Sun™ Management Center 3.0 Configuration and Deployment Guide

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Contents

Preface

This document is intended to be a single point of reference for all high-level information regarding the planning, sizing, costing, deploying, configuring and maintaining of the Sun Management Center product.

This document should empower existing users, potential users, and Sun Technical Support, Professional Services and Sales personnel to be proactive in their analysis of their systems management requirements and to be prudent in their execution of any Sun Management Center rollout.

This document is intended to complement existing documentation and is not intended to provide detailed procedures, command lines or specific operational parameters to be used in the deployment and configuration of the product.

Text presented in gray highlight boxes represents background information regarding the content and intended audience of each section of this document. It is intended to assist the reader in understanding the structure of the document and in locating sections relevant to their needs.

To contact Sun Microsystems with questions about Sun Management Center, send email to SunMC-info@sun.com.

1.0 Product Overview

The product overview gives a high level rundown of the nature of the Sun Management Center product, the features and capabilities of the most commonly used core and value-add packages, and the licensing structure of the various required and optional components.

This section is intended to help the reader determine what management functions are required to meet the needs of a specific environment, and correspondingly what product components are required to realize a workable management solution.

1.1 Introduction

This section provides an overview of the core Sun Management Center product. It emphasizes the key aspects of the Sun Management Center design, including reliability, availability, scalability, extensibility, support for multiple delivery channels, and comprehensive security. This section will help the reader understand the product's goal and its key features.

Sun™ Management Center software is a systems management solution that simplifies the management of Sun hardware, Solaris operating environments and applications running in these environments. The overall goal of Sun Management Center software is to increase service levels, decrease administrative costs, enhance application availability and optimize performance in enterprise computing environments.

In addition to these goals, Sun Management Center software has been designed to improve the customer's ability to do predictive fault analysis, to gain flexible access to systems management tools, and to offer higher end-user availability. As a result, it is a powerful single point of management for the enterprise, making better use of administrative resources and yielding better efficiency per dollar spent on systems management. Furthermore Sun Management Center software is designed to be the single point of integration in heterogeneous environments by integrating with industry-leading third-party enterprise management, application management, and operating system administration platforms.

The key functions and features of Sun Management Center software can be summarized as follows:

Hardware System Management	Monitors and manages most Sun systems at the hardware level. Monitored Sun hardware includes boards, power supplies, disks and tapes.
Operating System Management	Monitors and manages operating system parameters including 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 real-time control systems.
Scalability	Provides an open, scalable, and flexible solution to configure and manage multiple management administrative domains (consisting of many systems) spanning across an enterprise. The software can be configured and used in a centralized or distributed fashion by multiple users.

Extensibility	Provides the ability, via the Developer Environment, to develop customized modules can be developed to meet specific requirements. Third-party modules can also be added to the management environment. Sun Management Center software's inherent design caters to this simple yet powerful paradigm of dynamically-loadable modules, allowing the packaged functionality to be extended with little effort, and more importantly, with minimal system management interruption.
Security	Implements enterprise-wide security measures such as authentication, data integrity, and access control lists for data management and active functions. Employs standards-based SNMP user-based security (SNMPv2usec) for communication between the management server and agents.

1.2 Product Architecture

This section provides an overview of the core Sun Management Center software framework and technology. It describes the features of the three-tier architecture, distributed intelligent agents and the use of standard technologies (Java™ Technology, SNMP, HTML, etc.).

This section will help the reader understand the relationship between the clients, server components and distributed agents. This understanding will help clarify the distinction between the various value-add offerings (such as ASM and PMA), and will assist in the determination of the quantities of each software component that must be licensed.

The Sun Management Center software framework is based on a three-tier agent-based architecture which in essence isolates the operation of the console, server and agent components. This approach provides an open, extensible system monitoring and management solution that makes use of Java Technology software as well as the Simple Network Management Protocol (SNMP).
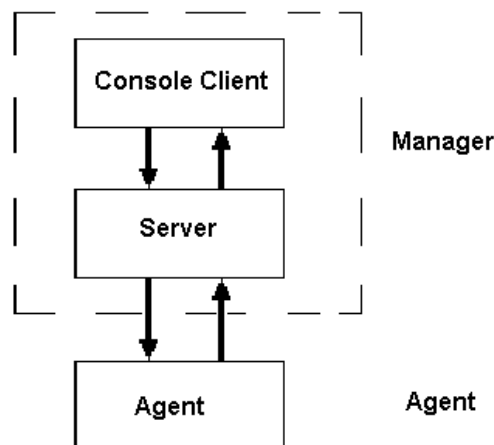
Figure 1. Architecture of Sun Management Center

From an operational standpoint, the Sun Management Center software distributes much of the management workload to the agent tier, which is responsible for data gathering, alarm determination and management directive execution. This differs from most traditional systems and network-management frameworks, which use the agent tier for data gathering only. Such centrally managed systems apply management rules and evaluate current conditions at a centralized location, an approach which forces all relevant agent information to be pulled to the server tier, which can be less reliable and require an excessive amount of network bandwidth.

In Sun Management Center, the management station initiates operations by sending requests to the agents that are managing those systems. Based on SNMP technology, these agents can process these directives and act accordingly. In addition, the agents can act autonomously, collecting and processing data locally, and can act on observed conditions to send SNMP traps or execute management operations. These intelligent agents can raise alarms or initiate specific

actions through customizable rules and thresholds even when connection to the manager is severed.

Management and monitoring functions on the agent are structured into loadable modules. This granularity provides flexibility and empowers the customer to establish as little or as much monitoring and management as required on a per system basis. Additional modules can be dynamically loaded into Sun Management Center agents from the console without disruption to the management or agent systems.

By distributing management intelligence, Sun Management Center's use of standards-based technologies enhances the reliability, availability, and serviceability (RAS) of the enterprise network.

1.3 Product Packaging

This section describes how Sun Management Center software is packaged. It describes the core product framework and the add-on packages that extend and enhance the basic functions and features.

Sun Management Center software is packaged to allow users to acquire and deploy the appropriate level of monitoring and management functions and features required for their environment. Sun Management Center software is comprised of a core product framework whose functionality can be extended and enhanced through various add-on packages.

The major Sun Management Center software packages are listed in the following table:

Package	Description
Base Management Framework (BMF)	This package serves as the core framework for the Sun Management Center software. The core framework is comprised of the console, server and agent layer, and includes several management modules that provide basic monitoring functions for the Solaris™ Operating Environment.
Advanced System Monitoring (ASM)	This add-on package extends the monitoring and management functions of the Base Management Framework. It offers several management modules that allow Sun Management Center software agents to significantly increase their coverage of key system properties and attributes.
Premier Management Applications (PMA)	This add-on package enables users to more effectively manage large enterprises using Sun Management Center software by allowing users to do such things as: • Efficiently propagate configuration changes to many Sun Management Center agents • Access Sun Management Center data through alternate client interfaces such as standard web browsers and command-line interfaces
System Reliability Manager (SysRM)	This add-on package enhances the reliability of systems managed by Sun Management Center. It provides management modules that monitor critical aspects of the Solaris Operating Environment such as key system configuration files and installed patches.

Service Availability Manager (SAM)	This add-on package monitors and ensures the availability of network services by continuously measuring the delivered quality of service. The network services monitored are: • Web Server services (using HTTP protocol) • Directory services (using LDAP/DNS/NIS protocols) • Telnet services • FTP services (using FTP protocol) • Mail Services (using SMTP/IMAP4/POP3 protocols) • Solaris Calendar Services
Developer Environment (DE)	This add-on package is comprised of a software development kit (SDK) and documentation. It allows users to extend Sun Management Center software functionality in various ways including: • Allowing users to create custom management modules • Allowing users to create client programs that interface with Sun Management Center • Allowing users to integrate applications with the Sun Management Center console.

The Base Management Framework, Advanced System Monitoring, Premier Management Applications and System Reliability Manager packages are described in the sections that follow. The Developer Environment package is described in a later chapter.

It should be noted that Sun Management Center software functionality can also be extended through third-party modules and products not mentioned here.

1.4 Base Management Framework

This section will outline the capabilities of the base Sun Management Center software framework, including its features, limitations and fundamental support for Sun Hardware and operating systems.

This section should be the starting point for any evaluation of an environment's management requirements, as the base features form the foundation upon which more advanced components can be built.

The Base Management Framework is a free package that primarily consists of the core framework of the Sun Management Center software. This core framework is comprised of the Java technology-based Console, Server and Agent software and also includes various management modules that allow agents to monitor the general health of systems by collecting and evaluating hardware and operating system data. Add-on packages such as ASM, PMA and SysRM are not a part of the base Sun Management Center software package.

The core framework included in the Base Management Framework provides users with the following key capabilities:

- **Network Discovery** - Discovery of Sun hardware and other IP-based devices on the network.

- **Hierarchical Organization** - Organization of hosts to be managed in a hierarchy comprised of domains and groups that can be displayed on the console. These groups can be organized based on physical locations, logical relationships, or administrative responsibility.

- **Security Access Control** - Dynamic, granular, console-driven administration of user access control to management data and operations.

- **Management Modules** - Dynamic loading of management modules that allow agents to monitor data, evaluate the data using alarm criteria, and automatically alert users to detected alarm conditions and invoke corrective actions.

- **Multiple Console Views** - Viewing of both logical and physical views of supported Sun hardware through the console.

- **Data Presentation** - Logging and/or plotting data values of properties being monitored by the agents.

- **System Configuration** - Configuration management, dynamic reconfiguration and alternate pathing for Sun systems that support these features.

•**Third-Party Integration** - Integration of Sun Management Center software with Sun's own integration packages for CA Unicenter and Tivoli TME, or third-party supplied HP OpenView Operations and BMC Patrol integration packages.

The Base Management Framework also includes various management modules that can be loaded by Sun Management Center agents. These modules provide basic monitoring capabilities and are listed in the following table:

Module	Description
Simple Kernel Reader	Monitors various system kernel properties such as CPU statistics, system load statistics, memory and swap utilization.
Simple MIB-II	Provides access to selected managed objects and properties of the standard MIB-II module (as defined by RFC 1213). Specifically, only the system table and network interface data are included.
Config Reader	Provides extensive hardware monitoring of the host system including memory, boards and power supplies. This module is supported on key Sun systems such as the Sun Fire™, StarFire™, Workgroup Servers and Netra™ product lines.
Dynamic Reconfiguration	The module allows users to dynamically reconfigure the host system.
Storage Device Modules (for Sun StorEdge A5x00 and T3 Array products)	Storage hardware-specific modules that provide both monitoring and management functions.
Log Viewer	Enables console users to view various log files including the system log file and various Sun Management Center log files.
Agent Statistics	Monitors the general health of the Sun Management Center agent process

Additional Information

•Appendix D of the Sun Management Center Software User's Guide provides detailed descriptions of Sun Management Center modules.

1.5 Advanced System Monitoring (ASM)

This section describes the purpose of the ASM offering as well as its various features and capabilities. This section emphasizes that the depth of the information gathered, and hence the comprehensiveness of the management model, depends highly on the nature of the modules loaded on the distributed agents.

This section should help the reader decide which systems in the target environment are candidates to make use of the services of the ASM product, and will describe the types of hosts and anticipated problems that ASM will cover.

Advanced System Monitoring is a licensed add-on package that builds on the monitoring and management capabilities to the Base Management Framework through the provision of additional management modules.

The ASM modules can be classified into the following categories:

- **Enhanced Modules** - The ASM package includes modules (such as the Full Kernel Reader and MIB-II Instrumentation) that extend the coverage of the more basic BMF modules by monitoring a more comprehensive set of data properties.

- **System Reliability** - Various management modules (such as Solaris Health Monitoring, Hardware Diagnostics, Solaris Process Details, NFS and IPv6 monitoring) greatly enhance the reliability of the host system - at both the hardware and the operating system level.

- **Application Monitoring** - Generic management modules (such as Process Monitoring, Directory and File Monitoring, and File Scanning) allow users to effectively monitor custom applications and environments.

- **Remote Monitoring** - Modules such as MIB-II proxy and HP Jet Direct allow users to monitor other SNMP enabled devices.

Together, these management modules allow users to improve uptime by more effectively monitoring their key applications and the host systems on which they run.

