

Managing IT As a Business

Using SAS IT Management Solutions to Effectively Manage IT Resources

Solution Brief
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Chapter 1

Introduction

With Internet computing and e-commerce now a part of everyday life, businesses are becoming increasingly dependent on the IT resources that support these highly critical applications. Corporate executives, financial managers, and business managers rely heavily on IT resources to provide daily business functions and are now responsible for IT operations and IT budgets. As the role of IT systems continues to grow, data centers are becoming more complex and costly to deploy and manage. To address these increasing costs, businesses are beginning to emphasize simplicity, consolidation, and return on investment for their IT systems and services.

Sun and SAS have come together to offer an end-to-end IT management solution leveraging the strength of the two industry leaders — one specializing in business intelligence and the other in network computing and systems management — to help companies to continually optimize the data center. Combined, Sun and SAS deliver a tightly integrated, open, scalable, and flexible infrastructure for IT management that allows IT managers to leverage existing information assets and extract real value from their data sources. SAS IT Management Solutions include a complete suite of IT resource management, service level management, IT value management, and chargeback tools incorporating broad-based data management, analysis, and the comprehensive reporting capabilities for which SAS is well known. Sun offers the robust IT infrastructure of innovative operating systems, scalable servers, storage solutions, and resource management tools to help deliver high performance, maximum uptime, optimized resource utilization, and low total cost of ownership (TCO). The combined IT management solution from Sun and SAS can help IT managers deliver:

- *Efficiency* — Effective planning and resource allocation, enabling cost-effective, highly available, and flexible services. Well-run data centers tend to grow more smoothly, have fewer customer satisfaction problems, are able to deliver on business goals with predictable results, and can thereby justify budget requests.
- *Flexibility* — The ability to respond quickly to changes in the business environment.
- *Service Level Agreements* — The ability to track and adhere to SLAs.
- *Profitability* — Accurate analysis of IT costs, value, and charge back capabilities, enabling IT resources to be put to their best use to solve business problems, rather than technology problems.

To manage the escalating demand and cost of IT resources, IT managers need tools to help them analyze and communicate resource usage, provide accurate chargeback information, effectively manage resources, and quickly allocate resources to meet changing demands. Unlike other solutions that are for IT only, Sun and SAS can help eliminate the void between the business and financial sides of the corporation. Together, Sun and SAS can help corporations build a comprehensive IT management solution that offers low total cost of ownership and provides the efficiency and flexibility needed for future growth and increased profitability.

Chapter 2

Understanding IT Management Issues

Today, more than ever, the success of businesses large and small depends on functionality provided by IT. Because of this escalating reliance, non-IT executives and managers are increasingly involved in financing IT services, either through best-guess estimates or actual chargeback accounting. In order for this model to be effective, IT managers need to accurately communicate usage and costs, and provide information for capacity planning and resource allocation. In effect, IT must now be managed as a zero-cost or profitable business within a business. In this environment IT managers find themselves grappling with several underlying pressures:

- *Infrastructure* — The expanding complexity of quickly evolving technologies is frequently at odds with the drive to increase productivity. The irony is that technology intended to make life easier is not always easy to manage or control.
- *Delivery* — Application availability, customer satisfaction — in the form of user experience, service level agreements, changing requirements, and the emergence of utility computing.
- *Cost efficiencies* — Accurate chargeback accounting enables better control of budgets and the ability to proactively manage TCO for IT services.

The Problems

IT executives encounter several problems when trying to deal with these pressures. The growing dependency of the business on IT resources is putting a great deal of strain on people resources and skills that are severely limited by budget cuts and belt tightening. The increasing demand for 24 x 7, high performance application services to support a global economy produces a correlating increase in the cost of those services. In light of these problems, IT executives need to prove the value of IT to avoid the possibility of outsourcing services and potentially higher costs. One stumbling block to proving the value of IT is the inability to know if the budget is spent in the right areas because resources are not tied to business activities. Another is untimely and inaccurate information delivery used to support business goals and strategies.

At a lower level, *IT managers* are faced with additional challenges. The most critical of which is enabling a limited staff to manage larger numbers of incrementally complex IT resources. Increasing system performance, utilization, and availability can help improve efficiency, but the difficulty of managing and analyzing data from many sources, and the inability to identify meaningful exception reports, makes this task nearly impossible. Another challenge, in support of the IT executive's need to prove the value of IT, is accurately analyzing, charging, reporting, and forecasting IT costs in a rapidly changing environment. And, all of these challenges need to be addressed in a continuous manner, rather than as a single cost-reducing, consolidation exercise.

