



Installing and Administering Solaris Container Manager 3.6

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Preface

The *Installing and Administering Solaris Container Manager 3.6* guide describes how to use Container Manager to create, use, and manage containers.

Note – The 1.0 version of this product was called N1™ Grid Console - Container Manager.

Note – The Solaris™ 10 release supports systems that use the SPARC® and x86 families of processor architectures: UltraSPARC®, SPARC64, AMD64, Pentium, and Xeon EM64T. The supported systems appear in the *Solaris 10 Hardware Compatibility List* at <http://www.sun.com/bigadmin/hcl>. This document cites any implementation differences between the platform types.

In this document the term “x86” refers to 64-bit and 32-bit systems manufactured using processors compatible with the AMD64 or Intel Xeon/Pentium product families. For supported systems, see the *Solaris 10 Hardware Compatibility List*.

Who Should Use This Book

The document is intended for users familiar with the Sun™ Management Center product. Therefore, many terms and concepts related to the Sun Management Center are not explained here. For more information about Sun Management Center, refer to *Sun Management Center 3.6 Installation and Configuration Guide* and *Sun Management Center 3.6 User's Guide*.

How This Book Is Organized

This document describes how to install and use the Container Manager software.

[Chapter 1](#) introduces Container Manager.

[Chapter 2](#) provides instructions for installation and setup.

[Chapter 3](#) describes the container model and explains how to start the product.

[Chapter 4](#) provides instructions for creating, using, and managing projects.

[Chapter 5](#) describes how to create, use, and manage resource pools.

[Chapter 6](#) describes how to create, use, and manage zones.

[Chapter 7](#) describes how to use alarms.

[Chapter 8](#) describes how to create reports.

[Appendix A](#) provides instructions for installation and setup by using the command line.

[Glossary](#) is a list of words and phrases found in this book and their definitions.

Related Information

The following documents provide information about concepts that are useful when using the Container Manager software.

- *Solaris Resource Manager 1.3 System Administration Guide.*
- *System Administration Guide: Network Services.*
- *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones.*
- Sun Blueprints book, *Consolidation in the Data Center*, by David Hornby and Ken Pepple.
- Sun white paper *Consolidating Oracle RDBMS Instances Using Solaris Resource Manager Software.*

The latest information about Sun Management Center software and add-on products is available at <http://www.sun.com/solaris/sunmanagementcenter>.

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Typographic Conventions

The following table describes the typographic changes that are used in this book.

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name%</code> you have mail.
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name%</code> su Password:
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	The command to remove a file is <code>rm filename</code> .

TABLE P-1 Typographic Conventions (Continued)

Typeface or Symbol	Meaning	Example
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . Perform a <i>patch analysis</i> . Do <i>not</i> save the file. [Note that some emphasized items appear bold online.]

Shell Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P-2 Shell Prompts

Shell	Prompt
C shell prompt	machine_name%
C shell superuser prompt	machine_name#
Bourne shell and Korn shell prompt	\$
Bourne shell and Korn shell superuser prompt	#

Introduction to Solaris Container Manager 3.6

This chapter introduces Solaris Container Manager 3.6 (Container Manager).

The following topics are discussed:

- “Container Manager Overview” on page 18
- “Solaris Container Model” on page 19
- “Resource Management” on page 21
- “Zones” on page 23
- “Resource Utilization Reports and Extended Accounting Data” on page 25
- “Before Using Container Manager” on page 25
- “Container Manager Examples” on page 26
- “New Features and Changes in Solaris Container Manager 3.6” on page 27
 - “Zone Management” on page 28
 - “Dynamic Resource Pools” on page 28
 - “Bandwidth Control Using IPQoS” on page 29
 - “Flexible Process Management” on page 29
 - “Timesharing Scheduler” on page 29
 - “Container Enhancements” on page 29
- “Container Manager Documentation” on page 30
- “Getting Started” on page 31

Container Manager Overview

Solaris Container Manager 3.6 is an add-on software product to the Sun Management Center 3.6 release. This product helps you to consolidate servers to control the cost of large networks of servers and software. Container Manager enables you to create and manage containers, projects, resource pools, and zones. You benefit from better utilization of hardware resources and higher server-to-administrator ratios.

The product enables you to do the following tasks:

- Partition the resources of a host
- Allocate, control, and organize resources
- Isolate applications from one another
- Analyze resource consumption for specific applications
- Monitor resource usage and gather extended accounting data for CPU and memory usage

Containers are ideal for any organization where users need their own virtualized environment, including IP address, disk storage, and applications. For example, a company might set up containers for specific applications, such as mail server, web server, or database. A company might also set up containers for geographic areas, such as United States, Americas, Europe, and Asia-Pacific. Similarly, a company might set up containers for functional departments, such as, human resources, research and development, and sales.

Specific industries can use containers or zones for a variety of purposes. A university might give each university student a zone with an instance of the OS, a share of system resources, and a root password. A wireless company might set up containers to monitor services, such as long-distance service, local telephone service, and voice mail. A cable provider or Internet service provider might set up containers for DSL, cable modem, or cable television service. A financial institution might set up separate containers for users, who do complex queries on data warehouses, and for users, who need online transaction processing. An independent software vendor (ISV) might set up containers or zones for separate customers to whom they sell software or services.

Container Manager and Other Resource Management Utilities

This product organizes existing resource management utilities that run on the Solaris 8, Solaris 9, and Solaris 10 releases. Specifically, this product provides tools to simplify the configuration of Solaris Resource Manager 1.3 and Solaris 9 Resource Manager.

For more information about the Solaris resource management utilities, see *Solaris Resource Manager 1.3 System Administration Guide* and *System Administration Guide: Network Services*.

Solaris Container Model

A Solaris Container is an abstraction layer that helps to organize and manage the collection of physical system resources. The container enables the creation of a blueprint that details the resource requirements for an application. The resource requirements of the application are the focus of the Solaris Container model. This model focuses on the service or workload. The service is delivered by an application, which is a workload to the system. A workload is a set of associated processes, such as an executing application.

An earlier form of workload-based management was implemented in the Solaris Resource Manager 1.3 release. In that release, the workload was associated with the *limit node*, `lnode`. Container Manager software builds on this earlier effort. The current container model provides a tool to help you organize and manage the ongoing delivery of resources for services. Common examples of services could be monthly payroll, customer order lookup, and web service delivery.

You need to be able to describe the environment that an application is limited to in a server consolidation. Establishing this description enables you to move from having one application running per server to having many applications running on a single server. The container provides this description, as well as being its instantiation. A simple container could, for example, describe system resources such as CPU, physical memory, and bandwidth. A more complex container could, for example, also control security, namespace isolation, and application faults.

The following illustration of a Solaris Container shows the relationship between services and resources.

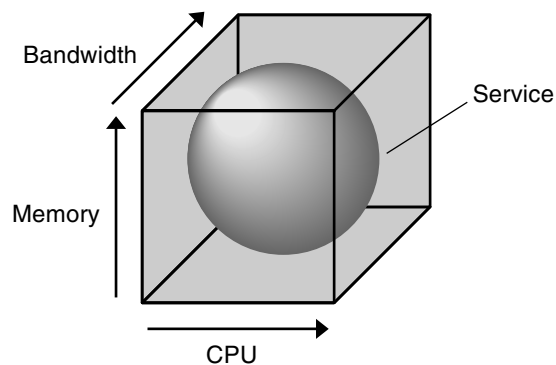


FIGURE 1-1 Example of a Solaris Container

The box represents the container. Three kinds of resources are shown along the x, y, and z axes of the box that surrounds the service. In this model, CPU, Memory, and Bandwidth are fundamental resources. The service is bound by the box to represent how this service is contained by the container. In this release, Container Manager controls all three fundamental resources: CPU, physical memory resources, and bandwidth.

Because Container Manager focuses on the workload, the amount of resources that is used by an individual host is not monitored. A host is a system on which the Container Manager agent software has been installed and which is part of the Sun Management Center server context. When installation is complete, the host is automatically discovered and the name is added to the navigation window in the Hosts view. The software monitors the amount of resources that is used by the service. In this model, a single instance of a service represents at least one process that runs on an individual host. The data is retained for possible system health monitoring and accounting purposes.

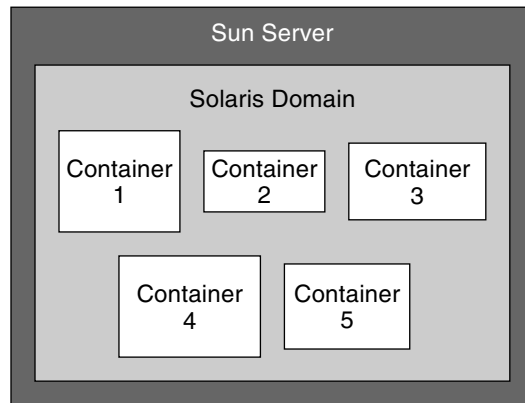


FIGURE 1-2 Example of Containers on a Host

More than one container can be active on an individual host at the same time. If multiple containers exist on a single host, you can set the boundaries of the containers so that the host can expand and contract them. In this case, resources that other containers are not currently using are available to a container that can use them. Ultimately, the number of containers that can be active on an individual host is determined by the amount of CPU and memory resources available, and how much of these resources each container reserves. The system must be able to meet the combined resource requirements of all the active containers, which are sized by the needs of the applications.

For more information about managing containers with Container Manager, see [Chapter 4](#).

Resource Management

Generally, a *resource* represents a process-bindable OS entity. More often, a resource refers to the objects constructed by a kernel subsystem that offers some form of partitioning. A resource can also be considered an aspect of the computing system that can be manipulated with the intention of affecting application behavior. Examples of resources include physical memory, CPUs, or network bandwidth.

Container Manager works with resource management utilities in the Solaris 8, Solaris 9, and Solaris 10 releases. In the Solaris 8 release, resource management is provided by Solaris Resource Manager 1.3. Every service is represented by an `lnode`. The `lnode` is used to record resource allocation policies and accrued resource usage data. `lnodes` correspond to UNIX user IDs (UIDs). The UID can represent individual users and applications by default. For more information about `lnodes` and resource management, see “Limit Node Overview” in *Solaris Resource Manager 1.3 System Administration Guide*

In the Solaris 9 and Solaris 10 releases, resource management is provided by the Resource Manager. In this release, the *project* is similar to the `lnode`. A project provides a network-wide administrative identifier for related work. All the processes that run in a container have the same project identifier, also known as the *project ID*. The Solaris kernel tracks resource usage through the project ID. Historical data can be gathered by using extended accounting, which uses the same tracking method. In Container Manager, the project represents the container.

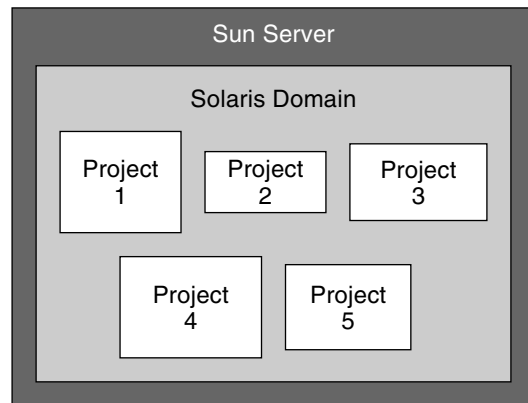


FIGURE 1-3 Example of Projects on a Host

Information about the processes that run in a container is obtained from the Container Manager GUI. The gathering of data is transparent to you as you create and manage containers by using the software.

Different methods can be used to create container boundaries. One method is to partition the system by using resource pools. Another method is to establish limits on the project through resource controls.

Resource Pools

A *resource pool*, or *pool*, is a Solaris 9 and Solaris 10 software configuration mechanism that is used to partition the resources of a host. A *resource set* is a process-bindable resource. Memory sets and processor sets are examples of resource sets. Only processor sets are currently available in the Solaris 9 and Solaris 10 release. A pool binds the various resource sets that are available on a host.

A resource pool can hold one or more projects. In the case of one project, the resources that are linked to the pool are dedicated to that project. In the case of multiple projects, the resources that are linked to the pool are shared with the projects.

On the Solaris 10 Operating System, the product has a feature called dynamic resource pools. The dynamic resource pools help you obtain better performance by enabling you to adjust each pool's resource allocations in response to system events and load changes. This feature is described in [“Dynamic Resource Pools” on page 28](#).

When running on the Solaris 8 Operating System, a host can have only one resource pool. This pool is called `pool_default`. Because resource pools do not exist in this OS version, the `pool_default` is created artificially. All of the CPUs on a host that run the Solaris 8 release are considered to be in a single pool by convention.

For more information about managing resource pools with Container Manager, see [Chapter 5](#).

Resource Controls

In the case when more than one project is bound to a single pool, you can set guarantees, or limits, on a single project. These limits are called *resource controls*. An example of a control is the setting of a minimum CPU limit, as in the case of using the fair share scheduler (FSS). Another example is the setting of a physical memory cap, as in the case of using the `rcapd` daemon. When setting a minimum CPU guarantee, the idle CPU cycles in one project can be used by the applications in the other projects.

Zones

Zones provide an isolated and secure environment for running applications. Zones give you a way to create virtualized operating system environments within an instance of Solaris. Zones allow one or more processes to run in isolation from other processes on the system. For example, a process that runs in a zone can send signals only to other processes in the same zone, regardless of user ID and other credential information. If an error occurs, it affects only the processes that run within the zone.

Global Zones

Every Solaris 10 system contains a general global environment, like previous versions of the OS, called a global zone. The global zone has two functions: it is the default zone for the system and the zone used for system-wide administrative control. All processes run in the global zone if no non-global zones, referred to simply as zones, are created by the global administrator.

The global zone is the only zone from which a non-global zone can be configured, installed, managed, or uninstalled. Only the global zone is bootable from the system hardware. Administrative functions, such as physical devices, routing, or dynamic reconfiguration (DR) are only possible in the global zone. Appropriately privileged processes or users that run in the global zone can access objects associated with other zones.

Unprivileged processes or users in the global zone might be able to perform operations not allowed to privileged processes or users in a non-global zone. For example, users in the global zone can view information about every process in the system. Zones allow the administrator to delegate some administrative functions while maintaining overall system security.

Non-Global Zones

A non-global zone does not need a dedicated CPU, a physical device, or a portion of physical memory. These resources can be shared across a number of zones that run within a single domain or system. Zones can be booted and rebooted without affecting other zones on the system. Each zone can provide a customized set of services. To enforce basic process isolation, a process can “see” or signal only those processes that exist in the same zone. Basic communication between zones is enabled by giving each zone at least one logical network interface. An application running in one zone cannot see the network traffic of another zone even though the respective streams of packets travel through the same physical interface.

Each zone that requires network connectivity is configured with one or more dedicated IP addresses.

For more information about zones, see *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

Resource Utilization Reports and Extended Accounting Data

If you have the Performance Reporting Manager add-on product installed with Container Manager, you can create reports that provide historical resource utilization data per container, resource pool, zone, project, or host. CPU data, memory utilization data, and CPU extended accounting data are stored in the database by the Performance Reporting Manager data collection service. From the GUI, you can request a graph report that details resource usage, or you can export the data to a text file in comma-separated value (CSV) format. The latter can be used in a billing and accounting application, for example.

For more information about Performance Reporting Manager software, see *Sun Management Center 3.5 Update 2 Performance Reporting Manager User's Guide*. For more information about the available reports and accounting data, see ["About Reports"](#) on page 123.

Before Using Container Manager

Before installing and using the Container Manager software, assess your resource consumption needs. As part of the container creation process, you provide a minimum CPU reservation and optionally a physical memory cap for the processes that will run inside the container. The container creation process is easier if you have already evaluated your needs, developed your goals, and have a resource plan in place. Additionally, a master list of the specifications of all the hardware involved is also useful before you begin.

Server Consolidation

A key component of a successful server consolidation is a master list of all the servers, storage, and applications that are candidates for consolidation. After you have finalized your consolidation plan, you can begin to implement the plan with this list.

If you intend to perform a server consolidation in your data center, you need to perform several tasks before installing and using the Container Manager software. A partial list of tasks to be performed includes the following:

1. Choose the applications to consolidate.
2. Identify the components, such as processes, groups of users, or users that make up the workload for the application.