The management modules included in the ASM package are briefly described in the following table:

Module	Description
Full Kernel Reader	Comprehensive monitoring of kernel statistics including detailed CPU data, memory, disks, filesystems, inter-process communications, device usage statistics, etc.
MIB-II Instrumentation	Implements RFC 1213(MIB-II) for network management of TCP/IP-based internets.
Solaris Health Monitoring	Monitors key aspects of the host system (such as swap, kernel contention, NFS, CPU, disk and memory) and employs heuristics-

	based rules to detect potential problems.
Hardware Diagnostics	Improves system availability through active testing and detection of hardware faults in field replaceable units (FRUs) using non-data destructive scheduled tests.
Solaris Process Details	Monitors various statistics for key processes running on the local host.
NFS Statistics	Monitors information on NFS filesystems and NFS-specific RPC calls by both server and client.
NFS Filesystem	Monitors key statistics of NFS filesystems mounted on a local host.
Ipv6 Instrumentation	Implements the following RFCs: 2452, 2454, 2465, 2466.
Print Spooler	Monitors the status of the printer daemon, queues and devices on the local host
Process Monitoring	This module monitors processes based on user-specified criteria such as the process name. The module checks whether the processes are running and collects various properties of the process including its memory size and CPU consumption.
File Scanning	Monitors key log files and scans them using regular expressions to determine error or warning conditions. This module can also be used to monitor site-specific log files as required (e.g. httpd, syslog, other application log files).
Directory Size Monitoring	Monitors the size, growth rate and properties of user-specified directories.
File Monitoring	Monitors the size, growth rate and properties of user-specified files.

MIB-II Proxy Monitoring	Monitors the MIB-II data of any SNMPv1 agent.
HP Jet Direct	Monitors the status of HP Printers configured with SNMP agents. Detects printer status in terms of availability as well as printer-specific errors.

Additional Information

- Appendix D of the Sun Management Center Software User's Guide provides a detailed description of Sun Management Center Modules

- Sun Management Center Hardware Diagnostic Suite 1.1 User's Guide provides detailed information pertaining to the Hardware Diagnostics Suite

- http://www.sun.com/sunmanagementcenter/hwds

1.6 Premier Management Applications (PMA)

> *This section describes the nature of the PMA offering, and how it provides enhanced user tools and enterprise-wide capabilities that increase the breadth of the management solution.*
>
> *This section will describe the types of environments that would benefit the most from PMA and the fact that PMA is highly applicable in large deployments and enterprise-wide solutions.*

The Premier Management Applications package is a licensed add-on package that enhances the user tools and the enterprise-wide capabilities of Sun Management Center.

- •**Client Interfaces** - In addition to the Java Technology based Console, PMA offers web browser and command-line interfaces to Sun Management Center data. These light-weight interfaces give users much greater flexibility in accessing Sun Management Center. In addition, PMA enhances the existing Java Technology based Console with Data Views functionality.

- •**Configuration Management** - To facilitate the management of the configuration of large numbers of Sun Management Center agents, PMA offers group task operations, module configuration propagation (MCP) and the importing and exporting of management data.

The features provided by the Premier Management Applications package are briefly described in the following table:

Feature	Description
Web Interface	The web interface allows users to view data and the status of objects being managed by Sun Management Center. It provides users with secure access to Sun Management Center data from a standard web browser, and also provides access from remote locations through firewalls. It should be noted that some management operations supported by the Java technology-based console (such as managing domains and editing property attributes) are not available through the web interface.
Command Line Interface (CLI)	The CLI is a secure lightweight non-graphical user interface for interfacing with Sun Management Center, and can run commands interactively or in a batch mode. CLI can be used as a building block for automating operations in a script-like fashion. CLI is very effective in interacting with the Sun Management Center software over low speed connections.

Console Data Views	Allows console users to create custom views of key information.
Group Operations	Allows users to efficiently manage many agents in an centralized fashion. Allows users to perform various tasks such as loading/unloading modules and setting property attributes.
Module Configuration Propagation (MCP)	Allows users to efficiently manage the configuration of selected agents in a batch operation or on a scheduled basis.
Data Import/Export	Support for exporting and importing of domain management data to allow users to preserve and restore the network and topology configuration.

Additional Information

- Sun Management Center Software User's Guide

- http://www.sun.com/solaris/sunmanagementcenter/docs/index.html#users

- Command Line Interface - Examples

- http://www.sun.com/solaris/sunmanagementcenter/docs/index.html#cli

1.7 Service Availability Manager (SAM)

> *This section describes the SAM offering and how it monitors the delivered quality of service of various Network services, thus increasing the availability of these services.*
>
> *SAM will benefit any system where network services are of high importance.*

Service Availability Manager is a licensed add-on package for the Sun Management Center 3.0 software that enhances the availability of a user's network services.

The network services and protocols supported by SAM are as follows:

Service	Protocols/Standards Supported
Web Server	HTTP
Directory Services	LDAP, DNS, and NIS
Telnet Service	Telnet
File Transfer Services	FTP
Mail Services	SMTP, IMAP4, and POP3
Calendar Service	Solaris Calendar

Service Availability Manager can monitor these systems locally, on the host upon which they reside, and remotely from a different computer on the network. Local modules called Service Element Modules periodically send requests that determine service availability and service time. Synthetic Transaction Modules are loaded on a remote host and contact the network service much as users of that service would see it, determining availability and response time for remote users. There is a Service Element Module and Synthetic Transaction Module for each of the ten protocols/standards listed in the preceding table.

SAM continually monitors network services and reports on whether that service is available, unavailable, or degraded, making use of Sun Management Center's event handling infrastructure to take appropriate corrective measures.

Additionally, SAM monitors a large amount of data for the status of requests to the network service. In particular, it provides availability metrics on the requests:

- Connect time
- Network time
- Resolution time
- Data transfer rate
- Total response time
- Total transaction time
- Outcome of request
- Reason for request failure
- Mean time between failures (MTBF)
- Mean time to repair (MTTR)

Service Availability Manager is clearly an important feature for any system where provision on network services is a high priority, and the monitoring of the availability and quality of service of these network services is important.

Additional Information

- http://www.sun.com/solaris/sunmanagementcenter/sam/

- Sun Management Center 3.0 Service Availability Manager User's Guide provides detailed information on the installation and use of Service Availability Manager.

1.8 System Reliability Manager (SysRM)

This section outlines the features that SysRM provides in order to optimize the availability of managed nodes. The ability for this module to automate tasks and provide audit trails of system configuration changes will be discussed.

The System Reliability Manager is a licensed add-on package for Sun Management Center software that consists of four modules. As an extension of existing features, the System Reliability Manager improves the reliability and robustness of Sun systems.

The System Reliability Manager add-on provides four important components; Patch Management, OS Crash Dump Analyzer, File Watcher, and Script Repository & Script Launcher. The features provided by these components are summarized in the following table:

Module	Description
Patch Management	Helps reduce potential downtime by automatically providing enterprise-wide identification of recommended security and general software patches and fixes. Detects when installed patches do not meet local requirements.
File Watch	Proactively monitors the critical system and configuration files for record addition, deletion, and modification as well as syntax errors, and also detects critical missing files. This module is primarily intended for configuration files that are not frequently changed. Pre-configured to check key system files: •/etc/hosts •/etc/aliases •/etc/nsswitch.conf •/etc/inittab •/etc/vfstab •/etc/passwd •/etc/printers •/etc/mnttab •/etc/rmtab

Script Repository and Script Launcher	Allows system administrators to remotely launch and manage the shell scripts, Java technology classes, and custom scripts that they use to administer and monitor Sun systems and applications. Enables scheduling of operating system jobs via the Sun Management Center user interface, subject to Sun Management Center security credentials.
OS Crash Dump Analyzer	Detects the presence of crash dumps in areas such as the unix/vmcore files. Checks the dump configuration of a system. Detects OS crash dumps (by checking for files in the savecore directory). Enables users to readily analyze crash dump files.

Additional Information

- http://www.sun.com/solaris/sunmanagementcenter/sysrm/

- *System Reliability Manager Documentation* provides detailed information about the System Reliability Manager software and its use

1.9 Licensing

This section will summarize the individual base and add-on components in terms of their licensing requirements. It will also describe how unit-based licensing works and how access to certain server features is restricted (or limited in quantity) by the licensing system.

This section will provide the reader with a mechanism to determine the types and quantities of licenses required to make use of the various features described previously. As such, it contains the vital link between the requirements analysis and the actual system deployment.

The licensing scheme for the Sun Management Center 3.0 software differs significantly from 2.x. In general, the 3.0 licensing scheme has been designed to encourage users to deploy Sun Management Center software to all workstations and servers - allowing users to achieve a base level of monitoring and management for all Solaris Operating Environments throughout their enterprise at no cost.

1.9.1 Sun Management Center 3.0 Licensing

In Sun Management Center version 2, all management modules are available free of charge when managing an individual server or workstation. When managing multiple servers or workstations, however, right to use licenses are required.

For Sun Management Center version 3.0, the Base Management Framework is available free of charge for an unlimited number of nodes. This base level of monitoring and management can then be augmented through Sun Management Center 3.0 licensed add-on products. As described previously, these add-ons include the following:

- Advanced System Monitoring (ASM)

- Premier Management Applications (PMA)

- Service Availability Manager (SAM)

- System Reliability Manager (SysRM)

- Developer Environment (DE)

Advanced System Monitoring (ASM)

Licensing for ASM is based on the number of managed nodes using ASM components as well as the machine type of these hosts. Based on these criteria, licenses may be purchased in the following denominations:

Machine Type	Number of Nodes		
Desktop/Workstation	25	250	1000
Workgroup	10	50	250
Enterprise Servers	10	25	100
Data Center	5	20	50

Premier Management Applications (PMA)

PMA is licensed per Solaris Operating Environment image, and licenses are available in increments of 25, 250 and 1000. The cost of PMA licensing is based on the number of managed nodes as well as the machine type, and prices include a built-in volume discount.

Service Availability Manager (SAM)

SAM is licensed per Solaris Operating Environment image, and licenses are available in increments of 1.

System Reliability Manager (SysRM)

SysRM is licensed per node using the same scheme employed by ASM, and licensing costs again depend on the machine type.

Developer Environment

The DE is licensed for either 1 or 5 systems.

1.9.2 Example Licensing Scenario

The following table represents a scenario in which various quantities of machines, machine classes and managed domains are utilized.

Machine Type	Number of Machines	Number of Solaris Images per Machine	Total Number of Solaris Images
Desktops	3	1	3
Workgroup Servers	4	1	4
Enterprise Servers	6	1	6
Data Centers	2	15	30
		Total	43

The number of licenses required in this example is illustrated in the table below:

License Type	Quantity Purchased	Used	Available
ASM Desktop	25	3	22
ASM Workgroup	10	4	6
ASM Enterprise Server	10	6	4
ASM Data Centers	5	2	3
PMA	50	43	7

Note that the granularity of the licensing scheme in this case will produce unused licenses, and that these licenses will be consumed as more systems are brought under management.

1.9.3 Upgrading From 2.x to 3.0

Existing Sun Management Center 2.x users can upgrade their 2.x licenses to the equivalent 3.0 licenses, which are required for 3.0 server operation. It should be noted, however, that while Sun Management Center 2.x agents are compatible with Sun Management Center 3.0 agents, Sun Management Center 2.x consoles and servers are not compatible with Sun Management Center 3.0 agents, servers or consoles. The license upgrade is therefore only one factor that must be considered during the upgrade process.

Please refer to Section 3.2.3 for more information about compatibility between versions of the Sun Management Center software.

1.9.4 Hardware Classifications

For the majority of the Sun Management Center add-on packages, the licensing scheme is based on the types of the hosts under management. As is evident in the tables above, different types of systems require separate licenses to be purchased, and the licenses for larger or more powerful servers typically cost more than those for small servers or workstations.