Requirements

In order to conquer these challenges, IT executives and managers need the ability to demonstrate and communicate the success and value of the IT organization by continually delivering services and resources efficiently and cost effectively. They need the capability to run as a profit center or zero-balance organization. And, they need the dexterity and the proof to acquire new technology based on detailed utilization, SLA tracking, historic information, knowledge of upcoming business changes, intelligent forecasts, and capacity planning reports.

The Solution — Efficiency, Flexibility, and Profitability

Together, SAS IT Management Solutions and Sun's suite of management tools meet the requirements for solving these problems by delivering:

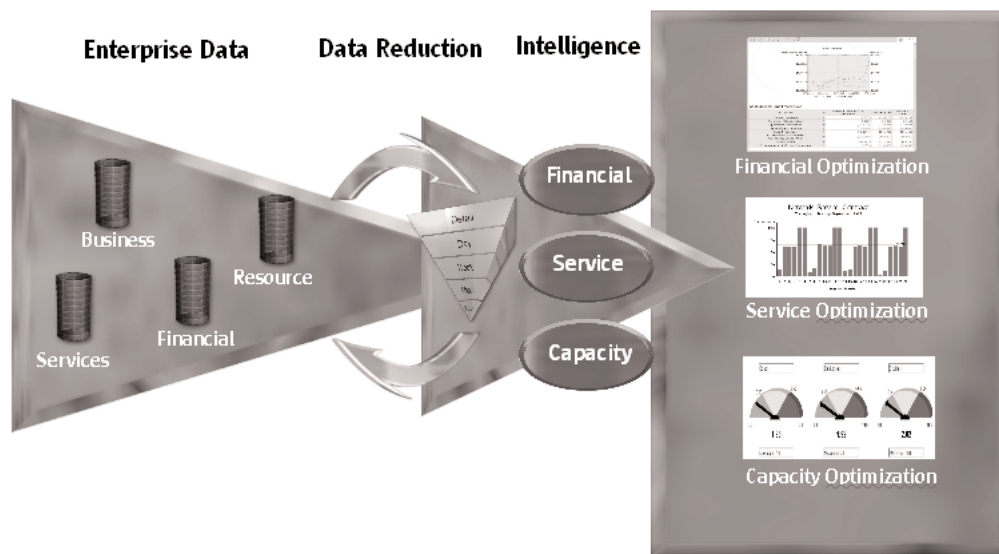
- Low TCO, investment protection, capacity planning, and managed service levels
- A comprehensive and cost-effective way to gain control of all IT resources
- A way to measure end-user experiences
- The ability to turn data from many sources into the knowledge needed to forecast IT needs and make financial decisions
- Tools to manage technology complexity and improve productivity
- System resource management, including flexible resource allocation and high availability for systems and applications
- Service levels for systems, applications, and end-to-end services

Chapter 3

Turning Data into Intelligence

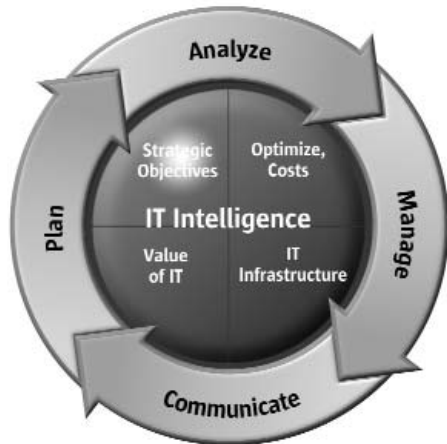
SAS IT Management Solutions enable IT managers to manage the IT organization and infrastructure, evaluate and control costs, and make informed business decisions that directly impact the organization's bottom line. The SAS IT Management Solutions architecture, shown in Figure 1, provides facilities for collecting operational data, such as IT resource, financial, and other related business data into a central repository where it is summarized and used to generate meaningful reports. These reports can then be delivered via the Web to support IT operational functions such as resource management, capacity planning, service level management, and financial management.

Figure 1. SAS IT Management Solutions



SAS IT Management Solutions are a combination of SAS IT Resource Management, SAS IT Service Level Management, SAS IT Charge Management, and SAS IT Value Management designed to address IT utilization, resource and component availability, computer performance management, service delivery, resource cost allocation, and chargeback. These tools can help leverage investments in existing operational systems by adding a layer of intelligence not found in any other IT management solution. With this new information, IT managers can implement an enterprise-wide closed-loop IT management intelligence flow as shown in Figure 2 and described below.

