host operating environment

host operating environment

the operating environment (computer, operating system, and other software and hardware) that is identified by an IP address or by a domain name and that provides centralized control for software applications.

HTML

See HyperText Markup Language

HyperText Markup Language

a coding system in which the codes indicate the layout and style of the text in a text file. Other HTML codes enable you to embed electronic objects such as images, sounds, video streams, and applets (small software applications) into HTML documents. All Web browsers can process HTML documents. Short form: HTML.

ID variable

a variable that contains an alternate identifier for the data in a CLASS variable. For example, the value of a CLASS variable could be a device address, and the value of the corresponding ID variable could be the name of the device. ID variables are useful for identification because their values rarely change.

index

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

informat

See SAS informat

information map

a collection of data items and filters that provides a user-friendly view of a data source. When you use an information map to query data for business needs, you do not have to understand the structure of the underlying data source or know how to program in a query language.

IT data mart

a logical collection of the jobs, data, information maps, tables, and other elements that support the extracting, transforming, and loading (ETL) of IT data.

job

a collection of SAS tasks that can create output.

keep status

1) for a table, a value that indicates whether the table is to be used or ignored. 2) for a variable in a table, a value that indicates whether the variable is to be used or ignored.

key performance indicator

a measurement that shows whether an organization is progressing toward its stated goals. Short form: KPI.

keyword parameter

a type of macro parameter that is identified by its name, followed by an equal sign. Multiple keyword parameters can be provided in any order, and must follow any positional parameters.

KPI

See key performance indicator

library reference

See libref

libref

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

local macro variable

a macro variable that is available only within the macro in which it was created and within macros that are invoked from within that macro. A local macro variable ceases to exist when the macro that created it stops executing.

machine

any type of data processing hardware that is recognized as a single unit. Examples include a physical unit (such as a computer, router, or telephone switch), a logical entity (such as a partition in an IBM z Series system), or a set of CPUs that share the same memory.

macro

a SAS catalog entry that contains a group of compiled program statements and stored text.

macro call

a statement that invokes a stored compiled macro program.

macro variable

a variable that is part of the SAS macro programming language. The value of a macro variable is a string that remains constant until you change it. Macro variables are sometimes referred to as symbolic variables.

management information base

a virtual database for data that is gathered by one or more SNMP agents. Short form: MIB.

master data dictionary

the master data definitions of tables and their associated variables, as well as override control statements, if any. Master copies of user-written definitions can be installed in the data dictionary, too.

mean

the arithmetic average, which is calculated by adding the values of a sample variable and dividing this sum by the number of observations.

measure data item

a classification of data items. The values of measure data items are aggregated (unless otherwise specified) and can be used in computations or analytical expressions.

metadata

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

metadata repository

a collection of related metadata objects, such as the metadata for a set of tables and columns that are maintained by an application. A SAS Metadata Repository is an example.

method

in object-oriented methodology, an operation that is defined for a class and which can be executed by an object that is created from that class.

MIB

See management information base

middle tier

in a SAS business intelligence system, the architectural layer in which Web applications and related services execute. The middle tier receives user requests, applies business logic and business rules, interacts with processing servers and data servers, and returns information to users.

migrate

to populate a new deployment of SAS software with the content, data, or metadata (or a combination of these) from an existing deployment. Migrating might include upgrading to a new software release, converting data or metadata, or other changes to ensure compatibility.

missing value

a type of value for a variable that contains no data for a particular row or column. By default, SAS writes a missing numeric value as a single period and a missing character value as a blank space.

multi-tier architecture

a distributed architecture in which multiple components interact with each other in multiple configurations.

MXG software

the software from Merrill Consultants that processes IT performance data records that are generated by the System Management Facility (SMF) under the z/OS operating system, the OS/400 operating system, and their subsystems. MXG software reads the raw IT performance data records and writes them to SAS data sets for further analysis. Examples of analysis are the measurement and management of IT resource capacity, resource utilization, measurement of service objectives, system tuning, and accounting and cost recovery.

n-tier architecture

a type of network architecture that is used in the development of relational business applications. N-tier architecture separates an application's interface, its business logic, and its databases into components, or tiers. This approach enables the tiers to interact with each other in multiple configurations. The tiers can easily be used and reused in new combinations in order to meet dynamic business requirements.

navigate

to purposefully move from one view of the data in a table (or in some other data structure, such as a cube) to another. Drilling down and drilling up are two examples of navigation.

network

an interconnected group of computers.

object

an entity that can be manipulated by the commands of a programming language. In object-oriented programming, an object is a compilation of attributes (object elements) and behaviors (methods) that describe an entity. Unlike simple data types that are single pieces of information (e.g. int=10), objects are complex and must be constructed.

operating environment

a computer, or a logical partition of a computer, and the resources (such as an operating system and other software and hardware) that are available to the computer or partition.