For the purposes of licensing, hardware systems are classified into machine types, or classes, as follows:

Machine Class	Example Hardware
Desktop/Workstation	Ultra™ 1, 2, 5, 10, 30, 60, 80, 450 Sun Blade™ 100, 1000 Netra T1 model 100 and model 105 servers, T1 AC200, X1 SPARCStation™ 1, 2, 5, 10, 20
Workgroup Servers	Sun Enterprise™ 2, 150, 220R, 250, 420R, 450 Sun Ultra Enterprise™ 2, 5, 10, 150, 220R, 250, 420R, 450, 3000, 3500, 4500, 5500 Sun Fire 280R, V880 Netra t 1120, t 1125, t 1400, t 1405

Enterprise Servers	Sun Enterprise 3000, 3500, E3500, 4000, 4500, E4500, 5000, 5500, E5500, 6000, 6500
	Sun Ultra Enterprise E3500, 4000, 5000, 5500, E3500
	Sun Fire 3800, 4800, 4810, 6800
	SPARCcenter™ 2000, 2000E, 1000, 1000E
Data Center	Sun Enterprise 10000, 6000, 6500, E6500
	Sun Fire 15K

Additional Information

- Sun Management Center Licensing FAQ

- http://www.sun.com/solaris/sunmanagementcenter/faq/faq-licensing.html

2.0 System Requirements and Sizing

This section is intended to help determine what operating system, storage and computational resources must be allocated or acquired in order to implement a specific Sun Management Center software solution.

This section, combined with the first, allows the reader to determine with confidence the prerequisite software and hardware for a particular Sun Management Center software deployment. As such, they can be considered in isolation from the remainder of the document as a valuable reference during the decision-making stages of any systems management implementation.

The Sun Management Center software's distributed architecture allows for a range of configurations, from a simple, out-of-the-box deployment to a more complex, highly-customized and layered solution. Identifying which deployment architecture and configuration is to be used is very much related to a particular customer's needs. This is true of any Systems Management Tool, and Sun Management Center's design provides for this flexibility.

The intent of this section is to provide Sun Management Center Environment Planners with:

▪An understanding of the requirements of the various features available in the product suite

▪An understanding of the various factors which are affected during deployment, as well as those which can have an affect on deployment

▪A guideline for selecting the appropriately sized hardware to be used in deployment

The information provided in this section does not take into consideration any third party modules, nor are such modules reflected in any of the sizing figures. Therefore, it would be prudent for the Planner to bear this in mind when attempting to specify any configurations for deployment.

2.1 Agent Layer

This section describes the types of managed nodes supported by the agent technology as well as the minimum recommended operating system and hardware configurations of these hosts.

This section may not have a large impact on sizing decisions, as the managed nodes may already exist in the field, or will often be sized based primarily on application considerations, not management requirements.

2.1.1 System Requirements

Sun Management Center agents are required to be installed on every managed node in the target environment. Sun Management Center agents are supported on any SPARC® platform-based workstations and servers running the Solaris Operating Environment version 8, 7, 2.6 or 2.5.1. Sun Management Center agents are not available on Solaris Intel Platform Edition systems.

Disk Space

The bulk of the agent software resides, by default, under the /opt directory of the managed node. The disk space requirements for this directory for the various agent software packages are as follows:

Package/Add-on	Required Disk Space
Basic Management Framework	18MB
Advanced System Monitoring	2MB
Premier Management Applications	2MB
Service Availability Manager	1MB
SysRM	1MB

For storage of configuration files, data files and history log files, the agent requires approximately 2MB of free disk space in the /var partition. This location is configurable, and these disk space figures do not take into consideration any customer-developed or third party modules.

CPU Resources

Sun Management Center agents will, by nature, introduce a minimal ambient computational load on the host system. This load is caused by normal management operations, including periodic data acquisition, alarm rule processing, alarm annunciation, alarm action execution and the processing of client requests.

The amount of load introduced is proportional to the rate at which data is gathered, the amount of data gathered, the number of alarms detected and the number of user requests. The percentage of CPU resources consumed will therefore depend on the number and type of

modules loaded on the system, and the configuration of these modules and, of course, computational capacity of the host system. In general, even on low-end machines with a comprehensive suite of modules loaded and high management activity, the agent should never consume more than a fraction of the CPU resources. See Appendix B for example Agent snapshots.

Virtual Memory

As with CPU consumption, the memory consumed by an agent depends on multiple factors. The primary considerations are the number of modules loaded and the amount of information being monitored by these modules. Loading many management modules on an agent will inevitably increase its footprint requirement. Similarly, agents managing hosts with large disk arrays or other highly scalable assets will probably require more virtual memory, as the sheer volume of management information passing through them will increase.

In general, a base agent with the default set of modules loaded will be under 10MB in size and under typical operation will only require 50-60% of this to be resident in physical memory.

2.1.2 Hardware-Specific Module Availability

The majority of Sun Management Center management modules are portable across all SPARC based systems running Sun Management Center agents. Some advanced hardware-specific Sun Management Center modules, however, are not supported on all Sun hardware. Specifically, the configuration reader and dynamic reconfiguration modules provide advanced management of the underlying hardware platform, and the functions they provide are not necessarily applicable to all hardware systems in the Sun product family.

The following table summarizes the availability of these modules on the various hardware platforms:

Hardware	Config-Reader Module	Dynamic Reconfiguration Module	All Other Sun Management Center Modules
SPARCStation 1, 2, 5, 10, 20	No	No	Yes
Sun Ultra 1, 2, 5, 10, 30, 60, 80	Yes	No	Yes

Sun Enterprise 5, 10, 150, 250/450, 220R/420R, Sun Fire 280R	Yes	No	Yes
SPARCServer™ 1000, 1000E	Yes	No	Yes
SPARCcenter 2000, 2000E	Yes	No	Yes
Sun Enterprise 3x00, 4x00, 5x00, 6x000, 10000	Yes	Yes	Yes
Sun StorEdge™ A5x00, T3	Yes	No	Yes
Netra T1, T1120-1125, T1400-T1405	Yes	No	Yes
Sun Blade 100, 1000	Yes	No	Yes
Sun Fire, 3800, 4800, 4810, 6800	Yes	Yes	Yes

2.1.3 Management Modules

As mentioned above, the resource requirements of management modules depend on the following factors:

- the number of managed properties in the module

- the volume of managed property data processed in the module - tables with many rows of data incur increased resource usage

- the refresh intervals of managed properties

- the complexity of data collection and rule processing

The following table summarizes the resource impact of various Sun Management Center management modules:

Module	Impact
Config-Reader	Will utilize CPU and memory relative to the complexity of the hardware configuration of the managed node.
Dynamic Reconfiguration	Will have minimal footprint impact and will utilize CPU only when performing reconfiguration operations.
Simple Kernel Reader	Will have minimal impact on CPU and memory.
Full Kernel Reader	Will impact CPU and memory based on the number of file systems, CPUs and other system resources under management, as well as the rate of refresh of this information. Consumes more resources than the Simple Kernel Reader.
Health Monitoring	Will have relatively low impact on resources.
MIB-II Simple	Incurs virtually no CPU load and very little footprint increase, proportional to the size of the system interfaces, IP forwarding, and IP address table.
MIB-II Instrumentation	Incurs minimal CPU load and low to moderate footprint increase depending on the number of network interfaces, the size of the routing tables, ARP tables, etc.
File Monitoring	Incurs low footprint increase, proportional to the number of files monitored, and low to moderate CPU load, depending both on the number of files monitored as well as the activity within those files.
Directory Size Monitoring	Incurs low footprint increase, proportional to the number of directories monitored, and low to moderate CPU load, depending both on the number of directories monitored as well as the activity within those directories.

Solaris Process Monitoring	Incurs low footprint increase, proportional to the number of processes monitored, and low to moderate CPU load, depending both on the number of processes monitored as well as the starting and stopping of those processes.
MIB-II Proxy Monitoring	Incurs moderate footprint increase, proportional to the size of the MIB of the proxy-monitored SNMP agent, and low to moderate CPU load, proportional to the number of managed objects in the proxy monitored SNMP agent.
HP JetDirect	Incurs low footprint increase and low CPU load.
NFS Statistics	Incurs low footprint increase and low to moderate CPU load.
NFS File System	Incurs low footprint increase proportional to the number of Network File Systems mounted on the host machine, and low CPU load.
Agent Statistics	Incurs low footprint increase and low CPU load increase.
Data Logging Registry	Incurs low footprint and CPU load increase proportional to the amount of data values being logged.
Print Spooler	Incurs low footprint and CPU load increase.
File Scanning (System Log)	Incurs low footprint and CPU load increase.
IPV6 Instrumentation Module	Incurs low CPU load increase and low to medium footprint increase dependent on the number of network interfaces.
Sun StorEdge A5x00 Array, Sun StorEdge T3 Array	Incurs moderate footprint and load increase proportional to the size of the storage device.

2.2 Server Layer

The server layer is the major hardware component that a client must dedicate to the purpose of running Sun Management Center software. As such, this section will assist the reader in determining a suitable configuration that meets the management needs without over-specifying the system configuration.

The server layer is the core of the Sun Management Center software. The specification of appropriate hardware for the server layer host is critical to ensure the reliable and responsive operation of Sun Management Center.

2.2.1 System Requirements

The Sun Management Center server layer is supported on SPARC platform-based desktops and servers running the Solaris Operating Environment (versions 8, 7 and 2.6) that meet the minimum hardware requirements described in this section. In general, the hardware requirements for the Sun Management Center server layer are significantly greater than that for agents and it is generally recommended that a system be dedicated to running the Sun Management Center server layer.

The disk space requirements for the server layer software installation (by default in the /opt directory) are as follows:

Package/Add-on	Required Disk Space
Basic Management Framework	300MB (plus 500MB in /var/opt)
Advanced System Monitoring	3.3MB
Premier Management Applications	45MB
SysRm	3.0MB
Service Availability Manager	1.6MB

For storage of configuration files, data files and history log files, the server layer requires approximately 500MB of free disk space in the /var partition. This location is configurable via the creation of a soft link pointing /var/opt to another location. If /var is not of sufficient size, the user will be prompted to select a different location to link /var/opt to. In general, it is recommended that /opt and /var/opt be local filesystems.

2.2.2 System Sizing

This section provides recommendations regarding Sun Management Center server layer hardware configurations. It also describes issues that must be considered when sizing server systems.

The Sun Management Server host sizing requirements are highly dependent on the number of agents being managed by the server layer and the management activity on these agents. In general, management activity is comprised of system-generated activity such as event processing, and user-initiated operations such as browsing data, network discovery, group operations, etc.

As a rule of thumb, the amount of management activity can often be correlated with the number and type of Sun Management Center add-on packages that are installed on the server and managed hosts. In general, the more add-ons in use, the greater the management activity and the higher the server hardware requirements.

The following diagram illustrates the recommended server machine classes as a function of the number of agents under management, and the estimated management activity:
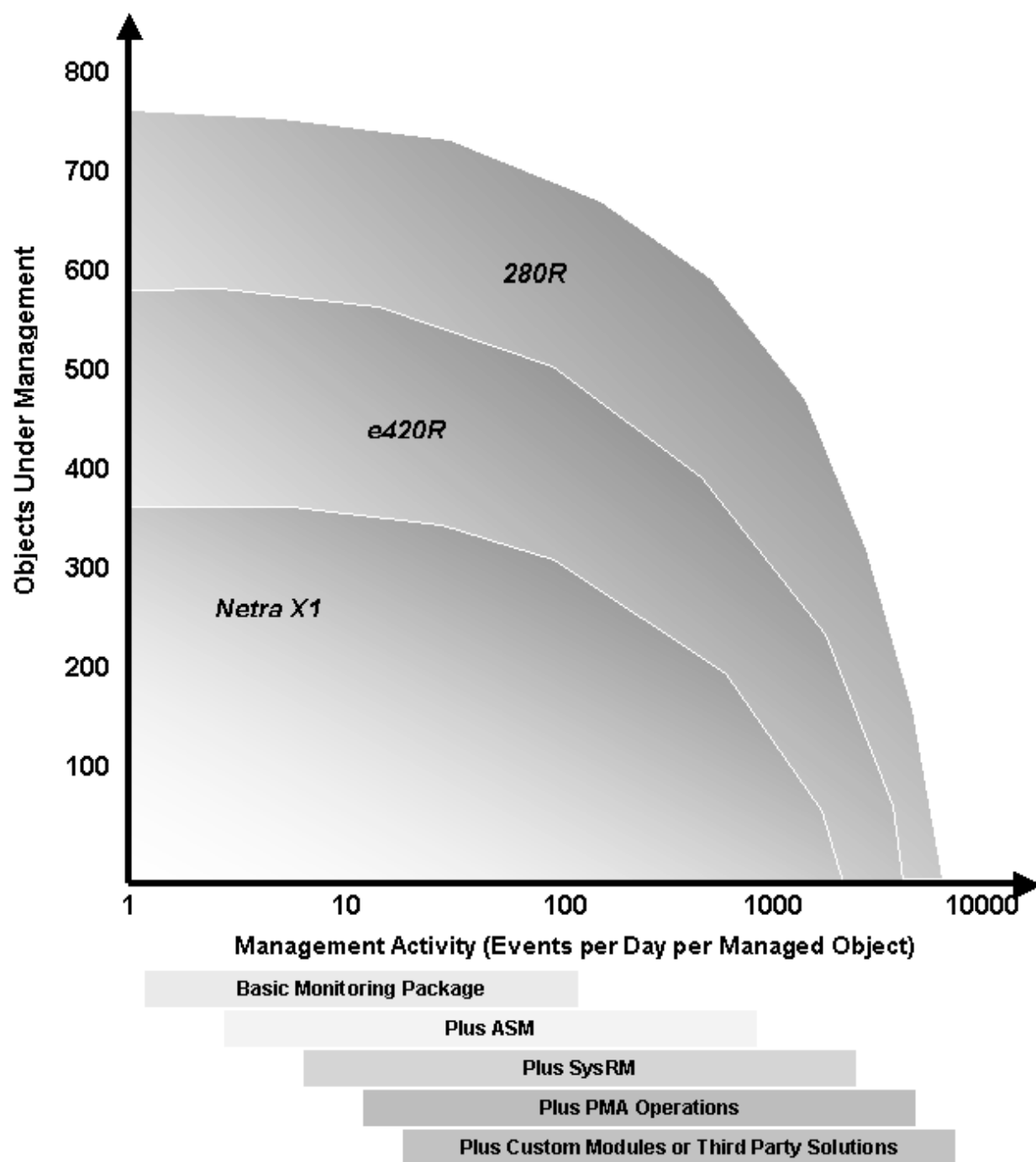
Estimated Limits of Server Hosts By event Rate:

Event Rate (events/day/node)	NetraX1 Maximum # of Nodes	Sun Enterprise 420R Maximum # of Nodes	Sun Fire 280R Maximum # of Nodes
1	350	600	750
10	320	580	730
100	300	500	650
1000	100	300	500

Note: See Appendix A for sample CPU performance figures for each of the machines tested.

Recommended Server Hardware Configurations

The hardware systems specified in the above diagram (Netra X1, Sun Enterprise 420R and Sun Fire 280R) represent three broad classes of machines that can be employed as Sun Management Center server platforms. In all cases, the host machine was dedicated to the task of running the Sun Management Center server layer, and did not run additional applications. The sizing diagram is based on specific configurations for each machine class, and in each case, there are alternate machine configurations which will provide equivalent performance. The hardware configurations associated with these machine classes are listed in the table below:

Machine Class	Server Hardware Configurations
Netra X1	Dedicated Netra X1, Netra T1 or Sun Blade 100 with a single 500 MHz UltraSPARC IIe CPU, 1 GB RAM and 1 GB swap
Sun Enterprise 420R	Dedicated Sun Enterprise 420R or Ultra 60 with dual 450 MHz UltraSPARC II CPUs, 1GB RAM, and 1GB swap
Sun Fire 280R	Dedicated Sun Fire 280R, Netra T4 or Sun Blade 1000 with dual 750 MHz UltraSPARC III CPUs, 1GB RAM, and 1GB swap

Impact of Management Add-ons

As noted earlier, there is a loose correlation between management add-ons and server management activity. It should be stressed that this is a broad generalization and that the actual activity depends more directly on the following factors:

- The number of operations initiated by users

- The nature of the host systems under management (stability, activity)

- The number of management modules loaded by the host systems

- The specification of alarm thresholds and rule parameters for properties under management.

The last two factors greatly influence the tendency of the managed nodes to generate management activity in the form of event processing.

As a result, it is possible to incur high management activity with no add-ons if the managed systems are problematic and alarm thresholds are poorly configured. Conversely, it is possible to utilize many add-ons and incur low management activity if the managed systems are well-behaved and the alarm thresholds are reasonable.

Sun Management Center Console Users

It is generally recommended that the Sun Management Center console be run from a host other than the server layer host. The console can be readily installed on any host and used to connect to the server layer remotely. The recommended server layer configurations assume that the host system is dedicated for running server layer applications only. Running other applications such as the Sun Management Center console on the server layer host should be avoided unless the server host has been sized generously to support this scenario.

With respect to resource consumption, increasing the number of concurrent Sun Management Center console user sessions incurs only modest increases in load on the server layer. The sizing estimates assume approximately 15 active users performing "normal" activities such a browsing managed property data and events and editing property attributes.

It should be noted that some user-initiated actions might temporarily impact the performance of the server layer for the duration of the operation. These actions include:

- *Large Group Operations* that and are targeted at many (100+) agents can consume significant server resources. These operations can further impact server performance if the changes generate alarms on the managed agents, resulting in additional management activity in the form of event processing.

- *Network Discovery Operations* involving the addition of many new entities for the server to manage can incur noticeable load on the server layer host during the discovery process.

- *Topology Data Import Operations* involving the addition of many new entities to manage can result in slower response from the server layer while the entities are being added.

In general, the impact of these user-initiated actions can be minimized by not executing these operations concurrently, by breaking up large operations, and when possible, by performing or scheduling the operations during off-peak hours.

Additional Considerations

Other scenarios and factors that affect the server layer performance include:

- *Simultaneous Startup* of the server layer and many agents can adversely affect server layer performance. The initialization of a server layer managing hundreds of agents can result in slow console response and the temporary inability to access some agents.

- *Large Topology Groups* containing many objects (100+) should be avoided and are more efficiently represented using smaller topology groups containing 75 objects or less.

2.0 vs. 3.0 Server Layer Requirements

It should be noted that the Sun Management Center 3.0 server layer system requirements are greater than the hardware requirements for 2.x server layers. As such, when upgrading from 2.x to 3.0, users should not assume that the server host meets the Sun Management Center 3.0 software system requirements.

2.3 Console Layer

Like the agent layer, the user consoles and other client programs will not typically warrant explicit hardware allocation, as users will usually run them on their existing desktop hosts. Nevertheless, it is prudent to outline the minimum supported configurations for the various client variations in order to give the reader early warning regarding potential sizing issues or incompatibilities.

2.3.1 Sun Management Center Console

The Java technology-based Sun Management Center console is supported on both SPARC based systems running Solaris Operating Environment (version 8, 7 and 2.6) as well as Intel-based systems running Microsoft Windows 2000, NT 4.0 (with Service Pack 3 or 4), 98 and 95.

The disk space requirements of the console software installation are as follows:

Package/Add-on	Required Disk Space
Basic Package	62MB
Advanced System Monitoring	0.27MB
Premier Management Applications	0.65MB
Service Availability Manager	0.5MB
SysRM	0MB

For SPARC based systems, the minimum systems requirements for running the Sun Management Center Console are:

Ultra 1 (or equivalent), 256MB RAM, 130MB Swap

For MS Windows Intel-compatible systems, the minimum requirements for running the Sun Management Center Console are:

300 MHz Pentium, 256 MB RAM, 35MB Free Disk Space

2.3.2 Sun Management Center Web Console

The Sun Management Center web interface is available through the Premier Management Applications add-on. The web server is automatically installed with this add-on, and incurs minimal impact on the server layer.

The web console allows users to access the Sun Management Center software from any system that supports either one of the following web browsers:

- Netscape v4.5.1 or higher

- Internet Explorer 5.0 or higher

2.3.3 Command Line Interface (CLI)

The Command Line Interface software is offered through the Premier Management Applications add-on package. CLI is supported on the same operating environments as the Java Technology based Sun Management Center console.

CLI is a lightweight, non-graphical interface to Sun Management Center. The minimum hardware requirements for CLI are within those needed for the Sun Management Center console. In addition, CLI also operates effectively over slower network connections (e.g. 28.8 baud connections).

2.4 Sun Fire Proxy/Platform Agent Sizing

Like the server layer, the platform agent requires dedicated resource allocation in order to enable the management of Sun Fire assets. Being proactive in the sizing and configuration of this host is quite important, as requirements in this area may not be obvious, and running platform agents on the sever layer may not be advisable in all situations.

To manage Sun Fire servers, Sun Management Center software employs platform agents that interact with the server system controller (SC) and domain agents. Multiple platform agents can be deployed on a single host system to manage multiple Sun Fire servers, provided that system has been sized accordingly.

Typical Platform Agent Resource Requirements

On average, each platform agent consumes 5-9% CPU and 15-18 MB of memory. The CPU and memory consumption of platform agents deployed on the same host system are additive and can be used to gauge hardware requirements. This CPU figure has been obtained from a dual 450MHz UltraSPARC II system such as the Sun Enterprise 420R.

In general, the CPU and memory resource requirements of a platform agent are proportional to the size and complexity of the Sun Fire server configuration being managed. Thus Sun Fire systems with larger configurations will require more platform agent resources.

The disk space requirements of multiple platform agent instances are minimally more than that for a single agent instance since the agents share the same software packages.

Startup of Multiple Platform Agents

By default, platform agents refresh their management information hourly. When multiple platform agents are deployed on the same host and are initialized at the same time, there is a tendency for the agents to perform their data refreshes in quick succession. If too many platform agents attempt to refresh their data concurrently, the overall responsiveness of the host system can be adversely affected.

To reduce the likelihood of concurrent operations by multiple platform agents on the same host, it is best to stagger the startup of each platform agent.

2.4.1 System Requirements

In general, the system requirements for platform agents are comparable to those of Sun Management Center agents. Since Sun Fire platform agents must be deployed on a Solaris instance external to the Sun Fire chassis that they monitor, a user may elect to install platform agents on either:

- A Sun Management Center Server Host

• A Sun Management Center Dedicated Platform Agent Host

The number of platform agents that can be installed on a given host will vary depending on whether that host is a server or agent host. To maximize the overall performance and responsiveness of Sun Management Center, it is generally recommended that platform agents be deployed on dedicated hosts instead of the server layer host.

However, in cases where the server layer is deployed on a multiple CPU system with excess capacity, running platform agents on a server layer host can be considered.

Dedicated Platform Agent Architecture	Platform Agent Residing on Server Layer
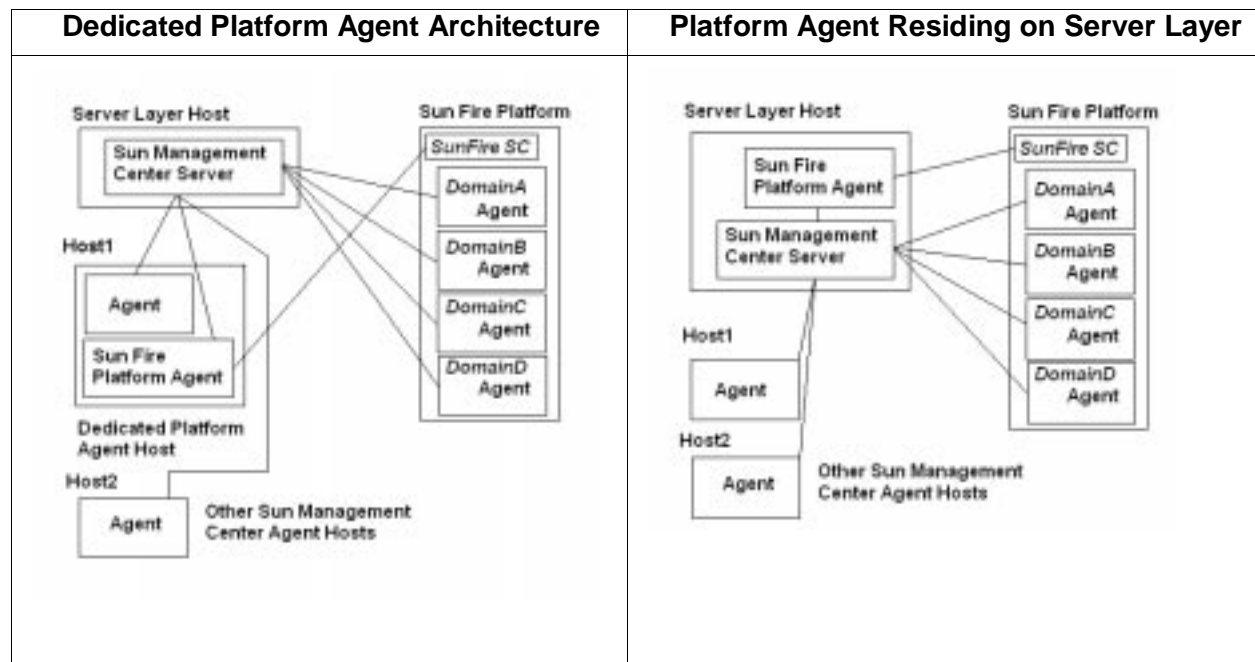
Deploying Platform Agents on a Dedicated Host

The following table lists typical hardware configurations and the corresponding number of platform agents that can be deployed on the dedicated host system.