Figure 2. IT Management Intelligence Flow



- *Analyze* — Analyzing costs and resources to provide the right resources at the right time for an appropriate price.
- *Manage* — Employing historical usage trends to provide for future capacity requirements
- *Communicate* — Effectively communicate the value of IT to the organization's bottom line
- *Plan* — Aligning IT resources to the organization's strategic objectives
- *Deliver* — Measure and manage services delivered to the business

SAS IT Resource Management

SAS IT Resource Management (SAS ITRM) automates the process of collecting diverse data from applications and systems (including servers, networks, applications, database management systems, IT infrastructure, and IT staff activities) into a common warehouse structure. The data can then be used for analysis and reporting, providing the knowledge to efficiently manage IT resources across the entire enterprise, and the flexibility to respond quickly to changing environments. The warehouse provides the input to measure Service Level Agreements (SLAs) and can expand to provide additional functionality such as chargeback, company balanced scorecards, and activity-based costing. Whereas other IT solutions for consolidation and management are for IT only, SAS ITRM can bridge the gap between IT and the business and financial sides of the corporation.

SAS ITRM provides a simple GUI interface to present an enterprise view of the IT infrastructure, administer the data warehouse, and generate reports. The interface includes functions to create a data warehouse and import data, apply analytical functions, apply reporting interfaces, and distribute intelligence via the Web. These functions are also accessible programmatically via SAS code and are described in more detail in the following sections.

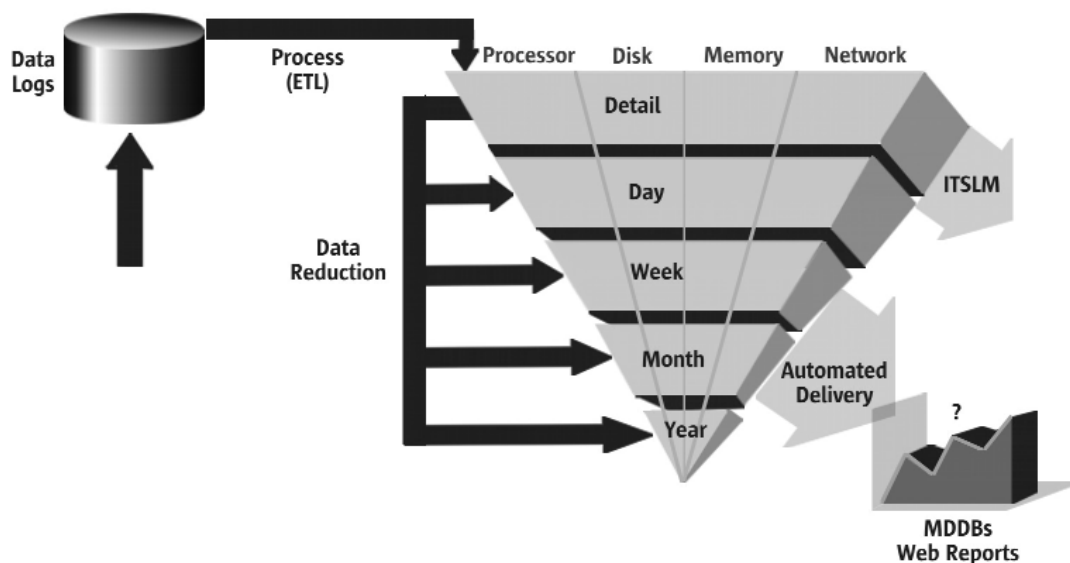
Enterprise View of IT Infrastructure

SAS ITRM brings together utilization, availability, and performance information from each component of the IT infrastructure, including servers, mainframes, databases, applications, networks, Web hosts, security data sources, and more. The data sources range from the familiar IT operations management frameworks such as HP OpenView, BMC Patrol, Tivoli, and mainframe SMF and RMF, through enterprise application systems such as SAP, as well as a wide range of database engines such as Oracle and IBM DB2. This end-to-end view of the heterogeneous enterprise can help facilitate processes to tie operational goals to the organization in the areas of capacity management, IT financial management, service level management, computer performance, cost recovery, Web infrastructure, and IT strategy.