3. Determine the performance requirements for each defined workload. This task involves monitoring the real-time activity of the application on the current system, including CPU, memory, network, and storage requirements and usage. You also need to determine which types of file systems, shared file systems, and shared libraries the workloads use to configure the new system and to share resources efficiently, such as read-only file systems, libraries, and man pages.
4. Rank the workloads that are to share the system resources by which applications require the most resources and the time periods they need them. You also need to identify competing workloads that are housed on the same systems.
5. Identify the projects for these workloads. The project serves as the administrative name that is used to group related work in a manner you deem useful. For example, you might have a project for a web services and a project for database services.

Note – Although the Solaris Operating System can have thousands of containers, for practical purposes and best performance, we recommend that you have no more than 200 hosts with approximately 10 zones per host and 10 projects per zone.

For more information about how to plan and execute a server consolidation, you can read the Sun Blueprints book *Consolidation in the Data Center* by David Hornby and Ken Pepple.

Container Manager Examples

The following examples show how you can use Container Manager.

Multiple Projects With a Zone for Oracle

In this example, you have a default resource pool with a zone. You then set up a container with one resource pool with two zones. One zone, `zone_ora1`, has the Oracle database application and the second zone, `zone_ws01`, has a web server application. Each resource pool has two CPUs. You set up eight CPU shares on the container, four shares for `zone_ora1` and three shares for `zone_ws01`. The container uses the fair share scheduler.

Dynamic Resource Pool Example

In this example, you set up one container with two resource pools. Pool1 has one to three CPUs assigned. The load goal for pool1 is greater than 20 percent and less than 80 percent. Pool2 is used by a mail server. Depending on the load that the mail server requires, the other pool is dynamic and can use from one to three CPUs for its applications.

Applications Sharing the Same Container

In this example, you set up one container with two zones. The first zone, `zone_ora02` has seven projects: one project for the user ORACLE, one project for any process run by the group database administrator, and five default projects: `system`, `user.root`, `noproject`, `default`, and `group.staff`. A total of 100 CPU shares are in the first zone. Each of the default projects is assigned one share each. The first project for user ORACLE is assigned 75 shares and the second project for `group.dba` is assigned 20 shares.

The second zone, `zone_ws_02`, is for a web server.

Oracle 10g Rack on Multiple Systems

In this example, the application Oracle 10g runs on multiple systems. You create a project on system 1 with one pool and one zone for the Oracle 10g application. You then copy the project with its zone and pool onto a second system and associate the project on the second system with the Oracle 10g application.

Multiple Systems With Multiple Resource Pools

In this example, you have two systems with two pools each. You have a project with a web server on system 1 and a project with a web server on system 2. Each project has 10 CPU shares with each web server allocated 5 shares. The other 5 shares are reserved for future use.

New Features and Changes in Solaris Container Manager 3.6

Solaris Container Manager has the following new features, which vary with operating systems.

TABLE 1-1 New Features in Solaris Container Manager

Benefit	Feature	Solaris 10 (SPARC and x86)	Solaris 9 (SPARC and x86)	Solaris 8 (SPARC)
Run processes in isolation and virtual OS environments	Zone management	Yes		
Set and obtain system performance goals	Dynamic resource pools	Yes		
Avoid network congestion	Internet Protocol Quality of Service (IPQoS)	Yes		
More flexible process management	Ability to move process across containers	Yes	Yes	
Timesharing scheduler support	Support of other scheduler class	Yes	Yes	Yes
Better visualization tools	Graph enhancement	Yes	Yes	Yes
Zone-aware containers with memory allocation	Container enhancement	Yes	Yes	Yes
Utilization report for top 5 resource objects	Graph enhancement	Yes	Yes	Yes

Zone Management

Container Manager enables you to create, delete, modify, halt, and reboot non-global zones. Container Manager also can discover existing zones, detect zone changes, monitor and archive a zone’s CPU, memory and network utilization, and generate zone up/down alarms.

For more information about zones, see [Chapter 6](#).

Dynamic Resource Pools

Dynamic resource pools dynamically adjust the resource allocation of each resource pool to meet established system performance goals. Dynamic resource pools simplify and reduce the number of decisions required from a system administrator. Adjustments are automatically made to preserve the system performance goals specified by a system administrator.

You can create, modify, and delete dynamic resource pools for Solaris 10 systems. After you configure dynamic resource pool constraints, such as the minimum and maximum CPUs, utilization objective, locality objective, and CPU share, the Container Manager agent dynamically adjusts the pool size to the conditions of resource availability and consumption.

Resource pool configuration is saved on both the agent and service database.

Bandwidth Control Using IPQoS

The IP quality-of-service feature helps you to provide consistent levels of services to network users and to manage network traffic. The service enables you to rank, control, and gather network statistics.

This feature controls inbound and outbound traffic of a Solaris zone. You specify the upper limit of the zone's input/output network bandwidth. The package is dropped if the limit is exceeded. Because IPQoS has a fair amount of CPU overhead, this is an optional feature.

Container Manager monitors and gathers work utilization data and provides a historical network utilization graph.

Flexible Process Management

To increase process management flexibility, Container Manager 3.6 enables you to move processes from container to container. For Solaris 9 systems, you can move processes across containers. For Solaris 10 systems, you can move processes across containers only within the same zone.

Timesharing Scheduler

Container Manager 1.0 supported the fair share scheduler (FSS) only. Container Manager 3.6 allows you to select the scheduler class, fair share or timesharing, when you create or modify a resource pool. The scheduler class determines the process priority, deciding which process runs next.

After you change a resource pool's scheduler class, any new processes for that resource pool changes to the resource pool's scheduler class. Container Manager does not change the scheduler class of a running process.

Container Enhancements

Container Manager includes the following enhancements to containers:

- On Solaris 10, containers are zone aware. Each zone has five default containers.
- You can allocate a specific amount of share memory for a container.

Container Manager Documentation

The following table lists the documentation resources that are available for the product. For the documentation for Solaris Container Manager 3.6, go to <http://docs.sun.com/app/docs/coll/810.4>.

TABLE 1-2 Documentation Resources

Task	Resource
To install and administer containers	<i>Installing and Administering Solaris Container Manager 3.6</i> (this book)
To access Help from the product	<i>Online Help for Solaris Container Manager 3.6</i> . To access this help, click the Help link in the Solaris Container Manager GUI.
To install Sun Management Center 3.6 and its add-on products, including Container Manager	<i>Sun Management Center 3.6 Installation and Configuration Guide</i>
To find installation issues, run-time issues, late-breaking news (including <i>supported hardware</i>), and documentation issues	<i>Sun Management Center 3.6 Release Notes</i>
To obtain information about Performance Reporting Manager, the optional add-on, which works with Container Manager	<i>Sun Management Center 3.5 Update 2 Performance Reporting Manager User's Guide</i>
If you use Solaris 8 Operating System, you should read about Solaris Resource Manager 1.3	<i>Solaris Resource Manager 1.3 Installation Guide</i> <i>Solaris Resource Manager 1.3 System Administration Guide</i> <i>Solaris Resource Manager 1.3 Release Notes</i>
If you use Solaris 9 or 10 Operating System, you should read about Solaris resource management and zones	<i>System Administration Guide: Solaris Containers-Resource Management and Solaris Zones</i>

Getting Started

If you have already installed and set up the Solaris Container Manager, the following links help you use the product quickly:

- [“To Start the Container Manager GUI” on page 51](#)
- [“Creating Projects” on page 73](#)
- [“Moving or Starting Processes in a Project” on page 85](#)
- [“Activating or Deactivating Projects” on page 88](#)
- [“Modifying Projects With a Resource Change Job” on page 97](#)
- [“Creating New Resource Pools” on page 104](#)
- [“Creating Non-Global Zones” on page 110](#)
- [“To Set an Alarm Threshold” on page 120](#)
- [“Requesting a Report” on page 126](#)

Container Manager Installation and Setup

This chapter contains procedures for installing, setting up, and uninstalling the Solaris Container Manager 3.6 (Container Manager) software with wizards. For information about using the command line for these procedures, see [Appendix A](#).

For the *latest* information about installing, setting up, and using the software, see the *Solaris Container Manager 3.6 Release Notes*.

This chapter discusses the following topics:

- “Container Manager Software Description” on page 33
- “Installing Container Manager Software” on page 37
- “Setting Up Container Manager Software” on page 39
- “Backup and Restore” on page 43
- “Agent Update” on page 43
- “Uninstalling Container Manager Software” on page 44

Container Manager Software Description

Container Manager is installed as an add-on product to the Sun Management Center 3.6 software with the latest patch applied. The add-on software is installed on the Sun Management Center server layer or agent layer, depending on the function of the host. Sun Management Center is a three-tier application that consists of the following three layers: server, console, and agent. For more information about the three-tier architecture, see “Sun Management Center Overview” in *Sun Management Center 3.6 Installation and Configuration Guide*.

Note – Container Manager requires that you install several additional software products. You must read all related documentation before beginning installation. You might need to apply software patches or plan for a reboot of the system to complete installation of other products. Also plan for the size requirements of these products before starting installation.

The following table provides a summary of Sun Management Center and Solaris Container Manager requirements.

For specific information about determining the total amount of resources needed, see Appendix C, “Determining Hardware Resources,” in *Sun Management Center 3.6 Installation and Configuration Guide*.

TABLE 2-1 Sun Management Center and Solaris Container Manager System Requirements

Base Layer	Operating System	Disk Space	RAM	Swap Space
Sun Management Center Server (SPARC)	Solaris 8, Solaris 9, and Solaris 10 Developer Software Group installation	800 Mbytes total 300 Mbytes in /opt 500 Mbytes in /var/opt	512 Mbytes minimum 1 Gbyte recommended for small to large servers 2 Gbytes recommended for extra-large servers	1 Gbyte recommended
Sun Management Center Agent (SPARC)	Solaris 8, Solaris 9, and Solaris 10	18 Mbytes per agent in /opt/SUNWsymon 2 Mbytes per agent in /var/opt/SUNWsymon	10 to 29 Mbytes per agent depending on modules loaded and system type	
Sun Management Center Agent (x86)	Solaris 9 and Solaris 10	18 Mbytes per agent in /opt/SUNWsymon 2 Mbytes per agent in /var/opt/SUNWsymon	10 to 29 Mbytes per agent depending on modules loaded and system type	

TABLE 2-1 Sun Management Center and Solaris Container Manager System Requirements *(Continued)*

Base Layer	Operating System	Disk Space	RAM	Swap Space
Solaris Container Manager Server (SPARC)	Solaris 8, Solaris 9, and Solaris 10	300 Mbytes	512 Mbytes minimum 1 Gbyte recommended for small to large servers 2 Gbytes recommended for extra-large servers	1 Gbyte recommended
Solaris Container Manager Agent (SPARC and x86)	Solaris 8, Solaris 9, and Solaris 10. Solaris Container Manager requires Solaris Resource Manager 1.3 on Solaris 8. Share memory is supported from Solaris 9 Update 5.	18 Mbytes per agent in /opt/SUNWsymon 2 Mbytes per agent in /var/opt/SUNWsymon	10 to 29 Mbytes per agent depending on modules loaded and system type	
Performance Reporting Manager Server (SPARC)	Solaris 8, Solaris 9, and Solaris 10	Depends on reporting options selected. <ul style="list-style-type: none"> ■ Small configuration: 5 Gbytes ■ Medium configuration: 12 Gbytes ■ Large configuration: 24 Gbytes 	1 Gbyte	1 Gbyte recommended
Performance Reporting Manager Agent (SPARC and x86)	Solaris 8, Solaris 9, and Solaris 10	8000 Kbytes minimum 80 Mbytes needed for 1000 properties logged at five-minute intervals		

The Container Manager software runs on the following versions of the Solaris operating system.

TABLE 2-2 Container Manager Features by Solaris OS Version

OS Version	Container Manager Features
Solaris 8 6/00 through Solaris 8 2/02 (SPARC® only)	Together with the Solaris Resource Manager 1.3 software, features include the ability to specify a minimum CPU reservation and a memory cap.
Solaris 9 FCS through Solaris 9 8/03 (SPARC and x86)	Features include the ability to specify a minimum CPU reservation. Memory control is not supported.
Solaris 9 12/03, or later (SPARC and x86)	Features include the ability to specify a minimum CPU reservation and a memory cap. Resource Pool management is also supported.
Solaris 10 (SPARC and x86)	Features include the ability to specify a minimum CPU reservation and a memory cap, zone management, dynamic resource pools, and IP Quality of Service.

The Container Manager agent runs on all the hardware platforms that Sun Management Center 3.6 supports for the agent layer. For more information, see Chapter 3, "Late-Breaking News," in *Sun Management Center 3.6 Release Notes*.

The Container Manager software consists of the following architecturally neutral software packages for both SPARC and x86:

- Packages for Sun Management Center server: `SUNWscms`, `SUNWscmc`, `SUNWscmca`, `SUNWscmdb`, `SUNWscmh` (online help)
- Packages for Sun Management Center server and agent: `SUNWscmcm`, `SUNWscmp`
- Package for Sun Management Center agent: `SUNWscma`

Note – The Container Manager module is automatically loaded after installation and setup of the software is complete. The module is not visible in the Sun Management Center Java or web console. You do not need to manually load this module in Sun Management Center as with other add-on software.

Installing Container Manager Software

Note – (Solaris 10 only) Install Container Manager in a global zone.

You can install the Container Manager add-on software either by using the Sun Management Center 3.6 installation wizard or the command line. This section discusses how to install the software by using the installation wizard. For more information about installing at the command line, see [Appendix A](#).

The Container Manager software can be installed at the following times:

- At the same time that you install the Sun Management Center 3.6 software.
- After you have completed your installation of, or upgraded to, Sun Management Center 3.6. In this case, you install the Container Manager software individually.

The Performance Reporting Manager software must also be installed if you want to use the performance and accounting data features of Container Manager. For more information about installation and setup of this software, see the *Sun Management Center 3.5 Update 2 Performance Reporting Manager User's Guide*. If you do not intend to use these features, you do not need to install this add-on software.

▼ To Install Container Manager During Upgrade to Sun Management Center 3.6

- Step** ● For more information and upgrade steps, see the *Sun Management Center 3.6 Installation and Configuration Guide*. You can also install additional add-on software, such as Performance Reporting Manager, at the same time.

▼ To Install Container Manager Individually

- Steps** 1. As superuser (su -), start the Sun Management Center installation wizard by typing:

```
# /opt/SUNWsymon/sbin/es-guiinst
```

where /opt is the directory in which Sun Management Center 3.6 is installed. Substitute the name of the actual directory if it is different on your system.

The Sun Management Center installation wizard appears and guides you through the installation process for the software. Click the Next button to move through the wizard.

2. Provide the source directory of the Container Manager software files when prompted.

- On SPARC systems, choose from the following:
 - If installing from the software CD, type:
`<DiskMountDir>/image`
 - If installing from a directory to which the software has been copied, type:
`disk1/image`

where *disk1* is the location where the software was copied.

- On x86 systems, choose from the following:
 - If installing from the software CD, type:
`<DiskMountDir>/x86/image`
 - If installing from a directory to which the software has been copied, type:
`disk1/x86/image`

where *disk1* is the location where the software was copied.

3. Select the check box Install Product Documentation if you want to install the documentation.

Note – The documentation installed in this step is the *Sun Management Center 3.6* collection. The Solaris Container Manager 3.6 documentation is *not* included in this collection. The Solaris Container Manager 3.6 documentation collection is at <http://docs.sun.com/app/docs/coll/810.6>.

You can view installed documentation from a browser at
`/var/opt/sun_docs/sundocs.html`.

4. If installing the server layer, select the desired languages from the Select Language Support panel. This panel only appears when installing the server layer.

Note – Translated documentation installed in this step is for *Sun Management Center 3.6* only. Translated documentation for Solaris Container Manager 3.6 is at <http://docs.sun.com/app/docs/coll/810.6> only.

The Checking for Available Products panel appears. When the progress bar is finished, the Products Already Installed panel appears.

5. Review the list of products already installed.

The Select Add-on Products panel appears.

6. Select Solaris Container Manager 3.6 from the list of add-on software to be installed.

The Add-on Products License Agreement panel appears.