Typical Hardware Configurations	Maximum Number of Platform Agents
Netra X1, Netra T1 or Sun Blade 100 with a single 500MHz UltraSPARC IIe CPU, 1 GB RAM and 1 GB of swap	5-7
Sun Enterprise 420R or Ultra 60 with dual 450 MHz UltraSPARC II CPUs, 1 GB RAM, and 1 GB swap	11-15
Sun Fire 280R, Netra T4, or Sun Blade 1000 with dual 750 MHz UltraSPARC III CPUs, 1 GB of RAM, and 1 GB of swap	14-20

Because platform agent footprint can vary, the limits are presented here as a range of acceptable values. In general, larger Sun Fire platforms yield larger platform agent footprints, resulting in fewer such platform agents that can be run on a single host. Conversely, smaller Sun Fire platforms have platform agents with smaller footprints, resulting in more such platform

agents that can be run on a single host. These estimates leave sufficient capacity to ensure that operational peaks do not exhaust system capacity.

Deploying Platform Agents on a Server Layer Host

As discussed earlier, the hardware sizing requirements of a host system running the Sun Management Center server layer are a function of the number of agents managed by the server layer and the management activity in the system.

In general, only large multi-CPU systems should be considered for running both the Sun Management Center server layer and Sun Fire platform agents. Deploying platform agents on a server layer host with limited capacity can adversely affect the overall performance of Sun Management Center.

Assuming a moderate level of management activity (less than 1000 events per host per day), the maximum numbers of platform agents than can be deployed on a server layer host are listed as a function of the number of agents under management and machine class:

Number of Agents Under Management	Maximum Number of Platform Agents	
	Sun Enterprise 420R[1]	Sun Fire 280R[2]
100	6	7
300	5	7
500	4	6
750	NA	6

[1] Sun Enterprise 420R denotes an Enterprise 420R (or Ultra 60) with dual 450-MHz UltraSPARC-II server layer host, with 1GB RAM and 1 GB of swap
[2] Sun Fire 280R denotes a Sun Fire 280R (or Sun Blade 1000 or Netra T4) with dual 750-MHz UltraSPARC III server host with 1GB RAM and 1 GB of swap

3.0 Installation and Setup

While the first two sections take a high level view of the requirements of a Sun Management Center deployment, this section deals with the specifics of how to effectively roll out the software in the target environment. It is intended to guide the reader through the process of planning and execution of the rollout of the Sun Management Center software product components.

Questions regarding the acquisition of installation media, the determination of required patches, the planning of software installation, the specification of setup options and the subtleties of enterprise-wide deployment will be answered in this section. This section does not describe the detailed procedures for software installation and setup, which are detailed in the product installation guide.

3.1 Sun Management Center Availability

This section helps the reader understand all the various media through which Sun Management Center software can be obtained, the various channels through which patches are communicated, discussed and obtained, the product documentation available and the various locales to which the software and documentation have been adapted.

3.1.1 Downloads and CD media

Sun Management Center software is available through download from the Sun web site (http://www.sun.com/sunmanagementcenter) or on CD media. The CDs are available in the Solaris Media Kit, or via the Sun Store. Contact a Sun sales representative (http://www.sun.com/sales) or visit the Sun store (http://store.sun.com) for pricing.

Sun Management Center software is periodically re-released under new Platform Updates. Platform Updates do not constitute new versions of the software; they are released as new Sun Hardware becomes available. Platform Updates ensure that the latest Sun hardware is always manageable from Sun Management Center, and provide an opportunity to consolidate and distribute the latest patches, and promote recent value-added packages into the core of the product.

It is highly recommended that users check the Sun web site periodically for the latest versions of the Sun Management Center software, add-on packages and required patches. The following downloads are available:

Sun Management Center 3.0 Software	This download includes the core Sun Management Center software framework, hardware specific packages and the most popular licensed add-on packages (ASM and PMA).
Sun Management Center Add-on Packages	Various add-on packages are available as separate downloads: System Reliability Manager - will be integrated into Platform Update 3 Service Availability Manager - will be integrated into Platform Update 4 Windows Console Platform Updates

Sun Management Center 3.0 Patches	"Jumbo" patches for the Sun Management Center software are available for download. The specific problems addressed by the patches are documented in the patch release notes. Versions of Sun Management Center patches are provided for specific Solaris versions. Additional patches for separate Sun Management Center software packages such as the Windows Console or Add-on packages are also available.
Sun Management Center Utilities	The Multi-node Installation Utility simplifies the installation and setup of Sun Management Center software on many hosts.

3.1.2 Available Documentation

There is a variety of documentation available for Sun Management Center, ranging from white papers that apply to the product as a whole, to specific supplements covering particular platforms and installation situations. The Sun Management Center website provides electronic copies of all Sun Management Center documentation in a central location.

User Guides and Reference Manuals

The *Sun Management Center Software User's Guide* provides information regarding the usage of the Sun Management Center software. This is a necessary guide for all users of the Sun Management Center software as well as an important reference for using the features of the product. It should be noted that the User's guide no longer contains instructions on the installation or startup of Sun Management Center, which are instead contained within the *Software Installation Guide*.

The *Release Notes* contain release-specific information about Sun Management Center, including system requirements, supported operating environments and browsers, information about upgrading to version 3.0 from previous versions, known bugs and limitations and various other information.

The *Alarms and Rules Information of Sun Management Center 3.0 Modules* document describes in detail each of the standard modules and provides information regarding the rules and alarms of these individual modules.

The *Software Installation Guide* provides instructions regarding the installation and startup of the Sun Management Center software. This document is aimed at a system administrator with familiarity in networking and some understanding of Sun Management Center.

The *Developer Environment Reference Manual* provides information for developers wishing to extend the Sun Management Center software. This document's intended audience is developers wishing to extend the functionality of Sun Management Center. These developers are assumed to already possess a thorough understanding of the Sun Management Center software, and object oriented programming. Developers intending to extend the Sun

Management Center console application require knowledge of the Java Technology programming language. Refer to the Developer Environment Release Notes for supplemental release notes that are specific to Developer Environment installations.

Hardware-specific Supplements

A number of platform-specific supplements are available for various Sun platforms. These supplements detail features of the Sun Management Center software that are specific to a given platform. For example, the Config Reader Module differs for each platform and is covered in the corresponding platform supplement. Additionally, platform-specific features such as Dynamic Reconfiguration are detailed in these supplements. Current supplemental information documents are:

- Supplement for Workstations
- Supplement for Workgroup Servers
- Supplement for Sun Enterprise 3500-6500 Servers
- Supplement for Sun Fire 3800-6800 Servers
- Supplement for Starfire (Sun Enterprise 10000)
- Sun Management Center 3.0 Supplement for Netra Servers

Enterprise Management Application Integration Guides

The *Tivoli TEC Adaptor Installation Guide* explains the installation and configuration of the integration package that serves to connect Sun Management Center software with the Tivoli TME product. The audience of this document is an experienced Tivoli system administrator with an understanding of Sun Management Center.

The *Sun Management Center CA Unicenter TNG® 2.2 Integration Package* explains how to install and configure the integration package that serves as a bridge between Sun Management Center software and CA Unicenter TNG. The audience of this document is an experienced TNG system administrator who is already familiar with the Sun Management Center software.

Additional Guides and Reference Manuals

The *Sun Management Center Hardware Diagnostic Suite 1.1* document explains how to use the Hardware Diagnostics Suite.

Finally the document titled, *Command Line Interface - Examples* explains the syntax and commands of the Command Line Interface and provides examples of its usage.

3.1.3 Localization and Internationalization

The Sun Management Center software has been translated into a number of different languages. Internationalized versions exist for French, German, Italian, Japanese, Korean, Simplified Chinese, Spanish, Traditional Chinese.

Additionally, most but not all of the aforementioned documentation has been translated into these languages. Localized versions of the documentation are available from the Sun Management Center website.

3.2 Upgrading to Sun Management Center 3.0

The rollout and use of the Sun Management Center software typically involves a considerable investment in the configuration of the agents, the construction of the topology database and the accumulation of event records. It is therefore imperative that there be high confidence in the software upgrade process and a reasonable understanding of the compatibility between various product versions and the data migration process.

3.2.1 Sun Management Center Compatibility

Sun Management Center 3.0 software is compatible with any SNMP v1, v2 and v2usec entities, regardless of the operating environment and architecture.

Solaris Enterprise Agents for Solaris 2.6, 7, and 8 Operating Environments can co-exist with Sun Management Center agents on the same host system by configuring them as subagents of the Sun Management Center agent.

Sun Management Center software also supports compatibility with previous versions.

Console	Server	Agent
2.0	2.0	2.0
2.0.1	2.0.1	2.0, 2.0.1
2.0.1, 2.1	2.1	2.0, 2.0.1, 2.1
2.1.1	2.1.1	2.0, 2.0.1. 2.1, 2.1.1
3.0	3.0	2.0.1, 2.1, 2.1.1, 3.0

Note that versions 2.0 and 2.0.1 are referred to as Sun Enterprise SyMON™ software, and 2.1, 2.1.1 and 3.0 are referred to as Sun Management Center.

3.2.2 Upgrading from Sun Management Center 2.1/2.1.1

When upgrading from previous versions of Sun Management Center software (2.1 or 2.1.1) or Sun Enterprise SyMON software (2.0/2.0.1), the console and server layers must be upgraded first.

As shown in the Sun Management Center software compatibility chart, Sun Management Center 3.0 servers and consoles support previous versions of Sun Management Center agents and Sun Enterprise SyMON 2.0.1 agents. Consequently, Sun Management Center agents can be upgraded when time or circumstances permit.

In general, it is recommended that all Sun Management Center software components be upgraded to achieve the improved monitoring and management capabilities.

3.3 Installing Sun Management Center 3.0

3.3.1 Server Layer

This section gives an overview of the installation of the server layer, which is the single biggest installation operation required during a Sun Management Center software deployment.

3.3.2 Pre-requisite Information and Tasks

There are a number of prerequisites that must be fulfilled and tasks that must be completed prior to installation. The details of this process are well documented in the *Sun Management Center 3.0 Software Installation Guide*.

System Sizing

The first step is to ensure that system meets the minimum hardware and OS requirements for the local environment. As described earlier in the server layer system sizing section, the system requirements vary considerably based on the expected number of agents to be managed, the add-ons to be installed and the anticipated management activity.

Required Patches

Several OS patches are required by Sun Management Center server installations for Java Technology version 1.2. The installation automatically applies any patches that are required. Note that the patch application persists even after uninstalling the Sun Management Center software.

Modification of System Files

OS patches are required by Sun Management Center server installations for Java Technology version 1.2 which is used by the server layer to communicate with the Java Technology based Consoles. The installation always supplies and applies any patches which are required. Note that the patch application persists after uninstall of the Sun Management Center software, and therefore only needs to be applied once, regardless of how many Sun Management Center software installations are performed.

The Sun Management Center software installation will check if the limits in the /etc/system file are sufficient or not for the services layer to perform as expected. The following lines will be added to the `/etc/system` file if they are absent, or the values present are inadequate.

```
**************************************************
* This file has been modified by Sun MC 3.0 setup. *
* DO NOT REMOVE THESE TWO COMMENTS LINES. *
**************************************************
set shmsys:shminfo_shmmax=402653184
set shmsys:shminfo_shmmin=1
set shmsys:shminfo_shmmni=100
set shmsys:shminfo_shmseg=10
```

```
set semsys:seminfo_semmni=100
set semsys:seminfo_semmsl=115
set semsys:seminfo_semmns=200
set semsys:seminfo_semopm=100
set semsys:seminfo_semvmx=32767
```

Note that if any of the /etc/system entries are changed by the Sun Management Center software installation, then the system requires a reboot prior to proceeding further. If these changes have already been performed by a previous installation of the Sun Management Center 3.0 software, a reboot is not necessary.