Historical Data Collection

SAS ITRM assembles the data collected in day-to-day business and turns it into knowledge needed to forecast IT needs and make financial decisions. It natively supports extract, transform, and load (ETL) of data from most widely used systems, and monitors, and collectors such as the above mentioned sources, into the Performance Data Warehouse. In addition, a special processing facility allows data from any source with a date time stamp to be extracted and loaded into the warehouse for analysis, making the warehouse easily extendable to support new data sources. SAS ITRM stores data in detailed daily, weekly, monthly, and yearly views. Daily, weekly, monthly, and yearly data stores are based on statistical summaries and require incrementally less data storage, as depicted in Figure 3. Some examples of possible input data sources are: databases, flat files, sar data, Web logs, NT server logs, UNIX® platform accounting records, and Telco equipment.

Figure 3. Historical Data Reduction



Decision Support and Trend Analysis

SAS ITRM provides a wide range of analytical processing and reporting options through a suite of user-friendly interfaces accessible by all levels of the organization. These options enable decision makers to draw upon a consistent pool of information to generate automated standard or customized reports.

Data Modeling Techniques (Visualization)

A key differentiator of SAS ITRM is the ability to interactively and dynamically evaluate data using statistically valid visualization and data modeling methods.

- Data visualization allows correlations and interrelationships among data from single or multiple, disparate data sources to be examined with regard to one another. SAS ITRM provides the data visualization techniques to help make business sense of IT data, including box mosaic, line, scatter, contour and rotating plots, histogram bar, and distribution, fit and multivariate analysis. SAS ITRM's powerful modeling facilities provide the ability to test relationship assumptions when potential relationships between data metrics are identified.

- Strategic capacity planning to manage growth, future workloads, and server consolidation uses existing metrics in the performance database and SAS's best-of-breed statistical modeling. SAS advanced analytics can help forecast the growth of existing workloads using statistical modeling with time series forecasting, event correlation, trending, regression, seasonality, etc. These same analytics can also be utilized to forecast the workload for new applications or to project the resources required for server consolidation.

Information Publishing

SAS ITRM includes a Web publishing facility for distributing static and dynamic (including drill down functionality) reports, such as production quality, billing, capacity planning, utilization, and service level exception and compliance reports via the Web. Reports can also be delivered to users via the Sun Java™ System Portal Server. SAS ITRM increases effectiveness, flexibility and profitability of the IT organization by helping to provide:

- *Optimal operational system management* — Making processes more efficient and competitive by relating IT resources to services
- *Optimal IT services management* — By managing seven key IT resources: servers, networks, applications, management software, infrastructure, databases, and staff activities
- *Optimal IT service delivery* — By measuring and managing service level agreements for the services delivered to the business and reporting on the goals to achieve availability and performance
- *Effective planning and resource allocation* — Collecting historical data and performing statistical data modeling and forecasting in order to predict future IT growth
- *Enhancements to existing IT investments* — Optimizing existing system resources without extensive re-engineering
- *Accurate analysis of IT costs* — By developing business-focused IT cost models

By effectively managing these functions, IT organizations can communicate services in easily understandable business terms and provide innovations and expertise to make IT a quantifiable asset to the organization. With a common repository of IT measurement data, IT management possibilities are virtually limitless. Some examples of how customers are successfully using SAS IT Management Solutions to increase efficiency, flexibility, and profitability are:

- *Consolidating servers* — Measuring CPU utilization of applications to determine where consolidation can be applied to attain optimal resource utilization, lowering TCO
- *Balancing loads* — System utilization reports can be used to balance application loads across multiple systems, increasing performance and availability of application services
- *Forecasting* — Allowing flexible, just in time upgrades by statistical forecasting, monitoring trends over short and long periods of time and integrating non-IT metrics to plan for “peak” events
- *Network consumption* — Eliminating bottlenecks and enabling department chargeback for usage
- *SLA management* — Service level management and exception reporting using target objective and scoring provide a system to implement, maintain, and report upon service level agreements

SAS IT Service Level Management

SAS IT Service Level Management (ITSML) is a solution for aligning IT services to business functions. It allows IT managers to measure and monitor IT services that are delivered to business units. ITSML records IT service metrics and enables companies to measure IT services against objectives (Service Level Agreements), introducing a composite score.

ITSMLM aids in discovering targets, establishing availability, response time and throughput of SLAs, and communicating objectives and results via published dynamic Web reports.