7. Read the license agreement.

- If you agree to the license agreement, click I Agree. The Confirmation panel appears.
- If you do not agree to the license agreement, click I Do Not Agree. The installation wizard exits and installation quits.

You must click the I Agree button to proceed with installation.

8. Review the Confirmation panel.

The Installation Complete panel appears when the software installation is complete.

After installation of the Container Manager software is complete, the setup wizard guides you through the setup process for the software. For more information, see [“Setting Up Container Manager Software” on page 39](#).

Setting Up Container Manager Software

After installation is complete, you must run the Container Manager setup wizard to configure the server and agent layers. As with installation of the software, you can run the setup process at the time you setup the Sun Management Center 3.6 installation or upgrade. You can also setup the software individually at a later time.

The following configuration files are created in the following locations during the setup process:

- System pool and processor set configuration files are stored in `/etc/pooladm.conf`.
- Extended accounting files are stored in `/var/sadm/exacct/files`.

If the `/etc/pooladm.conf` file already exists on a host, a backup of the existing file is created. This backup of the original file is named `/etc/pooladm.conf.scmbak`. If an active configuration exists on a host, all processor sets that are not associated with a resource pool are removed. The scheduling class for the resource pools is then set to fair share scheduler (FSS). Finally, the new configuration is committed and is stored in `/etc/pooladm.conf`.

If an active configuration does not exist on a host, a new configuration is discovered and stored in `/etc/pooladm.conf`. This discovered configuration is committed to make it active. The default pool scheduling class is set to FSS.

If the extended accounting files are active on a host at the time of setup, they remain the same. If the files are not active, they are then configured and activated. During configuration, the extending accounting file name is set to `/var/adm/exacct/tasktimestamp`.

Additionally, during the setup process the following changes are made to the host by the software:

- The memory cap daemon `rcapd` is started (Solaris 8 OS, Solaris 9 12/03 OS, or supported releases).
- All processes that run under the interactive (IA) scheduling classes are moved under the FSS scheduling class.
- Task-based extended accounting is enabled.
- The scheduling class of the host is set to the default FSS (fair share scheduler) if TS (time-sharing scheduler) is not specified.
- On systems that run the Solaris 8 operating system, the `lnode` hierarchy is aligned with the project hierarchy.
- On systems that run the Solaris 8 operating system, the `group.staff` project is deleted from the `/etc/project` file.

For more information about resource pools, scheduling classes, and extended accounting, as well as other standard Solaris resource management concepts, see *System Administration Guide: Network Services*.



Caution – Standard command-line commands in Solaris software resource management are not supported by Container Manager. Use the Container Manager GUI to manage the software.

▼ To Set Up Container Manager During Sun Management Center Installation or Upgrade

- Step** ● For more information and detailed steps, see Chapter 6, “Installing and Updating Agents and Installing on Microsoft Windows,” in *Sun Management*

▼ To Set Up Container Manager Individually

- Steps** 1. As superuser (su -), start the Sun Management Center setup wizard by typing:

```
# /opt/SUNWsymon/sbin/es-guisetup
```

where /opt is the directory in which Container Manager is installed. Substitute the name of the actual directory if it is different on your system.

The Container Manager setup wizard appears and guides you through the setup process for the software. The Overview panel appears first. Click the Next button to move through the wizard. Use the Back button to make corrections by moving back through the wizard.

Note – If you have installed more than one Sun Management Center add-on product, the setup wizard for each product appears automatically. Each wizard guides you through the setup process for its add-on product. Each new setup wizard appears automatically after the setup process is completed for the previous add-on product. The setup wizard for the Container Manager software might not be the first to appear.

2. **Review the list in the Stopping Components panel.**

The Sun Management Center components must be stopped before the setup process can continue. The Advanced Setup Options panel appears if you have completed the setup process for some of the add-on products installed. The remaining add-on software can be set up now.

3. **Select the Configure Add-ons option.**

The add-on software that was recently installed but not yet set up is now set up.

4. **Review the list of products in the Setup Complete panel.**

The Select Add-on Products panel appears. All products newly installed on the system that will be set up are listed. You can also run setup again on any product that was previously set up.

5. **Review the list of products to confirm that Container Manager appears as a product to be set up. Click Next to start the setup process.**

A progress panel appears while all components are being set up.

6. **When setting up the agent layer, if processor sets are detected that are not associated with a resource pool, a panel requests permission to delete these sets. Select from the following options:**

- Yes – These processor sets will be deleted from the system. In order for Container Manager to function correctly, any processor set that is not associated with a resource pool must be removed. This removal is necessary because projects need to be associated with the pools. After this selection, these processor sets are automatically deleted for you, and the setup process continues.
 - No – These processor sets will not be deleted from the system. After this selection, the setup wizard exits and the Container Manager software is not set up on the system. You are unable to use the Container Manager software on any host that has processor sets that are not associated with a resource pool.
 - Cancel – The setup wizard exits. The Container Manager software is not set up on the system.
7. **Type the valid user names separated by commas. These users must already be present in the `/var/opt/SUNWsymon/cfg/esusers` file on the server machine, and must be assigned to either `esadm` or `esdomadm` group.**

Note – Solaris Container Manager setup does not authorize the users.

8. **When setting up a server layer installation, provide the full path to a directory that has at least 300 Mbytes free disk space for the database and click Next.**
9. **After the progress bar in the Container Manager DB Configuration panel completes, click Next.**
10. **To invoke the Start Wizard, click Next.**

After the setup procedure is complete, you have the option to start the Sun Management Center processes. For more information, see Chapter 8, “Starting and Stopping Sun Management Center,” in *Sun Management Center 3.6 Installation and Configuration Guide*.

For information about starting the Container Manager GUI, see [“To Start the Container Manager GUI” on page 51](#).

Creating Profiles

After setting up Solaris Container Manager, the user needs to do the following tasks to manage projects, pools, and zones:

- Create the required profiles on the host
- Be a part of the local access user list

Following are the necessary profiles:

- On Solaris 10 - Zone Management, Pool Management, Project Management
- On Solaris 9 - Pool Management, Project Management
- On Solaris 8 - Project Management

Ensure that the user is associated with the necessary profiles by running the following command:

```
$ profiles <username>
```

If you find the necessary profiles missing, run the following command (as the superuser) and modify the profiles associated with a user:

```
# usermod -P "<comma separated list of necessary profiles>" <username>
```

If any profile does not exist on the system, please use the Solaris Management Console or `smprofile` to create the new profile. If the comma separated profile list is not specified, the existing setting for the given *username* will be removed.

Run the following command to find if the user is a part of the local access user list for the SCM module.

```
<BASEDIR>/SUNWsymon/sbin/es-config -M scm-container -s
```

If user is not part of the access list, run the following command:

```
<BASEDIR>/SUNWsymon/sbin/es-config -M scm-container -l <user_name>
```

Backup and Restore

Use the Sun Management Center backup (`es-backup`) and restore (`es-restore`) scripts to back up or restore Container Manager data. For more information, see “Sun Management Center Backup and Recovery” in *Sun Management Center 3.6 Installation and Configuration Guide*.

Agent Update

If you want to upgrade the agent layer on multiple hosts with the Container Manager software, you can use the agent update feature. When using the agent update feature, it is best to keep all Container Manager agent machines that are in the same server context at the same Sun Management Center version levels. For more information about server context, see “Sun Management Center Architecture” in *Sun Management Center 3.6 User’s Guide*.

For more information about using the agent update feature during installation, see “Creating Agent Installation and Update Images” in *Sun Management Center 3.6 Installation and Configuration Guide*.

Uninstalling Container Manager Software

Uninstallation of the software follows standard Sun Management Center procedures. Accordingly, you can use either the command line or the uninstallation wizard. The following is removed in addition to the software packages: the module entry from `base-modules-d.dat` and the application registration from Sun Web Console. You have the option to retain or delete the data stored in the database during the removal process. System resource configuration changes made during installation are not removed when the Container Manager software is uninstalled.

For information about uninstalling the software using the command line, see [Appendix A](#). For information about standard Sun Management Center removal procedures, see Appendix A, “Uninstalling SyMON and Sun Management Center,” in *Sun Management Center 3.6 Installation and Configuration Guide*.

▼ To Remove the Container Manager Software

Steps 1. As superuser (su -), start the uninstallation wizard by typing:

```
# /opt/SUNWsymon/sbin/es-guiuninst
```

where `/opt` is the directory where Sun Management Center is installed. Substitute the name of the actual directory if it is different on your system. The Sun Management Center uninstallation wizard appears.

2. Select **Container Manager** from the list of software, and click **Next**.

3. Indicate whether to preserve the data files, and click **Next**.

The software begins to uninstall. The Container Manager packages and configuration files are removed. If you chose not to preserve the data files, they are removed as well.

4. Click **Close** to exit the wizard.

About Containers and Starting the Product

This chapter describes containers and projects and how to start the product.

The following topics are discussed:

- “Container Overview” on page 45
- “About Container Properties” on page 46
- “Project States” on page 49
- “Container Manager GUI” on page 50
- “Default Containers” on page 59
- “About Container Creation” on page 60

Container Overview

A project is a container that has been associated with a host. A project helps organize and manage the collection of physical system resources. A project is useful when you implement an overall server consolidation plan. Projects offer the following features:

- Setting minimum CPU reservations and memory caps for applications to help balance system resources
Each application is guaranteed the minimum CPU reservation and the optional memory cap set for its project. For example, an application-based project enables you to establish both a minimum CPU reservation and a memory cap for any application that runs on your network. When several projects are active on the same host, with each application in its own project, contention for system resources is reduced. In this situation, the resource boundaries set for each project are enforced by the Solaris kernel that operates on that host.
- Tracking of resource utilization across a data center
The total amount of resources that are being used by the project is tracked, in part, with project membership. Each UNIX user must be assigned to a default project, although users and groups can belong to one or more projects. The processes that a

UNIX user starts can be bound to any of the projects of which the user is a member. Projects use both project membership and resource pools to help track and control application resource consumption.

For more information about how projects work and the resource management tools they use, see [Chapter 1](#).

- Shared memory allocation

After the software is installed and set up, several default projects are available for your immediate use. You also create your own projects by using a wizard that guides you through the process. Every project is associated with a container. This container can be used over again for creating new projects. Projects provide the following advantages:

- Ability to create multiple project instances with the identical set of CPU and memory resource boundaries.
- Spreading multiple project instances across several hosts. Whereas a single active project cannot span multiple hosts, additional project instances with the same container can be spread across multiple hosts.
- Shortens the time necessary to create a new project instance, enabling you to quickly apportion resources as needs fluctuate.

The GUI is browser based and provides three management views (tabs): one from the host perspective, one from the container perspective, and one for open alarms. You can further organize the host view and the container view by creating groups and selecting which elements the groups should contain.

Additionally, the processes running inside the container and the resources being used can be readily checked with the software. Several graphing options are also available to help assess the level of resource utilization per container or host, including the ability to export the data to a file. These features enable you to monitor and reassess resource consumption for the appropriate adjustments.

With the software's alarm feature you can be notified by email when a container's resource utilization reaches a threshold of your setting. Alarm icons are also visible in the GUI for both hosts and containers.

The resource change job feature enables you to schedule changes to current resource boundaries on one or more containers with one request. A wizard guides you through the steps required for creating or modifying a resource change job.

About Container Properties

The container has the following properties:

- Name
- Description (optional)

- Project type
- Project name that is associated with the container
- The UNIX users and groups that are associated with the container application
- The match expression, if one exists

The name you assign to a container is permanent and cannot be changed. The project name is likewise permanent. The other identifying information for the container can be changed.

The container is saved by the software and is available for repeated use until the container is deleted. The project is a container that has been associated with a host. A project is active when it has been associated with a host, and its resource reservations have been set.

Because multiple projects, with the same definition and resource reservations, can be active simultaneously on several different hosts, the container can conveniently manage projects across the data center. After the container has been saved, it can be used at any time to activate a project on any suitable host. Thus, the container can be used as a template for creating a new project.

The container acts as a *template* for multiple projects. The container stores the common properties of the projects in a central location. The common properties of the projects are the:

- Project name.
- The method by which the project determines which processes should be included in the project (for example, UNIX users and groups associated with the container or a match expression.)

Other properties, such as CPU share and memory limit, are specific to a host that the project is activated on. In Solaris Container Manager 3.6, this set of common properties, which is stored centrally, is called the container. When the container is activated on a specific host, it is instantiated as a Solaris *project* and is stored in `/etc/project`.

For example, a company wants to set up a container for its email applications. The common properties of the projects would be:

- Project name: `mail_services`.
- The method by which the project determines which processes should be included in the project would be a match expression containing “mozilla.”

When the container is activated on a specific host, the company instantiates the project and can now specify a resource pool, CPU shares, and memory limits.

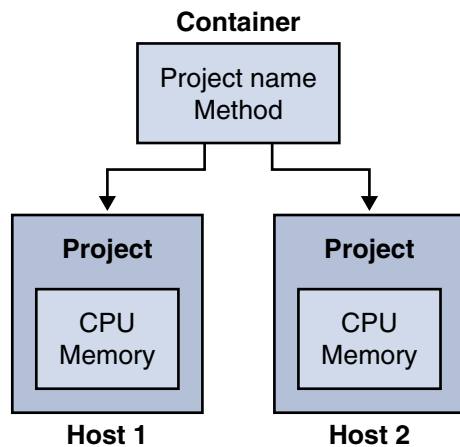


FIGURE 3-1 Containers and Projects

You can use a container to create multiple projects across zones and hosts. For example, if you use a single container to create three active projects on three different hosts, you have one container and three projects in that container. Changing the underlying information in the container changes all the projects that are based on that container.

The Project Creation wizard gives you the option to create a project that is activated on completion of all the steps. A container is created at the same time and its name is saved in the GUI. You also have the option to create just the container and activate the project at a later time with a wizard that guides you through the process.

For a *container*, you can perform the following tasks by using the GUI:

- Create a new container
- Create a new group
- Move the container into and out of groups
- Modify the properties
- Create a new project on a host
- Delete the container

For a *project*, you can perform the following tasks by using the GUI:

- Create a new group
- Move the project
- Modify the properties
- Change the resource reservations
- Create a resource change job
- Check the status of the processes running inside
- Request a utilization report and export the data to a file
- Deactivate or activate the project
- Set an alarm

- Delete the project

Project States

A project does not actually enforce the resource consumption boundaries that you set for an application. Rather, after the minimum CPU reservation and memory cap are provided and the project is activated, the Solaris kernel begins enforcing these boundaries. Before using projects, you need to know more about project states. A project can be in one of the following three states: defined, active, and inactive.

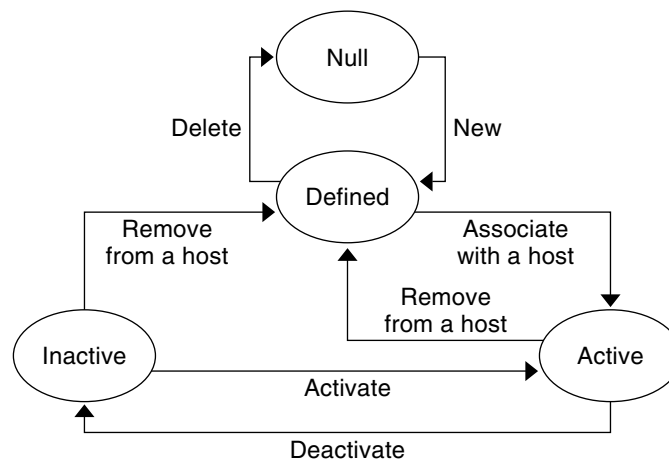


FIGURE 3-2 Project States

A project can move between these states throughout its lifetime.

Containers and Projects

The container is created during the initial stage when the project itself is still not fully formed. Each project must have a unique name and can be saved indefinitely in the database.

Figure 3-2 shows the project moves into the active state after the container is associated with a host. An inactive project can move back into the defined state after it has been deactivated and is no longer associated with a host.

Project Activation

The first step in making a project active is to associate its container with a host. The second step is to set the resource boundaries, namely, to assign the minimum CPU reservation and the memory cap for the project. The project must be associated with a host that can support these resource boundaries. An active project can also be referred to as being *deployed*, in the sense that the project has been pushed out and resides on a host.