The Sun Management Center software installation program will add the groups esadm, esdomadm, and esops to the local /etc/group file, and ensure that the user specified as the administrator of the Sun Management Center software is a member of the esadm and esdomadm groups. For example, if the root user account is specified as the Sun Management Center administrator, the installation program will append the following lines to /etc/group :

```
esadm::1000:root
esdomadm::1001:root
esops::1002:
```

Additionally, the Sun Management Center software installation will add a user **smcorau** to the **/etc/passwd** file. This user account is needed to run the Sun Management Center Database service on the server layer.

For further information about Sun Management Center users and groups, see chapter 4 of this document.

Preserving Configuration Files

It is important to note that when upgrading or re-installing Sun Management Center, users can migrate previous configurations and action scripts to the new installation.

To allow users to migrate existing database data during an upgrade, users are given the option to import existing data into the current installation during the setup phase.

It is possible to save the topology data of a Sun Management Center 3.0 software installation by using the Topology Import/Export utility. The procedure for this is outlined in the Sun Management Center 3.0 Software User's Guide. The process of exporting the topology layout creates an XML file that can later be used to create that same layout on another installation of Sun Management Center.

Additionally, the Sun Management Center software provides a set of backup and recovery utilities to preserve and restore the application data. These scripts and their usage are outlined in the *Sun Management Center 3.0 Software Installation Guide*.

In addition, the alarm action scripts (such as email.sh) can be preserved during upgrades or re-installations by saving the files in a different directory.

Uninstalling Sun Management Center

If installing the Sun Management Center 3.0 software over an existing version (2.X or higher) of the Sun Management Center software, uninstallation of the existing software is carried out automatically by the Sun Management Center 3.0 installation script. Uninstallation may be carried out manually by running the es-uninst script prior to running the install script.

Further information can be found in the *Sun Management Center 3.0 Software Installation Guide*, under the section "Preparing to Install the Sun Management Center 3.0 Software".

3.3.3 Installation and Setup

The installation of the Software is explained in the *Sun Management Center 3.0 Software Installation Guide* and in the corresponding platform supplement to your installation machine. Add-on products are automatically detected by the installation scripts.

Many of the advanced features of Sun Management Center software are licensed and require a license key. Such a key can be entered during the installation of the Sun Management Center software, or at any time thereafter by running the es-lic script.

The Sun Management Center software uses a security seed to generate passwords used for communication between the various processes in a given server context. This is an alphanumeric password of up to 8 characters that must be used in the setup of the server and all agents within that server's server context. If the seed is longer than 8 characters, it will be truncated. See the Sun Management Center Software User's Guide for information regarding the default seed value. It is not recommended that a user use the default seed.

Further information can be found in the *Sun Management Center 3.0 Software Installation Guide*, under the section "Installing the Sun Management Center 3.0 Software".

3.3.4 Web Server Considerations

The Sun Management Center PMA add-on includes a web server to support the Sun Management Center Web Service. This web server cannot be used for other web server duties. In the event of port conflicts, the web server can be configured to operate on a different port.

The Sun Management Center Web Service can be configured to run over the Secure Sockets Layer (SSL). The step-by-step process for this is documented in Chapter 18 of the Sun Management Center Software User's Guide.

3.4 Agent Layer

Although simpler in nature than the server installation, the agent install is typically performed on many hosts, making it one of the most important steps in the deployment process. This section outlines the primary considerations that affect the execution of agent installation.

3.4.1 Pre-requisite Information and Tasks

Before installing the Sun Management Center agent, the installer must ensure that the host system meets the minimum hardware requirements. In addition, the server layer must already have been installed for an agent to be fully functional.

3.4.2 Installation and Setup

The Sun Management Center installation script presents users with the option of installing hardware specific packages. The installer should refer to the hardware supplement corresponding to the platform on which the software is to be installed.

The agent layer consists solely of the agent process, which is by default configured to receive SNMP requests on port 161. In the event that this port is in use by another process, (for example the legacy snmpd process), the installation process will detect the port conflict and prompt the installer to provide an alternate port. In environments where the standard port is already in use and a non-standard port must be used, users should strive to be consistent in the selection of an agent's port number. Limiting the number of unique port numbers simplifies the future configuration and management of the agents. Port 1161 is a typical choice. The installer should note any non-standard agent port specifications used, as this information is required when adding the host to the topology hierarchy. The use of non-default ports is detailed in Appendix B of the Sun Management Center 3.0 Software User's Guide.

During the installation process, the user will be prompted to provide a security seed for the agent. The seed should be the same key as the one specified during the setup of the server layer. If using a non-default security seed, use the same key on all of the agents you wish to operate in the same server context. A Sun Management Center server and agent cannot communicate with each other if they have different seeds. The setup of security seeds is covered in Appendix B of the Sun Management Center 3.0 Software User's Guide.

3.4.3 Sun Fire Specific Issues

Due to the nature of the Sun Fire platforms, and domains with dynamic hardware allocation, these agents necessitate a different installation procedure than standard agents. Sun Fire platforms possess a number of domains, each with its own hardware allocation and running a separate Solaris Operating Environment instance. Each of these domains runs a domain agent. At the same time, the Sun Fire platform as a whole consists of all the hardware in the box allocated to any and all domains. The platform is controlled by an SC (System Controller) board within the platform. In order to monitor the whole of the platform, the Sun Fire Platform Agent must be installed on a host external to the platform itself.

Refer the document entitled *Sun Management Center 3.0 Software Supplement for Sun Fire 6800/4810/4800/3800 Systems* for details regarding installing the software on Sun Fire platforms.

3.5 Console Layer

> *The console layer installation, although perhaps not as complex as that of the other components, can pose several unique concerns, including conflicts in the Java Technology environment and special firewall or communication concerns.*

3.5.1 Java Technology Based Console Interface

The console installation in a Solaris environment is performed, just as with the server and agent layer installs, via the es-inst script. Sun Management Center software requires a specific version of the Java Technology Virtual Machine to be installed. This virtual machine can be installed in the default Java Technology version 2 location, or in a non-standard location, if co-existence with other Java Technology Virtual Machines is required.

To determine the installation location of the Java Technology Virtual Machine after the console has been installed, users can refer the installation log files in the /var/opt/SUNWsymon/install directory.

Users can use a graphical installation package when installing the Java Technology based Console in Microsoft Windows. This Java Technology based Console installation for Windows includes the Java Technology Virtual Machine and the Sun Management Center console software.

For more details regarding the installation of the console, refer to the *Sun Management Center 3.0 Software Installation Guide*.

3.5.2 Web Interface

The Sun Management Center Web Interface is a web-based management interface for the Sun Management Center software. It is a host management system that uses the HTTP protocol to provide easy access to Sun Management Center management information. Sun Management Center users can access the Web Interface across the firewall to monitor and manage Sun Management Center information from any location using widely available web browsers, such as Netscape Navigator™ and Internet Explorer. As previously mentioned, the Web interface can also be configured to run over Secure Sockets Layer (SSL).

For further information regarding the Sun Management Center Web Interface, see Chapter 18 of the Sun Management Center 3.0 Software User's Guide.

3.6 Sun Management Center 3.0 Packages and Add-ons

Because of the distributed nature of Sun Management Center, the installation of packages and add-ons may not be as simple as administrators sometimes assume. This section discusses the subtleties of extending the product in this manner, and outlines considerations regarding the addition and removal of optional product components.

3.6.1 Sun Management Center Packages

As with most Solaris software, the Sun Management Center software is delivered as a set of packages.

A package is a collection of files and directories required for a software product. The core Sun Management Center software framework and add-on products consist of numerous packages. The installation scripts install required packages on the target computer.

3.6.2 Managing Add-ons

Add-on packages may consist of components that need to be applied to the server or agent layers, or both. If the add-on augments agent functionality, it will need to be installed on the agent machines on which the functionality is required. If it has a server layer component or adds functionality to the console, then the add-on will have to be applied to the server layer. Add-on products for the Sun Management Center software include detailed instructions on how to apply the add-on.

As previously mentioned, Sun Management Center add-ons are delivered as packages. The application of an add-on to a system will result in additional packages being added to the system.

3.7 Enterprise-wide Rollout

Because an environment may have many managed nodes, the rollout of a truly enterprise-wide deployment can potentially be labor-intensive and time-consuming. This section highlights some techniques and resources that can simplify the task of large-scale deployment.

3.7.1 Sun Management Center Multi-Node Installation Utility

The Sun Management Center Multi-Node Installation Utility is an easy-to-use facility for interactively executing commands on multiple hosts simultaneously. This tool can be used to simplify the installation of the Sun Management Center software on multiple hosts.

The Sun Management Center Terminal graphical user interface consists of a Common Window and one or more Term Windows, each of which is connected to a different host.

The user can execute commands on all connected hosts by entering the commands in the Common Window. Alternatively, users can execute commands on specific hosts by entering commands in the relevant Term Windows.

The Multi-Node Installation utility is available from the download section of the Sun Management Center website (http://www.sun.com/solaris/sunmanagementcenter/get.html).

3.7.2 JumpStart™ Software

The JumpStart™ software application is a Sun framework for automating the installation of the Solaris operating environment. In addition to installing the operating system, Jumpstart can also be used to install software such as Sun Management Center.

The Jumpstart application is comprised of the following servers that provide services required in the installation process:

- Install Client - Target system on which software is to be installed or upgraded

- Boot Server - The system which provides a failsafe OS for installing the client.

- Configuration Server - The system that specifies the install client's profile information (e.g. software to install, scripts to execute, etc.)

- Install Server - The source of the software packages to be installed on the target systems.

In practice, the boot server, configuration server and install server often reside on the same host system, typically known as the Jumpstart server.

For large enterprises, the establishment of a JumpStart server is often a worthwhile investment as it provides long-term benefits through future OS, patch and software installations and upgrades.

3.7.3 rdist, ftp

Rdist is a program that can be used to maintain identical copies of files on multiple hosts. As such, rdist can be used to distribute common Sun Management Center configuration files to hosts on which Sun Management Center agents are to be installed.

RDIST is not appropriate for Sun Management Center Software Installations - the packages will not be installed properly and the host specific configuration files will have to be configured properly (i.e. by running es-setup).

For agent-only installations, the sub-directory tree can be captured and distributed onto machines that are part of the same server context.

3.7.4 Custom Scripts

Expect is a popular, public domain Tcl-based tool for automating interactive applications such as telnet, ftp, rlogin, etc.

Various users including groups within Sun have used Expect to develop custom scripts that automate the installation and setup of Sun Management Center.

The expect software can be downloaded from http://expect.nist.gov/

Referenced Documents:

- *Sun Management Center 3.0 Software Release Notes*

- *Sun Management Center 3.0 Software Installation Guide*

4.0 Configuration

This section describes many configuration considerations that must be taken into account in order to effectively use the Sun Management Center software. Issues such as user responsibilities and access privileges, user group structures, management data organization, logical environment modeling, multi-server enterprise configuration and general systems management workflow are discussed.

4.1 Users and Security

The Sun Management Center user model closely parallels the account structure of the underlying UNIX system. Although convenient, this relationship often causes users to make use of the product with inadequate consideration of their systems management roles, responsibilities or appropriate privileges. This section outlines recommendations regarding the specification of credentials and assists those with the overall administration responsibility for the Sun Management Center software in the establishment of a workable user configuration.

4.1.1 Users, Groups and Roles

Before setting up Sun Management Center users and user groups, it is important to understand the types of management operations that are possible in the product, and to relate these operations to the various classes of users that will be performing them. Consideration of this is the first step toward identifying an entitlement policy that ensures proper configuration management, data integrity and security of management information and system resources. Such a policy need not be complex, but it must be considered.

No user may gain access to the Sun Management Center software without first being explicitly identified in the master access control list. This is accomplished by entering the user's UNIX® user name in the `/var/opt/SUNWsymon/cfg/esusers` file, and once this is done, a user may log into the product using their standard UNIX user name and password.

Once logged in, the product controls access and defines privileges based on the following functional roles:

Domain Administrators - This is the highest-level role, which permits members to create top-level domains in a server context and assign privileges for other system users within these domains. This activity can be viewed as the provisioning of topology "environments" in which users can create customized configurations. As such, this role is typically assumed by the "owners" of the product implementation within a given environment. Users are considered domain administrators if they are members of the *esdomadm* UNIX user group.