ITSMLM is fully integrated with the IT Performance Data Warehouse (found in the SAS ITRM solution) and supports online maintenance of contracts, agreements, services, components, objectives, and measurements. ITSMLM adds to comprehensive performance and capacity management for a more integrated enterprise solution. ITSMLM incorporates the following features and capabilities:

- A hierarchical catalog of services that captures components, services, SLAs, and contracts. Performance measures can be applied to each element
- The ability to assign service level objectives, service level indicators, and various measurement methods for each component, service, SLA, and contract
- A data repository that hosts service level contracts, SLAs, and performance metrics for comparative analysis with service level objectives
- Extensive analytics for interpreting service delivery data in terms that are meaningful to line-of-business decision makers
- An easy-to-use Java technology-based GUI
- Web-based standard and custom reports for a clear and concise view of IT service quality

SAS can support an enterprise view of the IT infrastructure to provide strategic service level management with the following benefits:

- Implement and maintain effective IT governance as the IT organization and line-of-business consumers agree on essential services and quality levels for those services
- IT providers gain increased sensitivity to customers' IT needs and can better anticipate and exceed expectations
- Customers gain a better understanding of their IT consumptions, enabling them to fully appreciate the difference between realistic and superior service
- Evolve the IT organization from a cost center to a strategic partner in the business
- Support continuous quality improvements

SAS IT Charge Management

SAS IT Charge Management (SAS ITCM) provides chargeback data from diverse computing environments, coordinating IT cost and financial management information in one performance data warehouse. Charge Management can help increase profitability by allocating costs to users throughout the organization to help zero-balance the cost of IT, to communicate the cost of IT, and to influence IT user behaviors. It is also one of the key components in utility computing, enabling IT to charge only for the services consumed.

SAS ITCM is tightly integrated with SAS IT Resource Management, providing an enterprise solution for tracking and managing costs. It provides facilities to append billing data to the IT resource data warehouse such as: IT resource used, quantity used, user, time of use, units of use, rates of use, location of use, funding source for use, and invoice recipient. The greatest benefit of sharing a single IT data warehouse for management and billing is that it allows IT charges to be fully auditable to the system log files used to create the billing reports. This capability enables IT to quickly respond to and resolve billing inquiries.

SAS ITCM can be used in many ways to decrease TCO within the organization. One example is allocating IT resources to cost centers to help ensure optimized monetary margins. Another way is to employ variable usage rates to influence user behaviors, maximizing IT resource use.

Yet another use of SAS ITCM is to enable utility computing. The idea behind utility computing is to provide unlimited computing power and storage capacity that can be used and reallocated for any application and can be billed on a per-use basis. Utility computing not only delivers equal access to computing resources, it can also help create new revenue streams for data centers and new application pricing models based on metered use. SAS ITCM can supply the chargeback accounting functionality that is the core of utility computing.

With SAS ITRM, ITSLM, and ITCM, IT can provide optimized services, measure and manage the services delivery, and charge for those services. All SAS IT Management Solution reports can be delivered via the Java System Portal Server, providing:

- Security
- Access control (via LDAP/Portal)
- View customization (supports different input streams, SAS could be one or more of these streams)
- Delivery to different interfaces (wireless, browser, etc.)

Access control within the Java System Portal Server can be used to manage accessibility of the various static and dynamic reports that are available. Some examples of using the Java System Portal Server in this manner are:

- CTO can view IT exception (uptime, etc.) and service level compliance reports
- CFO can view expenses and activity costs
- CEO can view all of the reports
- System Administrator can view the systems they are responsible for (uptime, etc.)

ITCM supports an automatic reporting capability including Web and email billing, reporting, and alerts. It also offers advanced reporting to support customized billing needs with the ability to tie together many disparate sources of data with complex business and billing models.

SAS IT Value Management

Transforming IT from a commodity service provider to an integral business partner requires intense business intelligence that assesses the costs, business use, and efficiency in which IT services are delivered to the end user's satisfaction. SAS IT Value Management (ITVM) is exclusively focused on identifying, measuring and managing the activity based cost of IT and the operational efficiency by which IT services, and the quality of those services, is delivered to each line-of-business serviced by IT. ITVM is an enterprise-wide enabler that communicates the financial, demand utilization and line-of-business value derived from IT services. SAS ITVM is the culmination of ITRM, ITSLM, and ITCM, with the addition of SAS Activity Base Management for activity based cost modeling and SAS Strategic Performance Management, providing performance scorecards and reporting.