When creating an application-based project with the New Project Wizard, a *match expression* can be provided that identifies the processes associated with the application. All processes that correspond to the match expression are then automatically moved under this container. On project activation, an entry in the `/etc/project` database is created on the host that the container is associated with. Correspondingly, the matching processes are then moved under the project name for the container. After the processes are moved, all resource utilization data is collected and saved for the project.

Inactive Project

When a project is deactivated, the resource boundaries are no longer enforced. A deactivated project enters into an inactive state and is deleted from the host's `/etc/project` file. While inactive, the project still exists in the software's database, pending future activation. After the inactive project is reactivated, the container's resource boundaries are again enforced.

All data collected about the project's use of resources while it was active is preserved in the database. You can still request utilization reports for an inactive project for up to 30 days after the project was deactivated.

Container Manager GUI

Standard command-line commands in Solaris software resource management are not supported by the Container Manager software. You should manage the containers from the Container Manager graphical user interface (GUI). The GUI is started from the Java Web Console by using a browser. The following browsers are supported:

- Netscape Navigator™ 4.7x, 6.2x, and 7.x on Solaris releases 8 and 9
- Netscape Navigator 4.7x, 6.2x, and 7.x on Microsoft Windows (98/2000/XP)
- Mozilla™ 1.4 and higher
- Internet Explorer 5.0 and higher (including 6.x) on Microsoft Windows (98/2000/XP)

▼ To Start the Container Manager GUI

- Steps**
1. If your UNIX user ID is not present in the `/var/opt/SUNWsymon/cfg/esusers` file, create this entry.
You must also be assigned to either `esadm` or `esdomadm` group.

For instructions about creating an entry and assigning to a group, see “Setting Up Users” in *Sun Management Center 3.6 Installation and Configuration Guide*.

2. Start a browser.

For a list of supported browsers, see “Container Manager GUI” on page 50.

3. To reach the Container Manager GUI, type:

`https://sunmc-server_machine_name:6789/containers`

The Java Web Console login page appears.

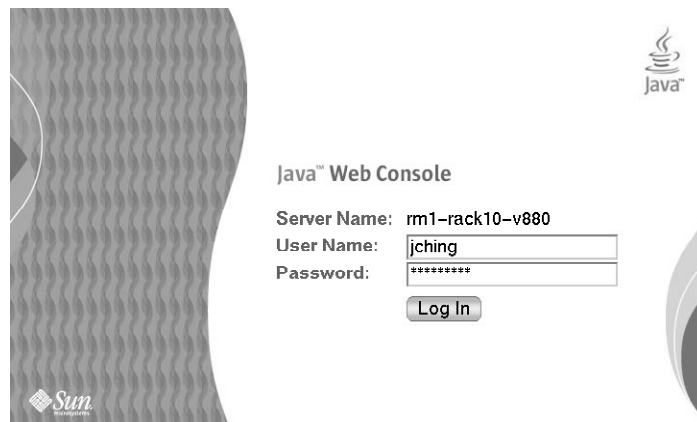


FIGURE 3–3 Java Web Console Login Page

If the login page does not appear, you might need to restart Java Web Console. For instructions, see “To Restart Java Web Console” on page 52.

Tip – If you reach the Console page, click the Solaris Container Manager 3.6 link beneath the Systems section to access the GUI.

4. Log in to the Java Web Console by using your UNIX user ID and password.
The Container Manager GUI appears. The screen has three tabs: Hosts, Containers, and Open Alarms.

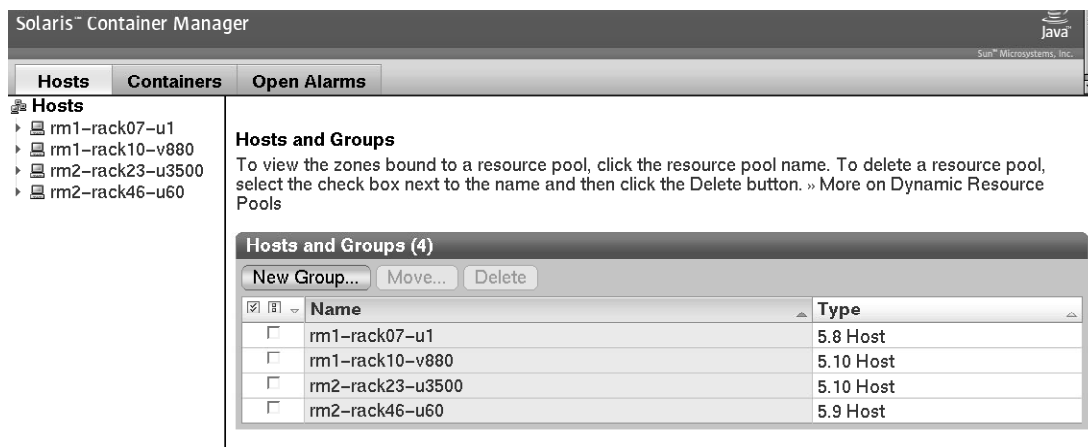


FIGURE 3-4 Container Manager Main Page

▼ To Restart Java Web Console

If you are unable to access the Java Web Console, use this command to restart it.

Step ● As superuser (su -), restart the Java Web Console by typing:

```
# /usr/sbin/smcwebserver restart
```

Container Manager GUI Tabs

The following table provides information about the tabs that appear in the right pane of Container Manager GUI.

TABLE 3-1 Container Manager GUI Tabs

Tab	Tab Name	Contents
Host (view)	Contents	Provides information about the resource pools on the selected host.
	Properties	Provides information about the properties of the selected host, zone, project, or resource pool.

TABLE 3-1 Container Manager GUI Tabs *(Continued)*

Tab	Tab Name	Contents
	Utilization	Provides information about a host's, zone's, project's, or pool's daily, weekly, or monthly resource utilization. Real-time utilization data is available for active projects. This tab is visible only if Performance Reporting Manager software is installed.
	Projects	Provides information about the projects that are associated with a host.
	Zones	Provides information about the zones associated with a host.
Containers (view)	Contents	Provides information about projects.
	Properties	Provides information about the properties of the selected host, container, project, or resource pool.
	Utilization	Provides information about a host's, zone's, project's, or pool's's daily, weekly, or monthly resource utilization. Real-time utilization data is available for active projects. This tab is visible only if Performance Reporting Manager software is installed.
	Jobs (Resource Change Jobs)	Provides information about scheduled resource change jobs. You can also create a new resource change job from this tab. Note that default containers cannot have resource change jobs associated with them.
Open Alarms		Provides information about open alarms, including severity, message, managed object, start time, and acknowledgment.
Resource Pool (drill down)	Contents	Provides information about the zones on the selected resource pool.
	Properties	Provides information about the properties of the selected resource pool.
	Utilization	Provides information about a pool's daily, weekly, or monthly resource utilization. This tab is visible only if Performance Reporting Manager software is installed.

TABLE 3-1 Container Manager GUI Tabs *(Continued)*

Tab	Tab Name	Contents
	Projects	Provides information about the projects that are associated with the selected resource pool.
Zone (drill down)	Contents	Provides information about the projects on the selected zone.
	Properties	Provides information about the properties of the selected zone.
	Utilization	Provides information about a zone's daily, weekly, or monthly resource utilization. This tab is visible only if Performance Reporting Manager software is installed.
Project (drill down)	Properties	Provides information about the properties of the selected project.
	Utilization	Provides information about a project's daily, weekly, or monthly resource utilization. This tab is visible only if Performance Reporting Manager software is installed.
	Processes	Provides information about the processes of the selected project.
	Alarm Thresholds	Used to set or remove alarm thresholds.

Hosts View

The Hosts view organizes information from the host perspective. All agent machines that you are managing appear in the navigation window. The resource pools that are available for each host are shown when you click the expansion triangle beside the host name. You can also manage the containers that are associated with the host from this view.

All agent hosts that have the software installed are automatically discovered and added to the Hosts view. This view is accessed from the left tab in the navigation window. All agent hosts that are discovered are initially placed under a default group titled Hosts. You can further organize this view by creating new groups and moving the hosts to relevant groups.

Note – Only those agent machines that are part of the Sun Management Center server context *and* that have Solaris Container Manager 3.6 installed are loaded into the Hosts view. For more information about server context, see “Sun Management Center Architecture” in *Sun Management Center 3.6 User’s Guide*.

The tabs and information that are available in the Hosts view are listed in [Table 3-1](#).

Information about every project instance that is associated with a host is listed in the Project table.

The following figure shows the Hosts view with the project table that is associated with the default pool.

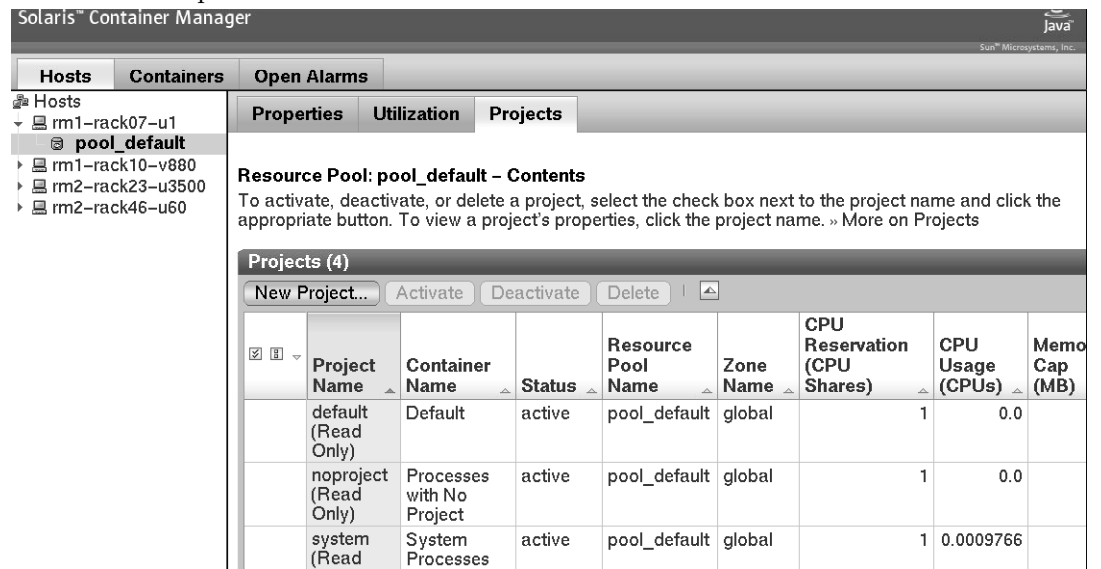


FIGURE 3-5 Sample: Hosts View Showing the Project Table

The Project table provides information about each project, detailing one project per row. The Project table provides the following data:

- Project Name Name of the project
- Container Name Name of the container
- Status State of the project: active and inactive
- Resource Pool Name Resource pool to which the project is bound
- Zone Name Name of the zone where the project resides. For Solaris 8 and Solaris 9 hosts, the zone name is always global.

CPU Reservation (CPU shares)	Minimum CPU shares set for the project
CPU Usage (CPUs)	Amount of CPU the project is using
Memory Cap (MB)	Maximum memory limit in megabytes
Memory Usage (MB)	Memory used by the project in megabytes
Shared Memory (MB)	Total amount of memory that is allowed to be used by the processes that run within this project in megabytes

The Resource Pool table provides information about each resource pool. The Resource Pool table provides the following data:

Resource Pool Name	Name of the resource pool
Current CPU(s)	Number of CPUs currently set for the resource pool
Unreserved CPU Shares	CPU shares that are not assigned to the zones or projects in the resource pool
Scheduler	Scheduler set for the resource pool: time-sharing scheduler or fair share scheduler
CPU Shares	CPU shares set for the resource pool
Minimum CPU Reservation	Minimum number of CPUs set for the resource pool
Maximum CPU Reservation	Maximum number of CPUs set for the resource pool

The Zone table provides information about each zone. The Zone table provides the following data:

Zone Name	Name of the zone
Zone State	State of the zone: configured, incomplete, installed, ready, running, shutting down, or down
Zone Host Name	Unique name for the zone as a virtual host
Zone Path	Absolute path that starts from the root (/) directory
IP Address	IP address for the zone
Project CPU Shares	Number of CPU shares that is allocated to the projects in the zone
Unreserved CPU Shares	Number of CPU shares available for allocation to projects associated with this zone
Reserved CPU Shares	Number of CPU shares that is allocated to this zone in the resource pool
Resource Pool	Resource pool for the zone

Containers View

The Containers view organizes information from the container perspective. All containers and projects appear in the navigation window. Because containers can be used repeatedly to make new projects, you can readily access the containers from this view, as well as perform other management tasks.

After installation and setup are complete, the Containers view automatically adds the Containers group as a default. Containers are managed from the Containers view.

The following figure shows the Containers view.

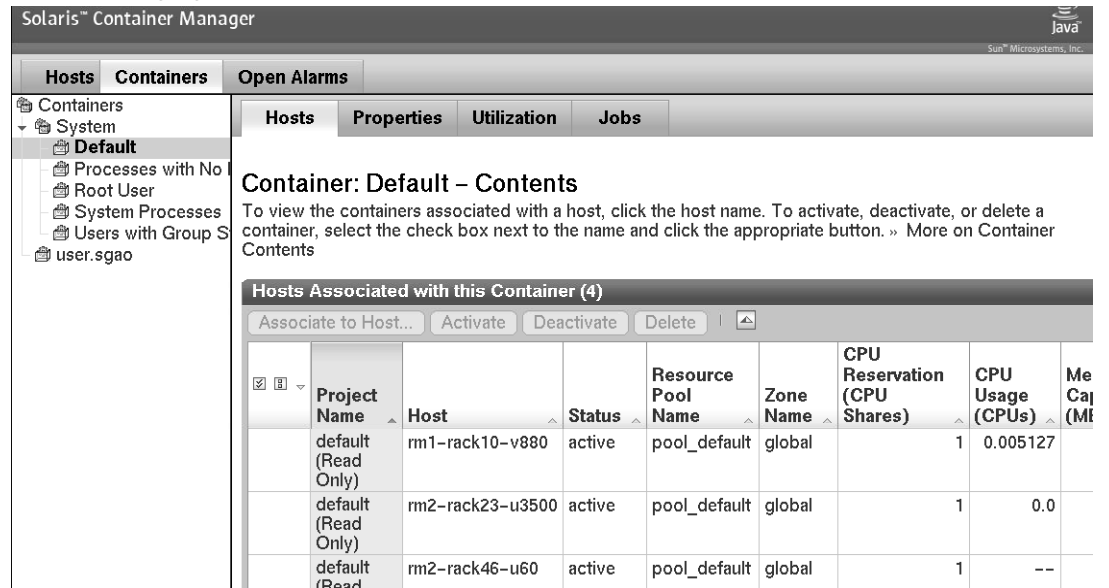


FIGURE 3-6 Sample: Containers View Showing the Hosts Associated With the Default Container

The information that is available in the Containers view is listed in [Table 3-1](#).

Organizing Hosts and Containers With Groups

The Hosts view contains the default group Hosts. All hosts that are discovered after installation of the software are placed in this group. Likewise, the Containers view has a default group named Default in which all the default containers of a host are placed. You can create additional groups in each view for organizing the hosts and containers.

You might use groups to organize the ten or hundreds of systems you have in a data center. For example, you might put hosts located together in a group. You might put containers owned by the same customer (internal or external) or department in a group. Likewise, you might put containers with a similar application in a group.

▼ To Create a Container Group or Host Group

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the appropriate view from the navigation window.**
 - For a new container group, select the Containers view. The Container table is displayed in the right pane.
 - For a new host group, select the Hosts view. The Hosts and Groups table is displayed in the right pane.
 3. **Click the New Group button.**

A dialog box appears.
 4. **Provide a name for the group, and click OK.**

The name cannot exceed 32 characters.

The new group appears in the selected view.

▼ To Move a Container or Host to a Different Group

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the appropriate view from the navigation window.**
 - To move a container to a different group, select the Containers view. The Containers table is displayed in the right pane.
 - To move a host to a different group, select the Hosts view. The Hosts and Groups table is displayed in the right pane.
 3. **To enable the Move button in the table, select the check box for the container or host that is to be moved.**
 4. **In the right pane, click the Move button.**

A dialog box lists the available groups.
 5. **Select the group to which the container or host is to be moved.**

6. Click OK.

The container or host is moved to the selected group.