PDB

See performance data warehouse

PDB data dictionary

in a performance data warehouse (PDB), a SAS library that contains metadata such as definitions of tables and variables and status information for the data that the tables contain. The library's name and libref are DICTLIB.

performance data

information about how your IT system is doing its work. You use this information to determine whether your system is doing work efficiently and to determine how to change its load or its tunable parameters so that it will perform more efficiently.

performance data warehouse

logically, a data warehouse that contains detailed and summarized performance data, as well as information (metadata) that is needed for managing the data. Physically, each PDB consists of a coordinated set of nine SAS libraries that contain performance data plus other information that is related to one or more IT services. Short form: PDB.

permanent SAS library

a SAS library that is not deleted when a SAS session ends, and which is therefore available to subsequent SAS sessions.

PGMLIB

the libref (library reference name) for a SAS IT Resource Management program library that is on the local server host.

positional parameter

a type of macro parameter that is named (using comma delimiters) in the %MACRO statement at invocation, and is defined in the corresponding position (again using comma delimiters) in the macro execution statement.

PROC

See SAS procedure

procedure

See SAS procedure

process

a functional unit of a program or task.

program library

the SAS library in which most of the SAS IT Resource Management software resides. For example, the master data dictionary resides in the program library

property

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

protocol

a set of rules that govern data communications between computers, between computers and peripheral devices, and between software applications. TCP/IP, FTP, and HTTP are examples of protocols.

publish

to deliver electronic information, such as files and system-generated events, to one or more destinations. These destinations can include e-mail addresses, message queues, publication channels and subscribers, WebDAV-compliant servers, and archive locations.

rank

to order observations according to the values of particular variables. When a data item's values are ranked, the values are both sorted and filtered. For example, to rank an organization's top 10 customers based on sales figures, a query would sort the sales figures in descending order and then filter the results to show the 10 customers who have the highest sales figures.

ranking

the process of ordering observations according to values of particular variables.

raw data file

an external file whose records contain data values in fields. A DATA step can read a raw data file by using the INFILE and INPUT statements.

remote server profile

a stored set of values that are used for connecting to a remote server host.

report definition

a specification that is used for generating a report. A report definition includes information such as the table, the names of the variables, the report style, and other attributes.

report gallery

another term for gallery.

repository

a storage location for data, metadata, or programs.

repository access control template

the access control template (ACT) that controls access to a particular repository and to resources for which access controls are not specified. You can designate one repository ACT for each metadata repository. The repository ACT is also called the default ACT.

response time

the amount of time to service a request.

restore

to recover the contents of a backup copy.

return code

a numeric value that indicates whether a request was successful. A return code can also indicate a specific error or warning.

SAS catalog

a SAS file that stores many different kinds of information in smaller units called catalog entries. A single SAS catalog can contain different types of catalog entries.

SAS catalog entry

a separate storage unit within a SAS catalog. Each entry has an entry type that identifies its purpose to SAS.

SAS data view

a type of SAS data set that retrieves data values from other files. A SAS data view contains only descriptor information such as the data types and lengths of the variables (columns) plus other information that is required for retrieving data values from other SAS data sets or from files that are stored in other software vendors' file formats. Short form: data view.

SAS datetime value

an integer that represents a date and a time in SAS software. The integer represents the number of seconds between midnight, January 1, 1960, and another specified date and time. For example, the SAS datetime value for 9:30 a.m., June 5, 2000, is 1275816600.

SAS Foundation Services

a set of core infrastructure services that programmers can use in developing distributed applications that are integrated with the SAS platform. These services provide basic underlying functions that are common to many applications. These functions include making client connections to SAS application servers, dynamic service discovery, user authentication, profile management, session context management, metadata and content repository access, activity logging, event management, information publishing, and stored process execution.

SAS informat

a type of SAS language element that applies a pattern to or executes instructions for a data value to be read as input. Types of informats correspond to the data's type: numeric, character, date, time, or timestamp. The ability to create user-defined informats is also supported. Examples of SAS informats are BINARY and DATE. Short form: informat.

SAS IT Resource Management client

a computer on which SAS IT Resource Management software is installed with a client license. The client accesses data on servers through a telecommunications protocol such as TCP/IP.

SAS IT Resource Management server

a computer on which SAS IT Resource Management software is installed with a server license. The server has 'write' access to the IT performance data in IT data marts and is used for processing data through the host operating environment's file system. In addition, the server is used for administering IT data marts.