Chapter 4

Intelligently Managing Sun Systems

Armed with analysis reports generated by SAS IT Resource Management, IT can employ this intelligence to better manage Sun systems (including domains, containers, and grids), manage and provision resources to meet SLAs, and provide highly available services. The knowledge can also be used to plan mainframe migrations and server or application consolidation projects to further cut the costs of providing services. Healthy, available, and flexible systems, managed efficiently through automation to maximize utilization, can help increase the profitability of an organization. Sun offers a full suite of solutions for monitoring and managing systems, storage, the operating system, and applications, as well as tools for automating provisioning, change management, load balancing, and providing highly available application services.

In addition, output from many of these tools can be input into SAS IT Management Solutions. In the Sun and SAS Management Process, data from Sun tools and applications is input into SAS ITRM for analysis and reporting, thus reducing the labor of producing standard and ad hoc performance and capacity reports. SAS analysis and reports enable administrators proactively manage the IT environment. Sun tools are then used to affect changes indicated by SAS reports necessary to increase performance, utilization, or change. New data from the modified systems is then fed back into the SAS data warehouse, thus renewing the IT management process and the whole cycle of data center optimization.

Efficiently Managing Systems

In today's global, quickly changing business environment, efficiently managed systems are a corner-stone to success and profitability. Wasted resources, unexpected downtime, inflexible platforms, and complex administrative procedures can eat away at IT staff and budgetary resources.

Monitoring and adjusting CPU, memory, and disk utilization, as well as network bandwidth allocation enables application response time and service-level requirements to be met. In addition, statistical forecasting can enable effective capacity planning and resource management. When systems operate at peak efficiency, administrators are better equipped to work more productively and make better decisions — factors that can mean the difference between merely surviving and thriving in an increasingly competitive marketplace. Using the intelligence gained from SAS IT Management Solutions and management tools from Sun, IT managers can concentrate on innovations that increase the value of IT and affect the bottom line.

Sun Management Center

The enterprise management framework offered by Sun is Sun Management Center. This solution uses Simple Network Management Protocol (SNMP) with monitor agents running on each Solaris Operating System. The agents report a wide variety of information back to a central Sun Management Center server, so the data imported into SAS for analysis comes from one system as opposed to hundreds of systems.

Sun Management Center enhances application availability, optimizes performance and scalability, and simplifies the monitoring and management of SPARC® and x86-based systems running the Solaris Operating System, Linux systems, and applications — all from a single Sun console. These tools enable Sun Management Center to provide integrated, comprehensive enterprise-wide management of Sun products and their subsystems, components, and peripheral devices. With Sun Management Center, system administrators are able to control the Sun infrastructure from virtually anywhere on

the network or on the Web. They can actively manage hundreds of Sun systems at once through a Java technology interface or Web browser

Sun Management Center provides comprehensive instrumentation and administrative knowledge for Sun environments as well as open interfaces that enable information to be shared with other management platforms such as SAS IT Management Solutions. Automated corrective actions can be taken at the agent level, minimizing service impact and reducing the need for manual corrective actions. The net result is systems management becomes easier and the overall cost of operations is lower.

Sun Management Center technology provides a solution to extend and enhance the management capability of Sun's hardware and software solutions. This technology can be grouped into the following functional areas:

- *System management* — Monitors and manages the entire system at the hardware and operating system levels.
- *Operating system management* — Monitors and manages operating system parameters that include load, resource usage, disk space, and network statistics.
- *Application and business system management* — Provides enabling technology to monitor business applications such as trading systems, accounting systems, inventory systems, and control systems.
- *Scalability* — Provides an open, scalable, and flexible solution to configure and manage multiple management administrative domains. These domains consist of many systems and span across an enterprise. Administrators can configure the software in a centralized or distributed fashion so that the product supports multiple users.

Sun Management Center software includes a variety of tools to help administrators proactively and automatically manage both common and complex administrative tasks, such as managing performance and data, and monitoring applications service levels. Tools include:

- *Proactive management and predictive failure capabilities* — Incorporates a large body of administrator knowledge into an intelligent rules-based monitor for the system and applications giving suggested steps for problem resolution, resulting in simplified administration. Intelligence from SAS can be used to write new health monitoring rules to increase the efficiency and uptime of systems.
- *Topology views* — Shows a hierarchical topological map of the objects managed, quickly familiarizing administrators with the Sun elements in the environment. A discovery process automatically builds the topology view, which can be divided into several administrative domains for distributed management.
- *Physical views* — Displays photo-realistic images of hardware components and relevant information such as network interfaces, disk types, processor module speeds, etc., enabling junior administrators to quickly determine which components to replace.
- *Logical views* — Presents a tree hierarchy of managed hosts, including all related hardware, dynamic system domains, storage, and operating system components, enabling administrators to quickly identify a component's exact location.
- *Graph views* — Enables administrators to isolate potential and existing bottlenecks. Data from this tool can be input into SAS for historical analysis, increasing performance and utilization.
- *Per-process display* — Extracts specific information on process resource usage and behavior, allowing administrators to monitor the load an application imposes on the system. This data can be input into SAS to help balance resources across grids, domains, or Solaris Containers.
- *Application monitoring* — Allows administrators to check the health and performance of application processes, to examine and parse log files for recurring problems and particular status messages, and to monitor application files and directory statistics.

- *Event and alarm management* — Uses complex rules and alarm limits to automate diagnosis, provide ongoing status information, and immediately notify administrators of significant events via the console, pagers, etc. Knowledge from SAS can be used to set new thresholds and alarms, or tune existing settings.
- *Domain-aware agents* — Allows dynamic system domains to be monitored independently.
- *Automatic discovery* — Enables fast inclusion of new systems into the Sun Management Center management framework. Data collected through this tool can be input into SAS for up-to-date inventory management.

Advanced Systems Monitoring

Advanced System Monitoring (ASM) is a licensed value-added software product that provides additional modules to support more complete system monitoring capabilities. It includes the following features:

- File systems monitoring — Enables administrators to isolate and monitor the size of any directory and its subdirectories. Data can be analyzed by SAS for capacity planning.
- Full kernel reader — Monitors kernel statistics and all kernel information including CPU statistics, system load statistics, disk statistics, file system usage, etc.
- Hardware diagnostics suite — Enhances system availability by stimulating and detecting hardware faults, warning administrators about latent problems before they cause system downtime.

Performance Reporting Manager

Performance Reporting Manager (PRM) — an add-on to Sun Management Center software — enables the administrator to create reports detailing the status of systems. Performance data is gathered by a history logging capability included with Sun Management Center software and used by PRM to generate performance reports. The reports can be generated at schedule times and viewed via a Web browser. Examples of how PRM can be used to increase efficiency, flexibility, and profitability are:

- IT service managers can use reports on the availability of services and performance levels from the previous day to make sure they are maintaining SLAs. A unique feature of PRM allows the administrator to click on a spike in the report to see alarm data and/or processes that were running at that time, providing further information to help troubleshoot problems.
- PRM reports can be used as input into SAS for diagnostic and trend analysis, as well as for capacity planning and inventory analysis.
- PRM can generate a very detailed level of information on the demand and workload endured on an application service and the resource utilization of memory, CPU, and I/O by applications and service components. This data can be input into SAS for more detailed analysis to determine dynamic allocation of resources.

Efficiently Managing the Application Environment

Once the data from Sun Management Center is input into SAS for analysis, it can be used to help consolidate applications and systems with Solaris Containers, or to pinpoint performance bottlenecks that can then be resolved using Solaris Dynamic Tracing.

Solaris Containers

Solaris Containers are designed to provide a complete, isolated, secure runtime environment for applications where resources can be managed with sub-CPU granularity. Solaris Containers allow application components to be isolated from

each other using flexible, software-defined boundaries within a single instance of the OS. These applications can then be managed independently to allocate the quantity of system resources each workload is permitted to utilize. Before consolidating applications onto a single system the performance requirements for each application need to be determined. Data from various commands in the system can be input into SAS to automate this task, and if run over some time, can check for any spikes in requirements that need to be considered when sizing the resources for each application on a shared system.

N1 Grid Console — Container Manager

An add-on to Sun Management Center software, the N1 Grid Console, helps administrators "turn on the lights" into functions already present in the Solaris Operating System. It does this through a Container management GUI that enables administrators to name a Container and then specify its workload, accessible compute resources, and the quantity of resources allocated to individual applications.

Usage graphs help administrators understand how an application or system is behaving. Graphs can be created on demand, as information about server health and performance is constantly updated. A simple tab on the N1 Grid Console enables usage data to be exported to third-party applications such as SAS, facilitating accounting chargebacks.