Default Containers

After the software is set up, the Containers view is initially loaded with a group titled Default. This group holds the following five default containers on a host that runs the Solaris 9 or Solaris 10 Operating System (OS):

- Default
- Processes with No Project
- Root User
- System Processes
- Users with Group Staff

Each of the five default containers has a corresponding entry in the `/etc/project` file. Specifically, the five entries correspond to `default`, `noproject`, `user.root`, `system`, and `group.staff`.

Note – On a host that runs the Solaris 8 release, the Users with Group Staff (`group.staff`) container does not exist. Otherwise, the default containers are the same.

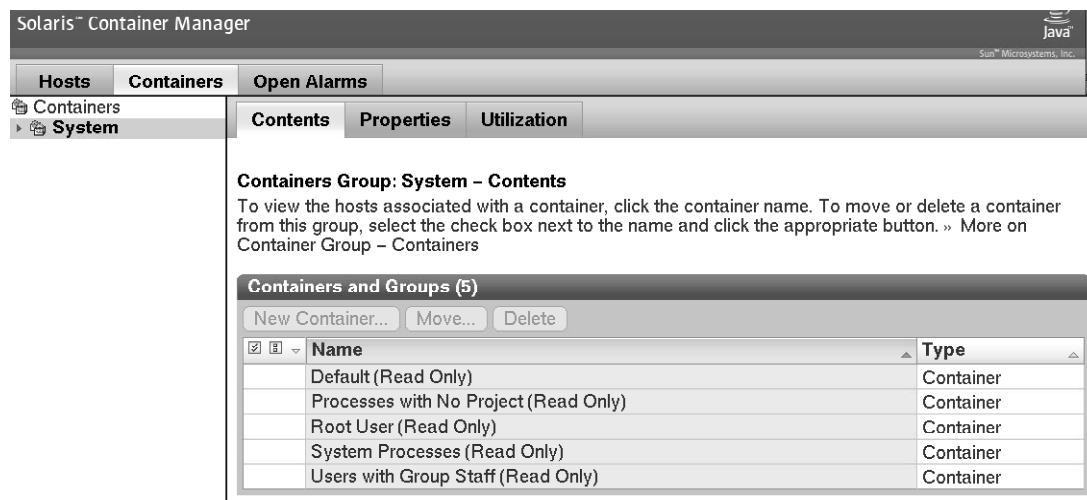


FIGURE 3-7 Sample: System Containers Group With Containers Showing

Each default container is in the active state, and the boundaries are set at 1 minimum CPU reservation (CPU shares) and no memory cap. A default container is always bound to the default resource pool (`pool_default`) of the host. You can monitor the resource utilization and run reports on each default container if you have Performance Reporting Manager installed.

These default containers cannot be deactivated, edited, or deleted. Each container is labeled Read Only accordingly.

Every UNIX user is assigned to a default project and is correspondingly assigned to a default container. Initially, the default containers hold all processes that are running on the system. As you create projects, processes are moved from the corresponding default container into the project you create.

About Container Creation

Every project starts with a container. A project can be one of three types, depending on the project type that is selected during its creation. The project type determines how processes are tracked.

Project Types

When creating a new container, you must select the project type. A project is a network-wide administrative identifier (ID) for related work. All processes that run in a container have the same project ID, and a container tracks the resources being used with the project ID. The container type is based on which project type is selected when creating the container.

Every container has a project name that is a permanent part of its information. When a container is activated on a host, this project name is added to that host's `/etc/project` file. This entry remains as long as the container is active on that host.

You cannot have two projects with the same project name active on a host at the same time. This is because processes that run in a container are tracked with the project ID, so every project name on a host must be unique.

When creating user-based and group-based projects, the user or group name becomes part of the project name. For user-based containers, the project name becomes `user.username`. For group-based containers, the project name becomes `group.groupname`. Therefore, when creating user-based or group-based projects, you cannot use a user name or group name that duplicates the `/etc/project` entries for the default containers. For more information, see [“Default Containers” on page 59](#).

You provide a project name of your choosing as part of the creation process for application-based containers. The Project Creation wizard accepts duplicate project names for different application-based projects. But two application-based projects that have the same project name cannot be active on the same host at the same time. Reuse project names when creating application-based projects, only if you plan to activate these containers on different hosts. If you try to activate a second project on a host that already has a project with the identical project name, the activation fails.

The following table provides details about the three project types that are available and which changes occur based on the selection.

TABLE 3–2 Project Type Details

Project Type	OS Version	Details
User-Based	Solaris 8	Only type of project supported in the Solaris 8 release. The project name in the <code>/etc/project</code> file becomes <code>user.username</code> . The project becomes the user's primary default project.

TABLE 3-2 Project Type Details (Continued)

Project Type	OS Version	Details
	Solaris 9 and Solaris 10	The project name in the <code>/etc/project</code> file becomes <code>user.username</code> , with a list of UNIX users who can join this project. Valid forms are <code>username</code> .
Group-Based	Solaris 9 and Solaris 10	The project name in the <code>/etc/project</code> file becomes <code>group.groupname</code> . Valid form is <code>groupname</code> .
Application-Based	Solaris 9 and Solaris 10	The project name can be the application name or any other chosen name. The name that is provided is added to the <code>/etc/project</code> file. A match expression can be provided for automatically moving the matching processes to the project name. This expression is case sensitive. The corresponding <code>username</code> or <code>groupname</code> under which the processes currently run must be provided.

About Making Resource Reservations (CPU Shares)

Before you begin using projects to manage an application's resources, you must first know the resource trends for the application. The performance of certain applications, such as ORACLE®, will be significantly degraded if the amount of the memory cap is inadequate. Every project must have resource reservations set: a minimum CPU share and optionally, a maximum memory reservation (*memory cap*). You should only begin using projects to manage these reservations after you have established the resource requirements for the applications.



Caution – Do not set a physical memory cap for a project that is less than what the application typically uses. This practice affects the application's performance adversely and might result in significant delays because of higher paging and swapping as the application is required to use more virtual memory.

You must have your server consolidation plan finalized before you start using projects to manage system resources. An important related task is to identify the trends in the resource consumption of the applications you include in your consolidation plan. Ideally, you identify the trends in resource utilization of the application for at least a

month in your test environment before implementing your plan in your production environment. After you have established the CPU and memory consumption trends, you should allow at least a few percentage points above the typical memory requirement.

When making a reservation for the amount of CPU shares that is needed by the project, you assign the amount of CPU as an integer. For example, 25, 1, and 37 are all valid amounts. The term *share* is used to define a portion of the system's CPU resources that is allocated to a project. If you assign a greater number of CPU shares to a project, relative to other projects, the project receives more CPU resources from the fair share scheduler.

CPU shares are not equivalent to percentages of CPU resources. Shares are used to define the relative importance of workloads in relation to other workloads. For example, if the sales project is twice as important as the marketing project, the sales project should be assigned twice as many shares as the marketing project. The number of shares you assign is irrelevant; 2 shares for the sales project versus 1 share for the marketing project is the same as 18 shares for the sales project versus 9 shares for the marketing project. In both cases, the sales project is entitled to twice the amount of CPU as the marketing project.

CPU shares can be further broken down into two categories:

- CPU shares
- (Solaris 10 only) Project CPU shares (on a specific zone)

CPU Shares Assigned During Pool or Project Creation

On hosts running Solaris 8 OS, one resource pool, `pool_default` only, is available. The `pool_default` has a value of 100 CPU shares.

On hosts running Solaris 9 and Solaris 10 OS, when you create a new resource pool, you establish the value of the CPU shares for the pool. Solaris Container Manager gives a default value, but you can enter any integer. Some system administrators use a formula of 100 CPU shares per CPUs available to the resource pool. For example, you might assign 100 CPU shares to a pool, which has 1 CPU.

Let's say, for this pool, you have three projects: Project X, Project Y and Project Z. You assign the most important project, Project X, 50 CPU shares and the next project, Project Y, 10 shares and the next project, Project Z, 40 shares.

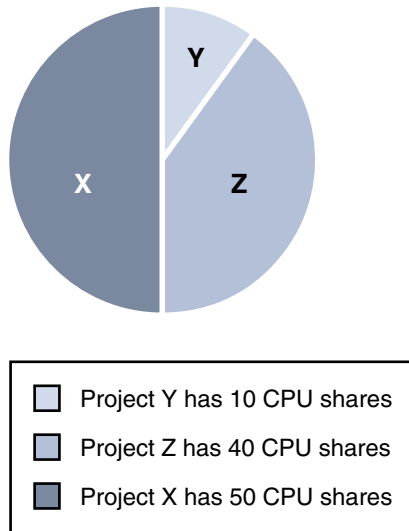


FIGURE 3-8 Project CPU Shares

You assign the CPU shares to the project when you create the project by using the New Project wizard. The New Project wizard shows the Unreserved CPU shares for the pool so you can determine the CPU shares available and assign an appropriate amount to the project.

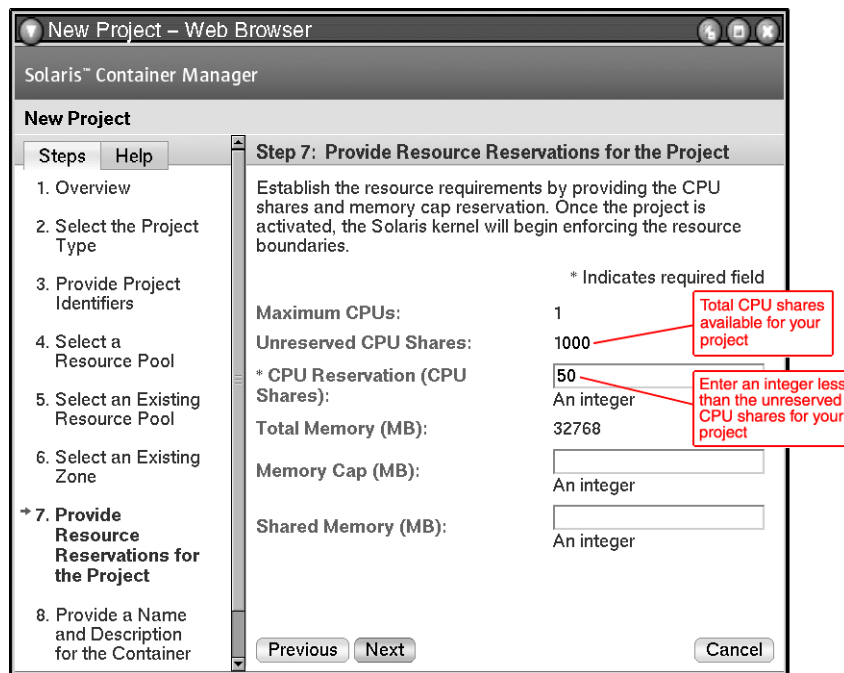


FIGURE 3-9 CPU Shares

(Solaris 10 only) CPU Shares Assigned During Zone Creation

If your host runs on the Solaris 10 Operating System, you can create zones and assign CPU shares for the zone as a whole and Project CPU shares for the projects in the zone. These are related entities.

You assign the CPU shares and Project CPU shares during zone creation by using the New Zone wizard. In Step 4 of the New Zone wizard, you select a resource pool. The wizard shows the Total CPU Shares for the pool and the Total Available CPU Shares for the pool.

You enter a value for the CPU shares that you want to allocate to this zone from the resource pool. This integer must be less than or equal to the Total Available CPU Shares for the pool.

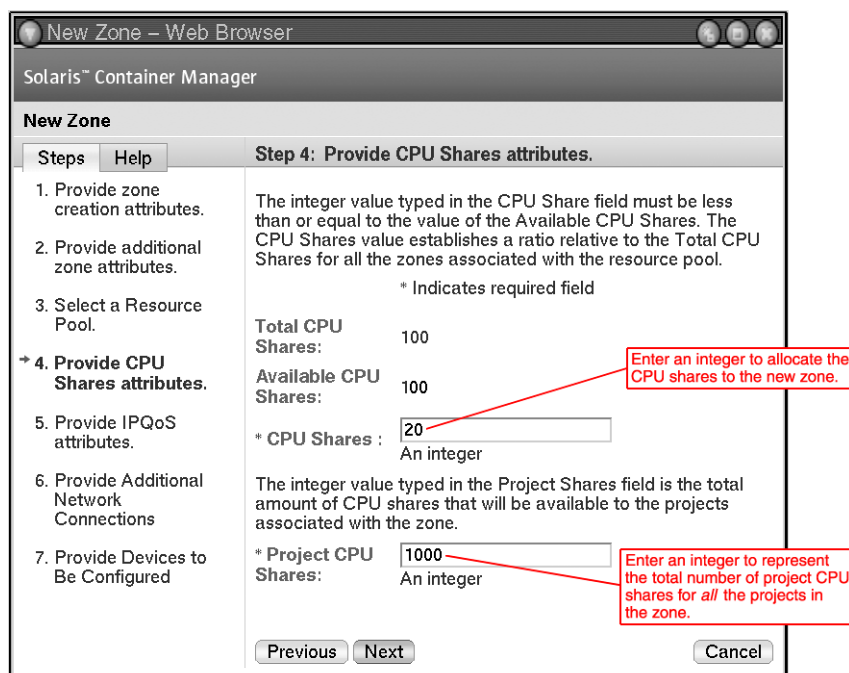


FIGURE 3-10 Zone Shares

If the pool has a Total Available CPU Shares of 100, then you can assign this zone all or some of the 100 shares. In this example, let's say we assign the zone 20 CPU shares from the resource pool.

Project CPU Shares Assigned During Zone Creation

In Step 4 of the New Zone wizard, you can also enter the Project CPU Shares. This field specifies the number of CPU shares that is allocated to projects in the zone. When you create this value, you establish the value of the Project CPU shares for the zone. You can enter any integer. The integer you enter determines the granularity you want to achieve.

For example, let's say we assign the Project CPU shares for Zone A to be 1000. On a physical level, 1000 Project CPU shares is the 20 CPU shares, inherited from the resource pool, divided into 1000 shares. Here is a formula that shows the relationship between 1 Project CPU share and CPU shares in this example:

$$1 \text{ Project CPU share} = 20 \text{ (number of CPU shares allocated to the zone)} / 1000 \text{ (number of Project CPU shares)} = 0.02 \text{ CPU shares}$$

When you create a project, Project 1, in Zone A, Project 1 gets the shares from the zone and not directly from the resource pool. If Project 1 is assigned 300 shares in Zone A, then it gets 300 Project CPU shares or $300 / 1000 \times 20 / 100 = 0.06$ CPU shares.

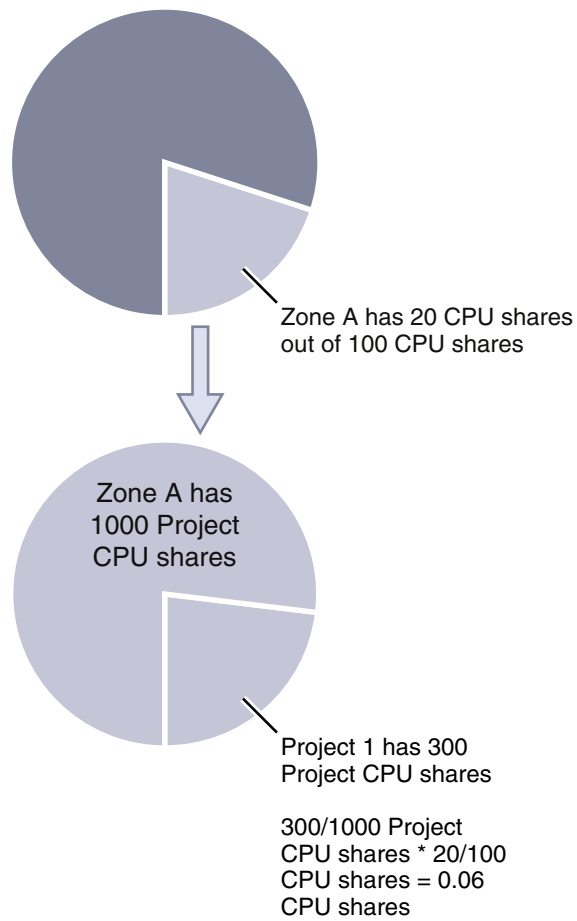


FIGURE 3-11 Zone CPU Shares

You assign the Project CPU shares to the project when you invoke the New Project wizard. In Step 7 of the New Project Wizard, Provide Resource Reservations for the Project, you enter the Project CPU shares in the field labeled CPU Reservations (CPU Shares). This is true when you create a project only in a zone on a Solaris 10 host only.