Administrators - This is the product administration role for all operations outside the topology system. Administrators can perform privileged operations, including the loading of modules and the configuration of managed objects and data properties. Administrators can also specify access control at the agent and module level, making this role instrumental in the establishment and maintenance of entitlement policies. Users are considered administrators if they are members of the *esadm* UNIX user group.

Operators - Operators are system users that are generally free to configure their own domains and topology containers, to configure managed objects with respect to their data acquisition and alarming, and to view management information. Although they may enable or disable management modules, operators cannot, by default, load modules or alter access control privileges. They therefore represent a class of user that can effectively use the product and fine tune its operation, but cannot affect major configuration or architectural changes. Users are considered operators if they are members of the *esops* UNIX user group.

General Users - Users that are entered as users of the product but are not explicitly members of the above three groups are considered general users. These users are relatively unprivileged, and can by default only view management information and acknowledge alarms. As such, this role is well suited for first-level support, in which problem identification, remediation and escalation are the primary goals.

In large organizations, it is likely that these roles will map directly onto existing systems administration and support functions, somewhat simplifying the process of defining the Sun Management Center user groups. For others, the process may be slightly more involved, as the mapping between a corporate function and a product role may be less clear. At the extreme, small implementations may warrant the assignment of all logical roles to a single user.

It should be noted that the specification of privileges is flexible, and need not be confined to the above UNIX user groups. Privileges can be explicitly specified at the domain, topology container, agent and module levels. This specification can reference any arbitrary UNIX user or group, with the groups named above being used only by convention. This allows the use of existing account configurations when assigning functional roles. Although it is not recommended to name explicit users when assigning privileges, the use of UNIX groups is quite convenient, particularly in environments where these groups are already established.

Chapter 14 of the *Sun Management Center 3.0 Software User's Guide* provides further information on users and groups in Sun Management Center.

4.1.2 Security

Server to Agent

Communication between the Sun Management Center server and its managed nodes is primarily performed using the industry-standard Simple Network Management Protocol version 2, and employs the User Security model (**SNMP v2usec**). This mechanism is well suited to mapping the user credentials from the server layer to agent-side operations, and is the primary mechanism for ensuring that access control policies cannot be circumvented.

The product also supports SNMP v1 and v2 with community-based security. Although not as robust from a security standpoint, support for these is important for integration with other devices and other management platforms. In environments where the use of these mechanisms is undesirable, it is possible through the access control specification mechanism to restrict or even forbid access via these protocols.

For ad-hoc operations where data streaming may be a requirement, a **probe** mechanism is also employed. This mechanism is initiated by SNMP operations, and hence the same model governs it as other operations. One initiated, probe operations use a streaming TCP connection to implement bi-directional, potentially interactive services on the managed node (e.g. log file viewing). As with SNMP communication, the probe mechanism does not perform any encryption of the packet payload.

Cross-Server Context

When communicating with managed nodes outside the local server context, the user security model will ensure that operations are performed as the generic "espublic" SNMPv2 usec user. This greatly restricts privileges, and essentially limits users to the perusal of management data.

Client to Server

Communication between the server layer and clients (i.e. consoles, command-line interfaces, etc.) is performed using Java Technology Remote Method Invocation (**RMI**) in conjunction with a comprehensive product-specific security model. This model allows clients to operate in either low, medium or high security modes, which affects the level of message authentication performed:

Low - no message authentication - only user password is checked at time of login

Medium (default) - console-to-server authentication only (i.e. server authentication of incoming console messages)

High - both console and server authenticate messages

Because of the potential performance impact of the higher security levels, consideration should be given to the true requirements in this area.

Other Considerations

The user security model employed in the Sun Management Center software requires a security seed in order to establish credentials within a server context. This seed is specified at the time of installation, and the same seed must be used for the server layer and all agents within the same server context. If a seed is not explicitly specified then a default value will be used.

This seed is essentially a password for a privileged internal account, and as such it can potentially be used to mimic the server layer if used with generic SNMPv2usec tools. It is therefore highly advised that the default seed not be used, and that a separate, private seed be specified for each server context. These seeds should be treated with the same significance as a superuser password, and their confidentiality should be rigorously maintained.

4.2 Management Approach

The Sun Management Center software provides many mechanisms to assist in the organization of management data and the specification of management parameters. The correct use of these mechanisms is instrumental in promoting the overall success of a Sun Management Center software deployment. Similarly, an understanding of the systems under management and their relevance to the business objectives of an organization is imperative, and hence a successful management approach should begin with an introspective look at the nature and purpose of the target environment.

4.2.1 Server Contexts

The highest-level building block for the organization of management information is the server context. Each Sun Management Center server provides one (and only one) server context. Each server context may have one or more managed nodes reporting to it, and these managed nodes may report to only one server context.

Communication between server contexts is typically restricted, and management events are not forwarded between servers. The use of server contexts should therefore somewhat parallel the structure of the groups within an organization that are using the product, and in particular the responsibilities of these groups with respect to systems management. In other words, those who "own" the server context will "own" the management data within it and will control all access to systems management operations on the nodes within that context.

4.2.2 Domains

Domains are the highest-level construct within a server context, and are used to provide individual environments within which topology configurations can be constructed. Domains are very generic, and may be created to represent information specific to users, environments or any other logical division. Managed nodes may appear in more than one domain, allowing multiple, overlapping domains to exist and hence facilitating the construction of several different representations of the same management information.

Domains typically contain a hierarchical collection of "containers", which can be used to aggregate sets of managed nodes, management modules or managed objects. This hierarchy not only defines the visible breakdown of information in the user interface, but it also defines the rules for aggregating management status and "rolling up" this status to high-level summaries. This capability and flexibility makes domains, along with the containers within them, a powerful tool for the construction of logical management "models" of a target environment.

4.2.3 Organization

The Sun Management Center software contains a powerful Discovery Manager, which can be used to automatically (and periodically) examine the local environment in order to identify all managed nodes. While instrumental in the configuration of the product, this will have a tendency to cause all management information to be structured along physical, network-based lines.

Depending on the nature of the local environment, this may or may not be the most useful way to view management information and aggregate status information.

Several other ways to model an environment include:

Physical

The physical locations of managed nodes may not necessarily be correlated to the networks on which they reside. In this case, it may be prudent to create a new domain in which containers are structured on physical lines. Cities, sites, buildings, floors, server rooms and even equipment racks can easily be represented, and the nodes within them can simply be "copied" and "pasted" in from the domain in which the discovery was performed.

Configuring this requires administrators to actually know where the nodes are, but once it is performed it becomes a valuable and easily accessed reference. It also defines a physical status roll-up path, enabling problems to be isolated on physical lines and assisting in the identification of common-mode failures. For example, a localized power outage may affect nodes residing on several networks but will only appear in one physical area.

Care should be taken to keep the information up-to-date in this type of model, as it will not be automatically updated when discoveries are performed and it will not automatically track assets that are physically relocated.

Environmental

Organizations may have several logical environments whose locations and resources overlap but whose logical functions are distinct. Such environments include corporate groups such as sales versus engineering, functional groups such as retail versus institutional, and even logical software environments such as user acceptance versus production. In all of these cases, it may be useful to produce topology breakdowns that isolate the elements of each so that problems in one will not raise alarms in another. This is particularly important when modeling systems that include multi-domain servers, as the different domains may be performing functions for completely different groups or environments, and to roll the status of these domains into a single container may be misleading.

Application

Applications are complex entities in systems management, and precisely what constitutes an application from a management context may be difficult to define, particularly when it is distributed and relies on many external services to operate properly. It is precisely this reason that it is important to model applications up-front, and not defer consideration of these cause-effect relationships until the time a problem is actually encountered. Some initial analysis will go a long way toward increasing the efficiency with which application-level problems are resolved.

When building an application model, the topology containers will typically contain a mix of hosts, modules and specific objects. This is because some hosts may be completely dedicated to that application, while others may only be partially responsible for its proper operation. An example of this would be an application that makes use of a corporate directory service, whereby the

health of that service is critical to the operation of the application, but the health of other services on that server is not.

Service

Groups that provide an agreed-upon service level to the client applications but which are not responsible for those applications will typically seek to configure their systems management models to help ensure a high quality of competence in horizontal technologies, and hence the specialists administering these services may want a very focused management model. An example of this would be a database administrator, who is ultimately responsible for service availability and data integrity but is not responsible for hardware or operating system administration. Such users should certainly keep in touch with "the big picture" by accessing the general topology models, but at the same time would benefit from having access to a more specific view.

The following figure shows a "Database Administration" topology domain that is aggregating the status of two database servers, a configuration that will help database administrators focus on their area of responsibility.
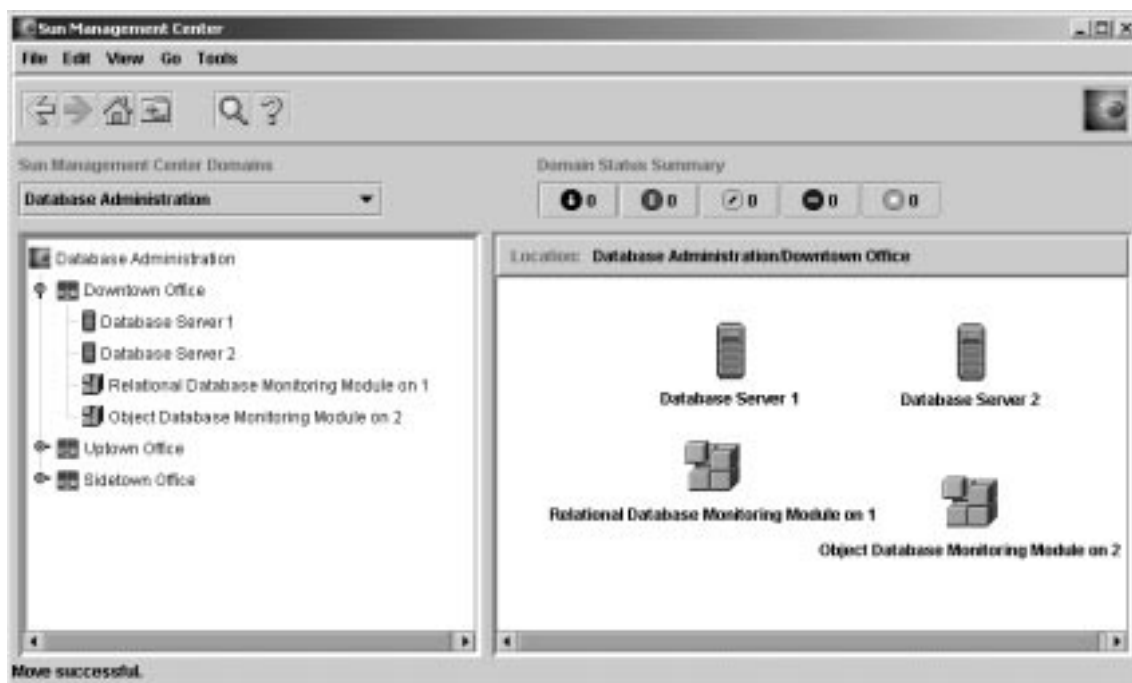
In all of the above modeling techniques, emphasis should be placed on completeness. It is important that the breadth of coverage is sufficient to proactively or at least immediately identify system problems. Failures in devices, hosts, services or processes that are critical to an environment but that are not being "touched" by the monitoring can cause gaps in the coverage that will impact the overall effectiveness of an implementation. To this end, customized modules, proxy solutions and even information from other server contexts should be considered when building a management model.

4.2.4 Managing Large Enterprises

Several facilities exist within the Sun Management Center software to simplify the management of large enterprises. These include Reference Domains, which allows groups to share management information across server contexts, as well as the grouping operations system, which facilitates performing large, highly distributed management operations.

The grouping system is capable of setting data property values, modifying data property attributes, and of loading, unloading, enabling and disabling modules in the local server context. All of these operations can be applied to a large group of managed nodes, and these groups can be defined using existing topology structures or flexible, discovery-style filters. Grouping operations can be saved and performed multiple times, and a scheduler is available to automate their operations. Grouping operations also include Module Configuration Propagation (MCP), a facility in which a reference node's entire configuration can be "cloned" by pulling it to the server and then pushing it to all similar nodes.