Solaris Dynamic Tracing (DTrace)

SAS reports and analysis can be used to help pin-point performance bottlenecks in the environment, especially when systems are under heavy load. However, replicating the problem on non-production system to find the root cause is often nearly impossible, not to mention extremely time-consuming. Solaris Dynamic Tracing (DTrace) — a dynamic tracing framework for troubleshooting systemic problems in *real time on production systems* — solves this problem. DTrace can safely, dynamically instrument the running operating system kernel and running applications without rebooting the kernel and without recompiling (or even restarting) the applications. And, when not explicitly enabled, it has zero affect on the system.

Chapter 5

The Benefits of SAS IT Management Solutions and Sun

The initial benefits of using SAS IT Management Solutions in a data center environment apply to infrastructure and personnel costs and service delivery improvements. Infrastructure engineering effort can be reduced by providing IT information quickly, consistently and accurately. Total cost of ownership can be lowered by optimizing existing IT investments and proactively predicting the need for new IT resources. Effective IT governance can be gained by implementing service level management. Finally, service quality can be improved by managing IT resources effectively. However, it is important to remember that these benefits can only be maintained by a continuous process of gathering and analyzing data.

Below are several examples of companies that have benefited from SAS IT Management Solutions. Most recent successes are in the areas of effective server usage and server consolidation, load balancing network servers and bandwidth, and improved productivity of IT personnel.

- A financial services company did not have a way to assess utilization of IT resources across the company and therefore could not make informed recommendations regarding equipment and systems upgrades. With the implementation of SAS IT Resource Management, utilization data from all of their UNIX servers is stored in a central performance database that enables them to make educated and informed decisions on purchasing and consolidating resources. “Having this information readily available helps management to make informed decisions regarding upgrades and hardware purchases, saving the company money that would have been lost due to unneeded or unwise purchases/upgrades.”
- A large insurance company was losing profits and experiencing rising IT costs. They needed enhanced quality analysis and reporting capabilities to measure and improve responsiveness to clients. They also needed improved analytics and forecasting abilities for capacity planning. Using ITRM in both a distributed and mainframe environment, they are now able to better anticipate the impact of business requirements on IT resources and reduce IT costs.
- In a large telecommunications company, the CTO was faced with rising costs due to the inefficient use of dedicated network servers. New network servers were being purchased and added to the network in support of business critical applications, while existing network servers were not being used to full capacity. Additionally, time and resources were wasted in trouble-shooting and reacting to problems rather than proactively optimizing network server performance. The network administrators were faced with supporting high-levels of network traffic and the demand for constant availability of business-critical applications. Using SAS IT Resource Management to quantify inbound and outbound performance data for each network server, they were able to balance the network load across production nodes. By proactively monitoring the network and making better use of IT resources, the CIO was able to reduce more than \$3,000,000 in related expenses over the first year of implementing SAS.
- A recent implementation at a major Internet retailer solved major performance, capacity, and productivity problems. By consolidating all server performance data within ITRM, they were able to identify and redeploy 400 under utilized servers, at a conservative savings of \$2,000,000. The SAS Performance Data Warehouse now delivers the necessary data to their server modeling project. The following are examples of IT personnel productivity gains:
 - Eight team members each spent 12 to 16 hours per week creating weekly capacity plan reporting. Now it is fully automated and available on a daily basis. They can now look at needs any time, not just Sunday peaks. Not counting the added analysis value, this is a savings of two and a half to three people.
 - One person spent four hours per day producing daily reports that are now fully automated. Another 0.5 person savings.

- Having all data always available enables the performance team to troubleshoot without first having to manually process relevant time period data. This shortens problem resolution time and saves an estimated 20 hours per week.
- Similar results are expected as they incorporate new data sources from their IT infrastructure.

Chapter 6

Summary

IT executives and managers are faced with the challenge of delivering return on investment and proving the value of their IT services. With increasingly demanding customers (both internal and external) around the globe, accountability for profitability and regulation compliance, and the looming threat of outsourcing it is imperative that they implement a comprehensive, enterprise-wide solution to provide accountability, manage service level agreements, and help improve return on investments.

Sun and SAS, each with over 20 years of experience designing and building hardware and software solutions, have joined together to provide a tightly integrated, open, scalable, and flexible infrastructure for IT management that allows companies to leverage existing information assets and extract real value from their data sources. SAS IT Management Solution's complete suite of IT resource management, service level management, IT value management, and chargeback tools combined with Sun's robust IT infrastructure of scalable servers, storage solutions, and resource management tools help deliver the efficiency, flexibility, and profitability necessary to help make IT a successful and profitable component in the organization.

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