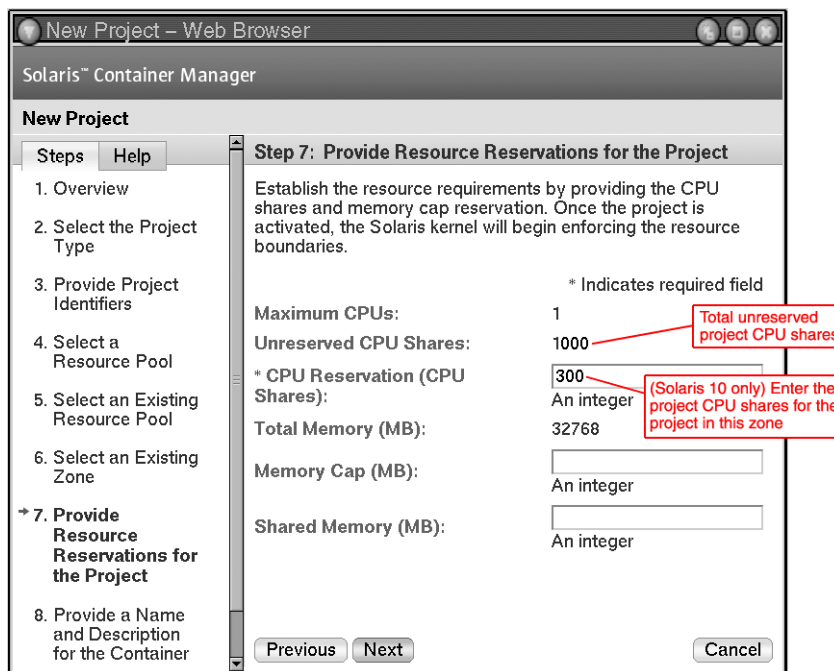


FIGURE 3-12 Project CPU Shares

Note – When you create a project on a Solaris 8 or Solaris 9 host, the field Unreserved CPU Shares is used for entering CPU shares (not Project CPU shares).



Caution – Do not use the command line (zonecfg command) to change the CPU shares manually. This will interfere with the Solaris Container Manager calculations.

The Global Zone and Its Projects

The global zone is the only zone that is not bound to only one resource pool. It can get CPU resources from any pool. Projects in the global zone can obtain CPU resources from every resource pool on the host because a hidden global zone is present in every resource pool on the host.

For example, the resource pool, Pool_default, has 4 CPUs and has zone_1 and zone_2 deployed on it. The Pool_default has 10 CPU shares. Zone_1 has 5 CPU shares, zone_2 has 4 CPU shares and the global zone has 1 CPU share.

Another resource pool, Pool_1, has 2 CPUs and has 10 CPU shares. Pool_1 has only one zone, zone_3 deployed. Zone_3 has 9 CPU shares. The global zone has 1 CPU share.

The projects in the global zone get their CPU resource from the 1 CPU share of the pool that they are deployed on.

In Solaris Container Manager, projects in the global zone must be deployed to pool_default.

Fair Share Scheduler (FSS)

Container Manager uses the fair share scheduler (FSS) to ensure the minimum CPU shares you set. The fair share scheduler is the default scheduler. The fair share scheduler calculates the proportion of CPU allocated to a project by dividing the shares for the project by the total number of active projects' shares. An active project is a project with at least one process that uses the CPU. Shares for idle projects, that is, projects with no active processes, are not used in the calculations.

For example, three projects, sales, marketing, and database, have two, one, and four shares allocated respectively. All projects are active. The CPU resources for the resource pool is distributed this way: the sales project receives $2/7$ ths, the marketing project receives $1/7$ th, and the database project receives $4/7$ ths of the CPU resources. If the sales project is idle, then the marketing project receives $1/5$ th and the database project receives $4/5$ ths of the CPU resources.

Note that the fair share scheduler only limits CPU usage if there is competition for the CPU. A project that is the only active project on the system can use 100 percent of the CPU, regardless of the number of shares it holds. CPU cycles are not wasted. If a project does not use all of the CPU that it is entitled to use because it has no work to perform, the remaining CPU resources are distributed among other active processes. If a project does not have any CPU shares defined, it is assigned one share. Processes in projects with zero (0) shares are run at the lowest system priority. These processes only run when projects with nonzero shares are not using CPU resources.

Timesharing Scheduler (TS)

The timesharing scheduler tries to provide every process relatively equal access to the available CPUs, allocating CPU time based on priority. Because the TS does not need to be administered, it is easy to use. However, the TS cannot guarantee performance to a specific application. You should use TS if CPU allocation is not required.

For example, if two projects are assigned to an FSS resource pool and they each have two shares, the number of processes that are running in those projects is irrelevant. A project can only access 50 percent of the available CPU. Thus, if one process is running in the sales project and 99 processes are running in the marketing project, the one process in the sales project can access 50 percent of the CPU. The 99 processes in the marketing project must share 50 percent of the available CPU resources.

In a *TS* resource pool, the CPU is allocated per process. The one process in the sales project has access to only 1 percent of the CPU, while the 99 processes in the marketing project have access to 99 percent of the available CPU resources.

For more information about the fair share scheduler or the timesharing scheduler, see *System Administration Guide: Network Services*.

Using Container Manager to Trend Application Resource Consumption

You can use Container Manager in your test environment as a tool to help trend application resource consumption by doing the following:

1. Installing and setting up the Container Manager software along with any required software.

For information, see [Chapter 2](#).

2. Installing Performance Reporting Manager on all agent machines you want to monitor.

For more information, see [Chapter 2](#) and *Sun Management Center 3.5 Performance Reporting Manager User's Guide*.

3. Creating an active application-based container for the application you want to trend. In the New Creation wizard, make a minimum CPU reservation only. Do not set a memory cap.

For more information, see [“Creating an Application-Based Project”](#) on page 80 and [“To Create an Application-Based Project”](#) on page 82.

4. Monitoring the resources used for a couple of weeks with daily, weekly, or real-time graphs. Two graphs, one for CPU and memory resources used, are available for the container that is running on an individual host. You can also view the Processes table to monitor processes running in the application.

For more information, see [“To Request a Resource Utilization Report for an Active Project”](#) on page 128 and [“Viewing Project Processes”](#) on page 90.

5. After you have established the maximum physical memory requirement for the application, modify the container's properties to include a memory cap. Do not set a cap that is less than the maximum memory the application has been using.

For more information, see [“To Modify a Project Using a Property Sheet”](#) on page 96.

6. Setting an alarm so you are notified if the memory used starts to exceed the memory cap set. Make any adjustments to the memory cap using the Properties sheet.

For more information, see [“To Set an Alarm Threshold”](#) on page 120 and [“To Modify a Project Using a Property Sheet”](#) on page 96.

After you have established resource utilization trends by using Container Manager, you can use containers to consolidate servers in your production environment.

For more information about how to plan and execute a server consolidation, you can read the Sun Blueprints book *Consolidation in the Data Center* by David Hornby and Ken Pepple. For more information about server consolidation on systems running the ORACLE database, you can read the Sun white paper *Consolidating Oracle RDBMS Instances Using Solaris Resource Manager Software*.

Managing Projects

This chapter contains procedures for creating, using, and managing projects.

The following topics are discussed:

- “Creating Projects” on page 73
- “Moving or Starting Processes in a Project” on page 85
- “Activating or Deactivating Projects” on page 88
- “Viewing Project Processes” on page 90
- “Modifying Containers and Projects” on page 93
- “About Reports” on page 123
- “Deleting Projects” on page 101

Note – You must be a project administrator to manage (create, activate, deactivate, modify, delete) projects. The project administrators are specified while setting up the Solaris Container Manager software.

Creating Projects

You can create custom projects in addition to the default containers that are available after the software has been installed and set up. The combined use of both types of containers aids you in the implementation of your server consolidation plan.

Use the New Project wizard to create custom projects. You have the option to create and save just the container to the Containers view. Or, you can complete all wizard steps to create a project. The same wizard is used for both situations.

If you choose to create just the container, the name is saved in the Containers view. You can use the container to create one or more projects at a later time. For more information about how to activate a project, see “[Activating or Deactivating Projects](#)” on page 88.

If you choose to create a project, you also make a container as part of the process. After you finish creating the project, the container is saved to the navigation window of the Containers view. You can use this same definition to create additional projects that are associated with multiple hosts. The definition for all these projects, including the name and project type, will be the same for each of the hosts. You can vary the resource reservations of the project per host, or you can make them all the same. This flexibility is provided so that you can meet resource needs as conditions vary. For more information, see [“About Container Properties” on page 46](#).

The New Project wizard guides you through the project creation process. You should have the following information available when creating a project to move readily through the wizard:

- The name and description for the project.
- The project type the project will be assigned. For more information, see [Table 3–2](#).
- The name of the host to which the project will be associated.
- The name of the resource pool to which the project will be bound.
- The resource boundaries that the project will be assigned, namely the minimum CPU reservation and memory cap amounts.

This wizard is accessible from three different places in the GUI, but always from the New Project button. Depending on where in the GUI you access the wizard, you might not need to provide all this information. Again, certain information might be completed for you depending on the entry point.

▼ To Start the New Project Wizard

The New Project wizard can be accessed from three places in the GUI. Depending on the access point to the wizard, you might not be required to complete all its panels because certain information is completed automatically.

For more samples of the New Project wizard, see [“Creating an Application-Based Project” on page 80](#).

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).**
 2. **In the navigation window, determine the relationship of the container you want to create.**
 - To associate a specific host with the container automatically, do the following:
 - a. Select the host name in the navigation window from the Hosts view.
If needed, click the host group name to expand the list.
 - b. Select the Projects tab that is located in the right pane.
The Projects table appears.

You are required to select a host during the container creation process when using this method.

The screenshot shows the Solaris Container Manager interface. The 'Hosts' pane on the left lists several hosts, with 'rm1-rack07-u1' selected. The 'Projects' tab is active in the right pane, displaying a table of projects for the selected host. The table has columns for Project Name, Container Name, Status, Resource Pool Name, Zone Name, CPU Reservation (CPU Shares), CPU Usage (CPUs), and Memo Cap (MB). Three projects are listed: 'default (Read Only)', 'noproject (Read Only)', and 'system (Read)'. The 'default' project is selected with a checkmark.

<input checked="" type="checkbox"/>	Project Name	Container Name	Status	Resource Pool Name	Zone Name	CPU Reservation (CPU Shares)	CPU Usage (CPUs)	Memo Cap (MB)
<input checked="" type="checkbox"/>	default (Read Only)	Default	active	pool_default	global	1	0.0	
<input type="checkbox"/>	noproject (Read Only)	Processes with No Project	active	pool_default	global	1	0.0	
<input type="checkbox"/>	system (Read)	System Processes	active	pool_default	global	1	0.0009766	

- To automatically bind a project to a specific resource pool:
 - a. Select the resource pool name from the navigation window in the Hosts view.
If needed, click the key symbol next to the host name to expand the list. The resource pools that are assigned to the host are displayed.
 - b. Select the Projects tab located in the right pane.
The Projects table appears.

You are not required to assign a resource pool as part of the container creation process.

Solaris Container Manager Java
Sun Microsystems, Inc.

Hosts **Containers** **Open Alarms**

Hosts
 - rm1-rack07-u1
 - **pool_default**
 - rm1-rack10-v880
 - rm2-rack23-u3500
 - rm2-rack46-u60

Properties **Utilization** **Projects**

Resource Pool: pool_default - Contents
 To activate, deactivate, or delete a project, select the check box next to the project name and click the appropriate button. To view a project's properties, click the project name. » More on Projects

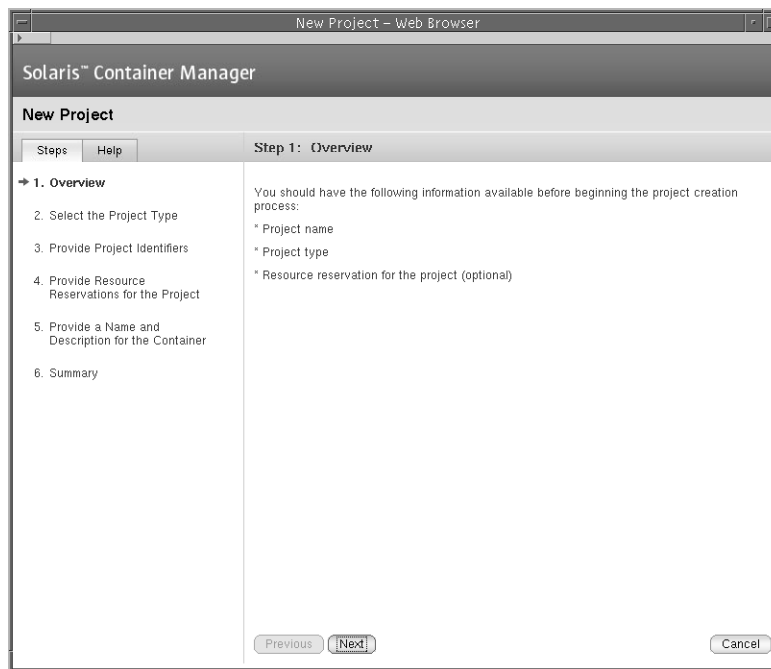
Projects (4)
 New Project... Activate Deactivate Delete | ▲

<input checked="" type="checkbox"/>	Project Name	Container Name	Status	Resource Pool Name	Zone Name	CPU Reservation (CPU Shares)	CPU Usage (CPUs)	Mem Cap (MB)
<input type="checkbox"/>	default (Read Only)	Default	active	pool_default	global	1	0.0	
<input type="checkbox"/>	noproject (Read Only)	Processes with No Project	active	pool_default	global	1	0.0	
<input type="checkbox"/>	system (Read Only)	System Processes	active	pool_default	global	1	0.0007019	

3. Click the New Project button from the host project table or the host resource pool table.

Note – The New Project button is always available from a table that appears in the right pane, regardless of which of the methods you selected.

The New Project wizard is displayed. The Overview panel is the first panel to appear.



Creating a User-Based or Group-Based Project

Note – Only the user-based container type is available if you are running the Solaris 8 release.

If you want the container to manage processes that are identified by either a UNIX user name or UNIX group name, you should create a user-based or group-based container. The project type that is selected during the creation process determines whether the finished container is user-based or group-based.

▼ To Create a User-Based or Group-Based Project

- Steps**
1. Start the New Project wizard, as described in [“To Start the New Project Wizard” on page 74](#).
The Overview panel appears.

2. Select User or Group as the project type.

A container with a user-based project type tracks processes with the same UNIX user name.

A container with a group-based project type tracks processes with the same UNIX group name.

Note – In the Solaris 8 OS, only the user-based container type is supported.

3. Provide project-type identifiers that meet the following requirements:

(On Solaris 8)

- **User-Based Project** - You must provide a valid UNIX user name in the first field. UNIX user names of those users that can join the project can be added in the second field. UNIX group names of those groups that can join the project can be added in the third field. Separate multiple entries with a comma.

Do not provide a user name that is being used in another user-based project or in a Default project in the first field.

- **Group-Based Project** - You must provide a valid UNIX group name in the first field. UNIX group names of those groups that can join the project can be added in the second field. UNIX user names of those users that can join the project can be added in the third field. Separate multiple entries with a comma.

Do not provide a group name that is being used in another group-based project or Default project in the first field.

Note – On Solaris 9 and Solaris 10, a valid user name and group name are not required. However, the additional user names and group names must be present on the system.

For additional information about this project type, see [Table 3-2](#).

4. If you accessed the New Project wizard by selecting a host name only (without selecting a pool), assign a resource pool that supports the resource requirements of the project.

New processes started in a project are bound to the corresponding resource pool. After the project is activated, the new processes that the project is holding are bound to its resource pool.