The grouping system is a Premier Management Application, and hence is subject to the PMA licensing. See Chapter 2 of the *Sun Management Center 3.0 Software User's Guide* for information on how to reference remote domains. Chapter 15 of the Sun Management Center 3.0 Software User's Guide contains detailed information on Group operations.

5.0 Integration with Other Enterprise Management Platforms

This section covers the integration of the Sun Management Center software with other management platforms. This section should be of interest to virtually all individuals involved with the planning, deployment and use of the Sun Management Center software in environments where other systems management products are used.

Sun Partners recognize that Sun Management Center software offers a best of breed solution for Sun platforms. As such, integration capabilities between OpenView, Patrol, Unicenter & Tivoli are available.

The goals of integration among all partners include:

- Mapping the Sun Management Center alarms to partners' messages and sending them to partners' server

- Starting the Sun Management Center Console from the partners' application framework

- Starting the Sun Management Center Details Console for a chosen Sun Management Center managed node directly from the partners' application framework

- Basic monitoring of the Sun Management Center server and agent processes from within the partners' application framework

5.0.1 Additional Documentation

- http://www.sun.com/solaris/sunmanagementcenter/partner-forum

5.1 HP OpenView Operations

HP OpenView (HPOV) Operations (formerly known as VantagePoint Operations) is a distributed client/server software product for managing distributed environments. HPOV Operations is comprised of a centralized management console (server) that allows users to interact with agents running on host systems being managed.

The Sun Management Center software complements the features of HPOV Operations by providing in depth monitoring and management of Sun products. Integration between HPOV Operations and the Sun Management Center software is accomplished through the HPOV agent and Sun Management server.

5.1.1 Key Features

- Enables mapping of the Sun Management Center alarms to HPOV messages and their distribution to the HPOV Operations management server

- Allows users to start the Sun Management Center Console from the HPOV Application Bank

- Allows users to start the Sun Management Center Details Console for a chosen Sun Management Center managed node directly from the HPOV Application bank

- Allows for basic monitoring of the Sun Management Center server and Sun Management Center agent processes

5.1.2 Key Components

- HP OpenView VantagePoint Operations (VPO) Version A.05.xx or A.06.xx

- HP OpenView VantagePoint Operations (VPO) Integration Package Version A.02.00 (for Sun Management Center)

- Sun Management Center software, version 2.1.1 or 3.0

To obtain the HP OpenView integration software, visit http://support. OpenView.hp.com/cpe/patches and select "operations for unix/SunMC integration".

5.1.3 Prerequisites

In order to integrate the Sun Management Center software and HP OpenView Operations, the integration software must be installed on the HPOV server host and then distributed to all systems hosting Sun Management Center servers. This is facilitated by HPOV distribution capabilities.

The installation on the HPOV Operations server will automatically add a number of icons to the HPOV Application Bank, enabling operators to start the Sun Management Center console.

Event forwarding is done through a mapper process, which connects to the Sun Management Center server and the HPOV agents.

5.1.4 Supported Platforms

Solaris 2.6/7/8 - for HPOV

5.1.5 Additional Documentation

- *HP OpenView VantagePoint Operations - Integration for Sun Management Center Software User's Guide*

- http://ovweb.external.hp.com/lpe/doc_serv - select "IT/Operations for Sun Solaris", then download the *Integration for Sun Management Center Software User's Guide*

5.2 BMC Patrol

At the time of printing, the BMC Patrol Integration package is in the process of being released. Visit the following URL to register for further information:

- http://www.bmc.com/products/new/beta/registration.cfm

5.3 CA Unicenter TNG

The CA Unicenter TNG product provides network-monitoring functionality for a heterogeneous environment. The Sun Management Center software provides advanced capabilities and in-depth information for monitoring Sun products. An integration package is available from Sun that provides a bridge between the two products. The integration of these two products provides Unicenter TNG users with superior management capabilities in environments that contain Sun products.

5.3.1 Key Features

- Enables Unicenter TNG to discover Sun Management Center agents and their loaded modules, and present them in the Unicenter TNG WorldView

- Allows for agent status, agent alarms and agent module load/unload notifications to be forwarded from the Sun Management Center software to Unicenter TNG via traps

- Enables Unicenter TNG users to view Sun Management Center agent information by launching the Sun Management Center Host Details window from Unicenter TNG WorldView

5.3.2 Key Components

- CA Unicenter TNG 2.2 WorldView/DSM (Distributed State Machine)

- Sun Management Center Integration Package For Unicenter TNG (available on the Sun Management Center CD) containing:

    o Event Adaptor (SUNWescaa)

    o Package for TNG WorldView class files (SUNWescas)

    o Package for Unicenter TNG DSM policy files (SUNWescad)

    o Package for launching Sun Management Center Details Window (SUNWescah)

- Sun Management Center software, version 2.1, 2.1.1 or 3.0

5.3.3 Prerequisites

- Unicenter TNG 2.2 WorldView/DSM must be installed and running when installing the Unicenter TNG integration package

- The Unicenter TNG integration package can be installed at the same time the Sun Management Center software is installed or as an add-on package. The Sun Management Center software, version 2.1, 2.1.1 and 3.0 support the Unicenter TNG integration package.

- The Sun Management Center server and the TNG Event Adaptor can be installed on different hosts though the Event Adaptor must be installed on a host that already has the Sun Management Center console installed.

- The Unicenter TNG WorldView class files from the integration package must be installed on the same host as TNG WorldView.

- The Unicenter TNG DSM and Unicenter TNG must be on the same host for the Unicenter TNG DSM policy files (from the integration package) to be installed.

5.3.4 Supported Platforms

Sun Management Center agents: Solaris versions 2.5.1, 2.6, 7 and 8

TNG Event Adaptor: Solaris versions 2.6, 7, and 8

TNG Integration Packages on TNG Server: Solaris versions 2.6, 7 and 8

5.3.5 Additional Documentation

- *Sun Management Center Integration Package User's Guide For Unicenter TNG*

5.4 Tivoli TME

Tivoli TME provides good general network monitoring functionality, and the Sun Management Center software provides excellent advanced capabilities and in-depth information for monitoring Sun products. The integration of Tivoli TME and the Sun Management Center software provides Tivoli administrators with significant additional functionality to manage networks containing Sun products.

5.4.1 Key Features

- Enables Tivoli TEC to acquire alarms from the Sun Management Center software based on preset filtering and formatting parameters

- Enables TIVOLI TEC users to view Sun Management Center agent information by launching the Sun Management Center Host Details window from the Tivoli event console

5.4.2 Key Components

- Tivoli TME10

- Sun Management Center Tivoli TEC Adaptor (available on the Sun Management Center CD) containing:

    o Adaptor Package (SUNWestia)

- Sun Management Center software, version 2.1, 2.1.1 or 3.0

5.4.3 Prerequisites

Prior to installing the integration package, the following must be installed:

- Tivoli TME 10 FrameWork

- Tivoli TEC Server

- Tivoli TEC Console

- Sun Management Center version 2.1, 2.1.1 or 3.0 console must reside on the Tivoli server on which the adapter will be running

5.4.4 Supported Platforms

Solaris 2.6

5.4.5 Additional Documentation

- Sun Management Center Tivoli TEC Adapter Installation Guide

6.0 Developer Environment

This section covers the development of custom add-on modules and client applications for Sun Management Center.

The Sun Management Center software is extensible at several levels, and hence can be used as the basis for highly focused and customized solutions for client environments. This section outlines the typical reasons for making use of the Sun Management Center Developer Environment (DE) and the general capabilities of the DE product.

The Sun Management Center software and the third-party integration products described in this document provide users with a wide range of monitoring and management capabilities that meet the need of most user environments.

However, in instances where users require additional capabilities that are not presented through the existing product offerings, the Sun Management Center Developer Environment (DE) can be used to add those capabilities.

The Sun Management Center DE is a software development kit (SDK) comprised of Application Programming Interfaces (APIs) and graphical tools. The DE is a licensed add-on product intended for Application Programmers and Third-Party Developers.

The Sun Management Center Developer Environment enables developers to:

- Build custom Sun Management Center Agent Modules to monitor and manage third party applications or proxy monitor other SNMP compliant devices

- Create custom rules for Sun Management Center Agent Modules to assess the status of monitored properties

- Integrate real-time Sun Management Center data and management functions into other applications like Help Desk Ticketing, Problem Resolutions Systems or ERP Systems

- Consolidate peripheral management functions into the Sun Management Center console thereby providing a centralized management station

- Define and create custom composite objects to model complex objects in their system

-

The DE is comprised of the following key components:

Key Components	Description
Graphical Module Builder	Graphical tool used to build custom Sun Management Center agent modules. Allows users to define the module's data model and data acquisition mechanisms that include SNMP, scripts, Tcl/C-based programs. Supports the import and export of data models.
Module Building API	Allows users to create custom modules to monitor and manage applications, systems and hardware. The module building API complements the Graphical Module Builder by allowing users to define more sophisticated data acquisition mechanisms.
Module Rule API	Allows users to create rules to determine the status of managed objects and properties.
Client API	Provides a Java Technology based API for access to Sun Management Center server functions. Allows users to invoke management functions through Sun Management Center agents. Facilitates receiving data from the Sun Management Center software through polling or callback mechanisms. Allows users to automate management functions by responding to alarms and invoking custom management functions.
Console Integration API	Enables users to extend the Sun Management Center console to incorporate additional management functions through new screens or support for interfaces with other applications. Provides a configuration file-based interface to invoke third party management applications.

Composite Objects and Device Modeling	Provides support for defining custom devices to model new hardware and specific aspects of systems to be managed by Sun Management Center. Provides device modeling, allowing users to associate properties (such as object types, icons, internationalization) with devices. Composite objects are used to model a set of associated objects that are best represented as a single object.
Product Packaging	Describes how to package custom components for distribution and deployment with the Sun Management Center software.

Additional Information

- •Sun Management Center 3.0 Developer Environment Reference Manual

- •Sun Management Center 3.0 Developer Environment Release Notes

- •Sun Management Center 3.0 Software User's Guide

- •Licensing Section in this document

Appendix A: Server Layer Performance Data

The following data was collected using three different server layer machines. The table is indexed by machine type and event firing rate. The event firing rate refers to the number of events (alarm conditions) being reported to the server layer from agents within its server context. The percentages in the table represent the percentage use of the CPU(s). Note that this is a sum of total activity for the system, which was running only the Sun Management Center server and default Solaris processes.

100 Agents:

Architecture	Event Rate (events/sec)					
	0/1	1/10	1/5	1/1	3/1	5/1
Netra X1	24%	35%	52%	67%	88%	98%
Sun Enterprise 420R	5%	10%	14%	26%	42%	57%
Sun Fire 280R	4%	7%	8%	17%	32%	47%

500 Agents:

Architecture	Event Rate (events/sec)					
	0/1	1/10	1/5	1/1	3/1	5/1
Netra X1	32%	42%	57%	77%	90%	99%
Sun Enterprise 420R	18%	25%	25%	38%	54%	74%
Sun Fire 280R	6%	9%	12%	23%	38%	50%

Appendix B: Agent Performance Data

The following table provides rough estimates of the resource consumption for Sun Management Center agents. Provided are examples of a minimally configured agent, on three different architectures, and a very heavily configured agent running on a single processor desktop.

The *light* configurations are based on an agent with the following modules loaded:
- Kernel-Reader Simple
- Agent Statistics
- MIB-II Simple

The *heavy* configuration was based on an agent with the following modules loaded:
- Config Reader
- Health Monitor
- Full Kernel Reader
- MIB-II Instrumentation
- Directory Size Monitoring
- File Scanning
- Hardware Diagnostics Suite
- Script Launcher
- HP JetDirect
- Agent Statistics
- MIB-II Proxy Monitoring
- Various Other Modules, including Custom Modules

This configuration is likely to be greater than any needed.

Server Type	Config-uration heavy/light	CPU Usage			RAM Usage (average)	
		maximum	minimum	average	Size	Resident Size
Netra X1	light	16.3%	0.0%	0.09%	12MB	10MB
Sun Enterprise 420R	light	14.3%	0.0%	0.13%	15MB	14MB
Sun Blade 1000	light	0.3%	0.0%	0.03%	17MB	16MB
Sun Blade 100	heavy	14.0%	0.2%	8.9%	29MB	29MB

Note that larger machines typically have larger hardware configurations such as number of processors, disks, etc. This results in greater memory consumption by agents running on larger machines.