SAS library

one or more files that are defined, recognized, and accessible by SAS and that are referenced and stored as a unit. Each file is a member of the library.

SAS Metadata Repository

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

SAS Metadata Server

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

SAS procedure

a program that provides specific functionality and that is accessed with a PROC statement. For example, SAS procedures can be used to produce reports, to manage files, or to analyze data. Many procedures are included in SAS software.

SAS Stored Process

a SAS program that is stored on a server and defined in metadata, and which can be executed by client applications. Short form: stored process.

SAS variable

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

scheduled job

in SAS IT Resource Management, one of a set of batch jobs that run at a specified time, typically at night.

schema

a map or model of the overall data structure of a database. A schema consists of schema records that are organized in a hierarchical tree structure. Schema records contain schema items.

server

software that provides either resources or services to requesting clients, possibly over a network.

service

one or more application components that an authorized user or application can call at any time to provide results that conform to a published specification. For example, network services transmit data or provide conversion of data in a network, database services provide for the storage and retrieval of data in a database, and Web services interact with each other on the World Wide Web.

simple index

an index that uses the values of only one variable to locate observations.

simple index variable

a variable for which an index is built. The index contains information about the values of the variable and about the observations that contain those values.

Simple Network Management Protocol

a protocol or standard that is used for exchanging network management information, which is information that enables the network to be managed. Short form: SNMP.

slowly changing dimensions

a technique for tracking changes to dimension table values in order to analyze trends. For example, a dimension table named Customers might have columns for Customer ID, Home Address, Age, and Income. Each time the address or income changes for a customer, a new row could be created for that customer in the dimension table, and the old row could be retained. This historical record of changes could be combined with purchasing information to forecast buying trends and to direct customer marketing campaigns.

SNMP

See Simple Network Management Protocol

SNMP agent

a software module that performs network management functions.

staged data

raw data that has been read, possibly transformed, and written to a SAS data set.

staged table

a type of table that contains data that has been extracted from an input data store and transformed into a standard form for further transformation. A staged table is defined in metadata from a template table, which, after it is used, exists in physical form.

staging code

SAS statements that read raw data, transform it, and write it to a SAS data set.

stored process

See SAS Stored Process

summarize

to calculate summary statistics in order to represent the values of variables in the detail level of a performance data warehouse (PDB). The summary statistics are stored in the day, week, month, and/or year levels of the PDB.

supplied format

a format that is shipped with SAS IT Resource Management.

supplied report definition

a report definition that is shipped with SAS IT Resource Management.

supplied software

software that is shipped with SAS IT Resource Management.

supplied table definition

a table definition that is shipped with SAS IT Resource Management.

system availability

the percentage of time that a system is available to respond to the requests of its users.

table definition

the attributes of a table and of its associated variables.

template table

a type of table that represents a model of a staged table for a particular adapter. A template table includes metadata that controls the wizards that are associated with an adapter.

transformation

in data integration, an operation that extracts data, transforms data, or loads data into data stores.

tuning

the process of tracking the performance of an IT service, comparing the performance to service objectives in order to identify bottlenecks and hardware problems, and then adjusting the service to eliminate the problems. Tuning also involves distributing work equitably to the available computer hardware in order to optimize the use of resources.

type

See data type

utilization

1) for resources that can be partially occupied (for example, memory), the fractional usage of a resource. 2) for resources that cannot be partially busy (for example, a CPU), the ratio of time that a resource is being used to the total elapsed time.

variable

See SAS variable

view

a definition of a virtual data set that is named and stored for later use. A view contains no data; it merely describes or defines data that is stored elsewhere.

Web browser

a software application that is used to view Web content, and also to download or upload information. The browser submits URL (Uniform Resource Locator) requests to a Web server and then translates the HTML code into a visual display.

Web-distributed authoring and versioning

a set of extensions to the HTTP protocol that enables users to collaboratively edit and manage files on remote Web servers. Short form: WebDAV.

WebDAV

See Web-distributed authoring and versioning

WebDAV repository

a collection of files that are stored on a Web server so that authorized users can access them.

WebDAV server

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

weight

a numerical coefficient that is assigned to an item and which indicates the relative importance of the item in a frequency distribution or population

weighting variable

a variable whose values represent the weights for each observation.

WHERE clause

the keyword WHERE followed by one or more WHERE expressions.

WHERE expression

defines the criteria for selecting observations.

wizard

an interactive utility program that consists of a series of dialog boxes, windows, or pages. Users supply information in each dialog box, window, or page, and the wizard uses that information to perform a task.

workload

the amount of work a system is experiencing. Workload can be measured in terms such as characters per second, processes per second, or transactions per second.

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