- To assign a new resource pool:
 - a. Select Create a New Resource Pool.
 - b. Provide a name for the resource pool.

The name must be alphanumeric and contain no spaces. The characters dash (-), underscore (_), and dot (.) are allowed.

c. Assign the number of CPUs.

The number of CPUs must be an integer not less than one and cannot exceed the number of CPUs available on the host. The total number of CPUs on the host and the number that are currently available are shown.

■ To assign an existing pool:

a. Select Use an Existing Resource Pool.

A list of available resource pools is displayed.

b. Select the radio button next to the pool's name in the list.

The total number of CPUs assigned to each resource pool is given, as well as the amount of unreserved CPU still available in each pool. The container is bound to the selected resource pool.

5. (Solaris 10 only) Select an existing zone.

Click the button from the available zones to associate the project to a zone.

6. Provide the resource reservations for the project.

The number of maximum CPUs, the number of unreserved CPU shares, and memory resources available on the host is provided.

The CPU reservation is required and must be provided as an integer. A container with a CPU reservation of zero receives CPU resources only when no processes are running in any other container that is associated with the same host.

The memory cap is optional and should be provided in Mbytes.

The shared memory value is the total amount of shared memory allowed to be used by the processes that run within this project. The shared memory is also optional. The default value of the shared memory is one-quarter of the physical memory.

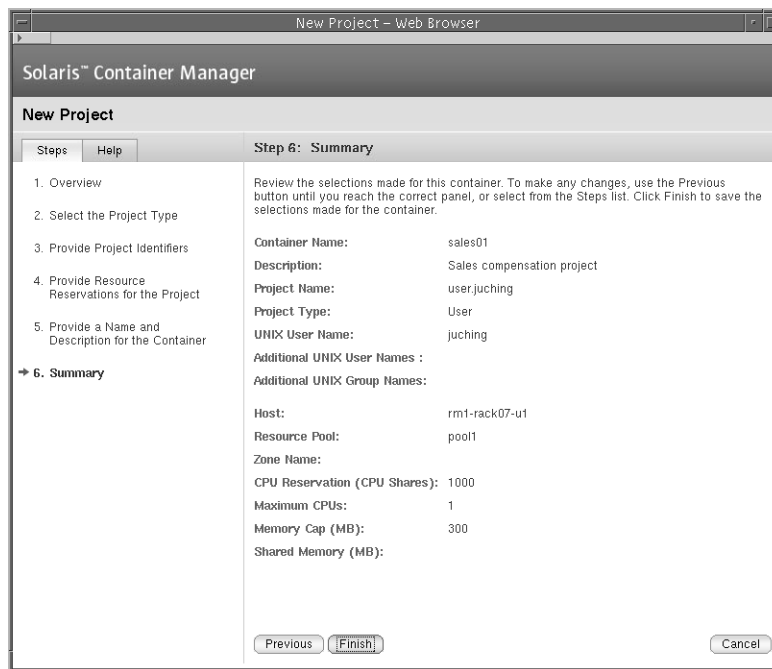
7. Provide a name for the container.

The name must be unique and not exceed 32 characters. This name identifies the container in the navigation window, status tables, and resource utilization reports. If a duplicate name is entered, the creation of the container fails.

A container name cannot be changed after the creation procedure is finished.

8. (Optional) Provide a description for the container.

9. Review the information in the Summary panel.



10. Click Finish.

The selections are saved, and the project is now active. The Solaris kernel begins enforcing the container's resource reservations.

Creating an Application-Based Project

Note – In the Solaris 8 OS, only the user-based container type is supported.

Use an application-based project to manage the processes that run in a particular software application. You can create an application-based project that moves the processes automatically or one that enables you to move the processes manually.

If you can provide a match expression that is truly unique to the application, you can add this expression to the project. You must also provide the UNIX user ID or UNIX group ID under which the processes will run. Additional users or groups that have the right to join the project at a later time can be added as well. To automatically move processes into the project, you must provide all required project identifiers when the corresponding wizard panel appears. The software then moves all matching processes automatically for all the projects that are based on this definition.

If the application does not create truly unique identifiers, then you will want to move the processes manually or start the application inside the project. If you want to move the processes manually, create the project with only the UNIX user ID or UNIX group ID under which the processes will run. Additional users or groups that have the right to join the project at a later time can be added as well. Then move the processes with the `newtask -p` command. For more information, see “Moving or Starting Processes in a Project” on page 85.

▼ To Determine the Match Expression for an Application

Use this procedure to determine the correct match expression to identify the processes corresponding to the application you want to manage. This expression is required in the New Container wizard to move processes automatically into a container.

- Steps**
1. From a terminal window, start the application that the application-based container will manage.
 2. To see a list of all processes that are running, in a terminal window type:

```
% ps -cafe
```
 3. In the **CMD** column, locate the corresponding executable name.
Choose the expression that will uniquely identify the application’s processes.

Example 4–1 Determining a Match Expression For Mozilla

The following is an example of output from the `ps - cafe` command in a search for Mozilla:

```
% ps -cafe
      UID  PID  PPID  CLS PRI   STIME TTY      TIME CMD
...
username 8044 7435   IA  50 19:47:09 pts/11  0:00 /bin/ksh -p /usr/sfw/lib/mozilla/mozilla
```

In this example, the unique executable name is `mozilla`. Likewise, a correct match expression is `mozilla`.

Example 4–2 Determining a Match Expression for Tomcat Server

When you know the name of the application, you can use the `grep` command in conjunction with `ps -cafe` to locate the correct match expression. The following is an example of output from the `ps - cafe | grep tomcat` command in a search for Tomcat server. This example has been condensed for space, leaving the irrelevant information.

```
% ps -cafe | grep tomcat
nobody 27307 /usr/j2se/bin/java -classpath //usr/apache/tomcat/bin/bootstrap.jar:/usr/j2se/1
```

In this example, the executable name is `java`. However, the correct match expression is `tomcat`. In this case, the match expression is the argument instead of the executable name, as `java` does not uniquely identify the Tomcat processes.

Example 4-3 Verifying a Match Expression for Tomcat Server

The following example shows how to use the `pgrep` command to find the PID. The PID verifies that you have identified the unique match expression for finding the desired process:

```
% pgrep -f tomcat
27307
```

The PID for Tomcat server is `27307`. This number matches the PID from [Example 4-2](#). This match confirms that the match expression `tomcat` corresponds to the Tomcat server process.

▼ To Create an Application-Based Project

- Steps**
1. **start the New Project wizard, as described in “To Start the New Project Wizard” on page 74.**

The Overview panel appears.

2. **Select Application as the project type for the container.**

The application-based project container tracks processes that are associated with the application. For more information about this project type, see [Table 3-2](#).

3. **Provide a name for the project.**

The name must be unique and not exceed 32 characters. This name identifies the project in the navigation window, status tables, and resource utilization reports. If a duplicate name is typed, the creation of the project fails.

A container name cannot be changed after the creation procedure is finished.

4. **Provide either the UNIX user names or UNIX group names under which the application’s processes will run.**

The UNIX user names or UNIX group names under which the application’s processes will run must be supplied. If these names are not provided, the corresponding processes will not be moved under the container until they are supplied. Separate multiple entries with a comma.

5. **Determine whether you want to move application processes under the project automatically when the container is activated or to move them manually from the command line.**

- To indicate that you want to move application processes manually from the command line, select the check box **Do Not Use Match Expression**.

- To move application processes under the project automatically when the project is activated, provide an expression in the Match Expression field.

You can use wildcards in the Match Expression field to identify the processes that are associated with an application. Examples of match expressions using wildcards are `moz`, `cat` that identify the processes associated with Mozilla and Tomcat respectively.

New Project...

Steps Help Step 3: Provide Project Application Process Identifiers

1. Overview
2. Select the Project Type
→ 3. Provide Project Identifiers
4. Provide Resource Reservations for the Project

A Project Name is required and can be the name of the application or any other suitable name. Providing either the UNIX user names or UNIX group names under which the application's processes will run is required.

You have the option to create the container so that application processes are moved automatically under the container when the container is activated, or to move the processes yourself from the command line.

To indicate that you want to move application processes yourself from the command line, select the check box Do Not use Match Expression. To move application processes automatically when the container is activated, provide an expression in the Match Expression field.

* Indicates required field

* Project Name:

UNIX User Names:

UNIX Group Names:

Do Not use Match Expression:

* Match Expression:

Previous Next Cancel

The match expression must be supplied to automatically move the application's processes to the container. This expression is case sensitive. To determine the correct match expression, see ["To Determine the Match Expression for an Application"](#) on page 81.

If a match expression is not provided at this time, the application's processes will not be moved under this container until this expression is supplied.

6. If you access the New Project wizard from the host name (without selecting a pool), assign a resource pool that supports the project's resource requirements.

New processes that are started in a project are bound to the corresponding resource pool. After the project is activated, the new processes that are held in the container are bound to its resource pool.

- To assign a new resource pool:
 - Select Create a New Resource Pool.
 - Provide a name for the resource pool.

The name must be alphanumeric and contain no spaces. The characters dash (-), underscore (_), and dot (.) are allowed.

- c. Assign the number of CPUs.

The number of CPUs must be an integer not less than one and cannot exceed the number of CPUs available on the host. The total number of CPUs on the host and the number that are currently available are shown.

- To assign an existing pool:

- a. Select Use an Existing Resource Pool.

A list of available resource pools is displayed.

- b. Select the radio button next to the pool's name in the list.

To total number of CPUs assigned to each resource pool is given, as well as the amount of unreserved CPU still available in each pool. The project is bound to the selected resource pool.

7. (Solaris 10 only) Select an existing zone.

Click the button from one of the available zones.

8. Provide the resource reservations for the project.

The maximum CPUs, unreserved CPU shares, and memory resources that are available on the host is provided.

The CPU reservation (CPU shares) is required and must be provided as an integer. A project with a CPU reservation of zero receives CPU resources only when no processes are running in any other container that is associated with the same host.

The memory cap is optional and should be provided in Mbytes.

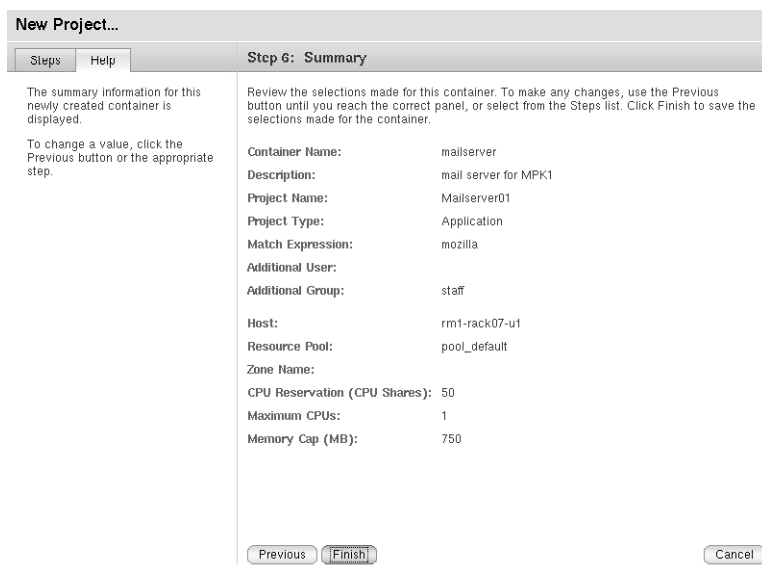
The shared memory value is the total amount of shared memory allowed to be used by the processes that run within this project. The shared memory is also optional. The default value of the shared memory is one-quarter of the physical memory.

9. Provide a name for the container.

The name must be unique and not exceed 32 characters. This name identifies the container in the navigation window, status tables, and resource utilization reports. If a duplicate name is entered, the creation of the container will fail. A container name cannot be changed after the creation procedure is finished.

10. (Optional) Provide a description for the container.

11. Review the information in the Summary panel.



12. Click Finish.

The selections are saved, and the container is now active. The Solaris kernel begins enforcing the container's resource reservations.

Moving or Starting Processes in a Project

If the application being managed by the project does not have a unique executable name, then you will want to move processes into the project manually. This method ensures that you track only the processes of the desired application.

▼ To Move Processes Into an Application-Based Project Individually

Use this procedure if you did not provide a match expression for an application-based project and want to move the application's processes into the project individually.

- Steps**
1. **Create an application-based project for managing the application. Select the Do Not Use Match Expression check box.**

For detailed steps, see the section, [“To Create an Application-Based Project”](#) on page 82.

2. Review the `/etc/project` file to determine the project name by typing:

```
% cat /etc/project
```

You will need this project name in [Step 5](#).

3. If needed, start the application in a terminal window.
4. Determine the processes that correspond to the application.
For examples, see [Example 4-1](#), [Example 4-2](#), and [Example 4-3](#).
5. Move the corresponding processes.
 - a. From the Container Manager GUI, click the host in the navigation window.
 - b. Click the Projects tab.
The Projects table is shown.
 - c. In the Projects table, click the project name. Note that the project name is underlined to show it is a link.
The Projects Properties tab is shown.
 - d. Click the Processes tab.
The Processes table is shown.
 - e. Select the processes to be moved.
 - f. Click the Move button.
The Move Process dialog box appears.
 - g. Select the new project (containers) for the process from the list of projects (containers).
 - h. Click OK.
6. Repeat [Step 5](#) until all processes are moved.

Example 4-4 Verifying That the Processes Were Moved Into the Project With `ps`

You can use the `ps` command in combination with `grep` to verify that the processes have been moved into a container. The following example shows that the processes that were individually moved are now in the container payroll:

```
% ps -ae -o pid,project,comm | grep payroll
17773  payroll ora_reco_AcctEZ
17763  payroll ora_pmon_AcctEZ
17767  payroll ora_lgwr_AcctEZ
```

Example 4–5 Verifying That the Processes Were Moved Into the Project With `prstat`

You can use the command `prstat` to verify that the processes were moved into a container if you know the project name. In this example, the project name is `payroll`.

```
% prstat -J payroll
  PID USERNAME  SIZE   RSS STATE  PRI NICE   TIME   CPU PROCESS/NLWP
 17773 admin      216M  215M cpu2    1   0   0:05:08  29% ora_reco_AcctEZ/1
 17763 admin      834M  782M sleep   1   0   0:35:02   0% ora_pmon_AcctEZ/1
 17767 admin      364M  352M run     1   0   0:22:05  23% ora_lgwr_AcctEZ/1
```

▼ To Start an Application in a Project

- Steps** 1. Create an application-based project for managing the application. Select the **Do Not Use Match Expression** check box.

For detailed steps, see [“To Create an Application-Based Project”](#) on page 82.

2. Select from the following by the OS version:

- For the Solaris 8 OS, type:

```
% srmuser user_name newtask -p project_name application_name
```

where *user_name* is the UNIX user name, and *project_name* is in the form `user.username`. In the Solaris 8 OS, because only the user-based container is supported, *user_name* and *project_name* are the same.

- For the Solaris 9 or Solaris 10 OS, type:

```
% newtask -p project_name application_name
```

where *project_name* is the project that is associated with the container, and *application_name* is the command that starts the application, including any command arguments.

The application is started in the container.

Example 4–6 Starting an Application Inside a Container on Solaris 9 or Solaris 10 OS

The following is an example of starting an application named `tracks` inside a container named `music`:

```
% newtask -p music tracks -z 0 mozart.au
```

where `-z 0 mozart.au` are the command-line arguments for the application `tracks`.

Example 4-7 Verifying an Application's Association With a Project

After the application has been started, you can verify which project the application is associated with by typing:

```
% ps -ae -o pid,project,comm
```

The following is an example of the output from this command:

```
  PID  PROJECT  COMMAND
...
17771  default  ora_smon_SunMC
16246  system  rquotad
26760  group.staff /bin/csh
16266  music    tracks
17777  default  ora_d000_SunMC
17775  default  ora_s000_SunMC
17769  default  ora_ckpt_SunMC
```

In this example, the application named `tracks` has PID 16266, the project is `music`, and the executable is `tracks`. This is the same application started in [Example 4-6](#).

Activating or Deactivating Projects

A project's resource boundaries are not enforced while the project is in a defined or inactive state. You must activate the project to enable this enforcement. Conversely, when you do not want these limits enforced, you must deactivate the project. An active project can be deactivated without losing the resource boundaries you have established. For more information, see ["Project States" on page 49](#).

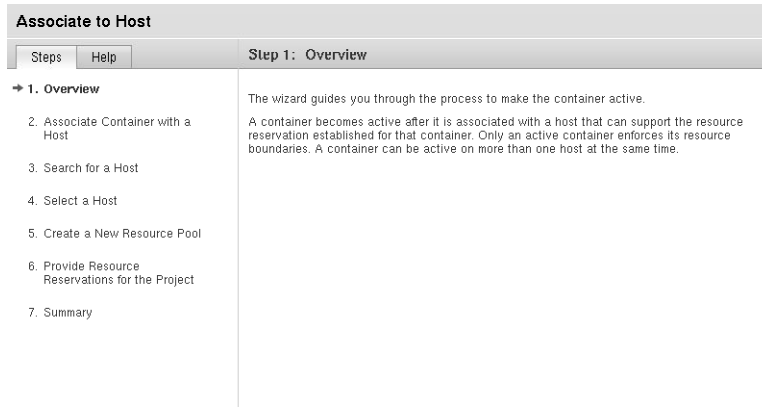
An existing container can be used to create new active projects with the Associate Host to Container wizard. You activate an inactive project or deactivate an active project with a button.

▼ To Activate a Project

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in ["To Start the Container Manager GUI" on page 51](#).**
 2. **In the Containers view, select the name of the container.**
If the container is part of a group, select the group from the navigation window to display the containers in the right pane.
 3. **Select the Hosts tab in the right pane.**
The Hosts Associated with this Container Definition table appears. All hosts that the selected container is currently associated with are listed in the table.

4. Click the Associate Host to Container button.

The Associate Host to Container wizard appears.



5. Follow the wizard instructions for typing a host name or finding an appropriate host.

▼ To Activate an Inactive Project

- Steps**
- 1. If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 - 2. In the Hosts view, select the host with which the container is associated.**
 - 3. Select the Projects tab in the right panel.**
A table appears that lists all projects that are associated with that host.
 - 4. To enable the Activate button, select the check box of the project to be activated.**
 - 5. (Optional) View and modify the properties of the project.**
 - a. Click the name of the project in the Project Name column of the table.**
The Properties tab appears.
 - b. (Optional) Modify the resource reservations for the project and click Save.**
For more information, see “Modifying Containers and Projects” on page 93.
 - 6. Click the Activate button.**
The project is activated and the resource boundaries are being enforced by the kernel.

▼ To Deactivate an Active Project

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. In the Hosts view, select the host with which the project is associated.
 3. Select the Projects tab in the right panel.
A table appears that lists all projects that are associated with that host.
 4. To enable the Deactivate button, select the check box of the project to be activated.
 5. (Optional) View and modify the properties of the project.
 - a. Click the name of the project in the Project Name column of the table.
The Properties tab appears.
 - b. (Optional) Modify the resource reservations for the project and click Save.
For more information, see [“Modifying Containers and Projects” on page 93](#).
 6. Click the Deactivate button.
The project is deactivated and the resource boundaries are not enforced by the kernel.

Viewing Project Processes

Information about the processes that are running in an active project can be obtained from a table in either the Hosts view or the Containers view. The same Processes table and identical information is provided in both views.

Properties	Utilization	Processes	Alarm Thresholds								
Default on rm1-rack07-u1 – Processes											
To update the Processes table, click the Refresh button. » More on Project on Host – Processes											
Hosts and Groups (10)											
Move...											
<input checked="" type="checkbox"/>	<input type="checkbox"/>	PID	User Name	SIZE	RSS	STATE	PRI	NICE	TIME	CPU	PROCESS
<input type="checkbox"/>	<input type="checkbox"/>	16237	noaccess	143M	125M	sleep	56	0	0:31.07	6.0%	java/55
<input type="checkbox"/>	<input type="checkbox"/>	20675	smcorau	9944K	5112K	sleep	59	0	0:00:00	0.0%	tnslsnr/1
<input type="checkbox"/>	<input type="checkbox"/>	20691	smcorau	491M	461M	sleep	59	0	0:00:00	0.0%	oracle/1
<input type="checkbox"/>	<input type="checkbox"/>	20693	smcorau	493M	463M	sleep	55	0	0:00:01	0.0%	oracle/71
<input type="checkbox"/>	<input type="checkbox"/>	20695	smcorau	492M	461M	sleep	1	0	0:00:01	0.0%	oracle/11
<input type="checkbox"/>	<input type="checkbox"/>	20697	smcorau	492M	461M	sleep	59	0	0:00:31	0.0%	oracle/11
<input type="checkbox"/>	<input type="checkbox"/>	20699	smcorau	490M	463M	sleep	59	0	0:00:00	0.0%	oracle/1
<input type="checkbox"/>	<input type="checkbox"/>	20701	smcorau	490M	462M	sleep	59	0	0:00:00	0.0%	oracle/1
<input type="checkbox"/>	<input type="checkbox"/>	20703	smcorau	493M	470M	sleep	22	0	0:01:33	0.4%	oracle/11
<input type="checkbox"/>	<input type="checkbox"/>	20705	smcorau	491M	460M	sleep	44	0	0:00:27	0.6%	oracle/1

Processes are listed one per row and the following information is available:

- PID** The process ID.
- User Name** The owner of the process (the UNIX user name or login name).
- SIZE** The total virtual memory size of the process in Mbytes.
- RSS** The resident set size of the process in Mbytes.
- STATE** The state of the process. Values include the following:
 - **cpuN** – The process is running on CPU *N* where *N* is an integer.
 - **sleep** – The process is sleeping, or waiting.
 - **run** – The process is running.
 - **zombie** – The process is terminated.
 - **stop** – The process is stopped.
- PRI** The priority of the process. The higher the number, the higher the process priority.
- NICE** Nice value that is used in priority computation.
- Time** The cumulative execution time for the process.
- CPU** The percentage of recent time that is used by the process.
- PROCESS/NLWP** The name of the process, which is the name of executed file. The number of lightweight processes (LWPS) in the process.

▼ To View the Processes Running in a Project From the Hosts View

Use this procedure if you know the name of the host with which the project is associated.

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the Hosts view by clicking the left tab in the navigation window.**
 3. **In the navigation window, select the host with which the project is associated.**
 4. **In the right pane, select the Projects tab.**
The Projects table is displayed and lists all the projects that are associated with the host. The list includes active and inactive projects. You must select an active project to see information about its processes.
 5. **Select the project by clicking the project name.**
The properties page for the project instance on the selected host is displayed.
 6. **Select the Processes tab.**
The processes running inside the project are displayed in the Processes table. The name of the project and the host it is associated with are displayed above the table.

If no processes are listed, you might have selected an inactive container.

▼ To View the Processes Running in a Project From the Containers View

Use this procedure when you know the name of the project and want to select from the list of hosts with which the project is associated.

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the Containers view by clicking the right tab in the navigation window.**
 3. **In the navigation window, select the desired container.**
If needed, expand the container by clicking the expansion triangle. After the project names appear, click the name of the desired project.

A table that lists all the hosts that the container is associated with is displayed in the right pane.

4. In the table, click the project name.

The properties page for the container instance on the selected host appears.

5. Select the Processes tab.

The name of the project and the host it is associated with are displayed in the table title. The processes that are running inside the project are displayed in the Processes table.

If no processes are listed in the table, you might have selected an inactive project.

Modifying Containers and Projects

Two property sheets are available for modifying either a container or an active or inactive project. The following table shows the differences between the property sheets.

TABLE 4-1 Property Sheet Details

Property Sheet	Usage	Tab
Container	Changes to description, project type, project identifiers (users, groups), match expression	Properties tab in Containers view after selecting the container
Project instance (active or inactive project)	Changes to resource pool association, CPU reservation, memory cap	Properties tab in Hosts view or Containers view

Each project instance has a container with which it is associated. Any change that is made to the container applies to all the project instances that use that definition. For example, if you change the project type in a container, the project type changes for all project instances that use the same container. Therefore, you can use both property sheets to make all modifications that are needed.

Each project instance also has a property sheet that is used to change only its own resource pool association or the resource reservations. You can change one project at a time when using this property sheet. For example, you can increase the current minimum CPU reservation or the current memory cap. Changes become effective after the new values have been saved. Modifications that you make to the resource boundaries on an inactive project are not effective until you reactivate the project.

The following example shows a completed property sheet for the sales01 project instance.

Properties	Utilization	Processes	Alarm Thresholds
------------	-------------	-----------	------------------

sales01 on rm1-rack07-u1 – Properties Save

To change the resource pool, CPU reservation, or memory cap, modify the value and click the Save button. » More on Project on Host – Properties

- ⌵ Container
- ⌵ Project Definition
- ⌵ Resource Pool Definition: Provide Resource Reservations for the Project

Container

Name: sales01
Description: Sales compensation project
Container Id: 11
Host Name: rm1-rack07-u1

⌵ Back to top

Project Definition

Project Name: user.jching
Project Type: User
UNIX User Name: jching
Additional UNIX User Names:
Additional UNIX Group Names:

⌵ Back to top

Resource Pool Definition:

Resource Pool:

⌵ Back to top

Provide Resource Reservations for the Project

FIGURE 4-1 Sample: Property Sheet for Changing Resource Reservations and Resource Pool

If you need to make resource changes to multiple projects that are active on multiple hosts, use the resource change job feature. For more information, see [“Modifying Projects With a Resource Change Job”](#) on page 97.

From the Containers view, a separate property sheet is available from which you can modify the container. You can make changes to one container at a time. You cannot use the resource change job feature to make changes to multiple containers.

The following example shows a completed property sheet for changes to the sales01 project instance.

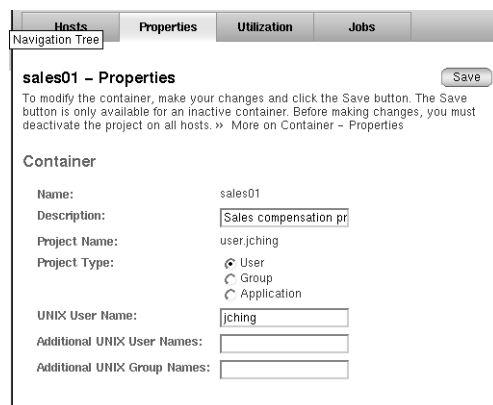


FIGURE 4-2 Sample: Property Sheet for Modifying a Container

You cannot modify the properties of a default project. Therefore, neither property sheet is available if a default project is selected.

Note – Only a container or an inactive project can have its properties modified. You must first deactivate an active project from every host that the project is associated with before modifying any properties. After the changes are saved, you can reactivate the project.

▼ To Modify a Container Using a Property Sheet

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. Select the Containers view.
 3. Select the container.
 - If the container is not currently used for any active project, select the Containers Group from the navigation window. This method displays the Container and Groups table in the right pane. Select the project from the table.
 - If the container is being used with any active projects, select the container from the navigation window. If needed, click the different Container groups to expand the list of individual containers. This method displays the Hosts Associated with this Container Definition table from which you can deactivate the project instances.

Note – All project instances that use this container must be deactivated before you can change the properties. If any instances show the status as Active, use the Deactivate button in the Hosts Associated with this Container table after selecting all hosts before continuing.

4. Select the Properties tab from the right pane.

The property sheet for the selected container appears. You can make the following changes in the text fields:

- Description – Provide the description of the container.
- Project Type – Provide the User, Group, or Application.
- UNIX User Name – Change existing entry for UNIX user name.
- Additional User – Change existing entries or provide additional valid UNIX user names. Separate multiple entries with a comma.
- Additional Group – Change existing entries or provide additional valid UNIX group names. Separate multiple entries with a comma.

Note – If the Save button is not available and the text fields are grayed out, the container is being used in one or more container instances. Verify that the state is Inactive for all hosts listed in the Hosts Associated with this Container Definition table. If any show status as Active, you must deactivate them.

5. Click Save to save the changes.

The property sheet remains displayed.

▼ To Modify a Project Using a Property Sheet

Use this procedure to make changes to the resource pool or resource reservations for only one project. If you want to make the same change to multiple projects, see [“Modifying Projects With a Resource Change Job”](#) on page 97.

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI”](#) on page 51.**
 2. **Choose from the following methods to select the desired project instance:**
 - If you know the name of the host that the project is associated with, select the host name from the navigation window in the Hosts view. Then select the Projects tab in the right pane to access a table that lists all projects that are associated with the host.

- If you know the name of the project, select its name from the navigation window in the Containers view. The Hosts Associated with this Container Definition table appears in the right pane.

Note – All projects must be deactivated before you can change the properties. If any projects show the status as Active, use the Deactivate button in the table before continuing. The tables in both views have this button.

3. Select the name of the project or host from the table, depending on the method that you selected in the previous step.

The property sheet for the project instance is displayed.

4. Make the desired changes.

Note – (On Solaris 10) It is not possible to change the resource pool of a project.

- Resource Pool Definition. To change the pool that the project is associated with, select from the drop-down menu.
- CPU Reservation (CPU shares). Provide the new value in the text box as an integer.
- Memory Cap (MB). Provide the new value in the text box.
- Shared Memory (MB). Provide the new value in the text box.

5. Click Save.

The requested changes to the resource reservations have been saved.

6. (Optional) To reactivate the project, return to the table that you used in Step 3 and click Activate.

Modifying Projects With a Resource Change Job

Use the resource change job feature to change resource limits on multiple projects that are spread across multiple hosts. These projects must all use the same container. You can either run the resource change job immediately so that the changes are implemented at the same time, or you can schedule the changes to occur later.

Note – On Solaris 10, the resource change job feature changes the resource allocation of containers only if they are deployed in the global zone.

Note – Changes to CPU reservations (CPU shares) are immediate. Changes to memory caps need to write to swap. Any big change to the memory cap will affect system performance while the memory cap is being adjusted.

The following information is available in the Resource Change Job table:

Resource Change Job Name	The name of the job that was provided during job creation.
Hosts	The names of the hosts with which the container is associated.
Schedule	The interval the job is scheduled to run. Options include One Time, Hourly, Daily, Weekly, Monthly.
State	The status of the job. Values include Queued, Succeeded, Failed.

The following example uses projects named “Webserver” and “Rollup” to show how the resource change job feature can be used to manage system resources across the enterprise. In this example, an online store provides order processing from its website. The Webserver project was created to manage the CPU and memory resources that are used by the web server across North America. The Rollup project was created to manage the resources that the database required. During the day and early evening hours, web server resource demands are high as people use the web site to place orders. But in the evening, the demand on the web server typically drops dramatically after midnight. During overnight hours, the database is scheduled to run reports on the day’s sales.

To manage the resources required by these two containers on an 8 CPU system with 6000 Mbytes of physical memory, you could create a total of four resource change jobs as shown in the following table.

TABLE 4-2 Sample of Resource Change Job Scheduling

Container Name	Resource Change Job Name	Start Time	Interval	Resource Change
Webserver	webserver-day	6:00 a.m.	Daily	CPU Shares: 6 Memory: 2500 MB
Rollup	rollup-day	6:00 a.m.	Daily	CPU Shares: 1 Memory: 2000 MB
Webserver	webserver-night	Midnight	Daily	CPU Shares: 1 Memory: 2000 MB

TABLE 4-2 Sample of Resource Change Job Scheduling (Continued)

Container Name	Resource Change Job Name	Start Time	Interval	Resource Change
Rollup	webservice-night	Midnight	Daily	CPU Shares: 6 Memory: 2500 MB

Two resource change jobs run every morning at 6:00 a.m. to change the resources for the Webserver and Rollup projects. During the day, the Webserver project is given the majority of CPU and physical memory resources as the demand of the webserver is high. Then at midnight each day a second set of resource change jobs run, and they reallocate the system’s resources to accommodate the changing need. The database requires the resources to tally the daily sales while the web server requires fewer resources as demand is low.

This feature is similar to the job management feature found in Sun Management Center, but use the Container Manager GUI to administer all Container Manager jobs. For more information about the Sun Management Center job feature, see “Job Management Concepts” in *Sun Management Center 3.6 User’s Guide*.

▼ To Modify a Project Using a Resource Change Job

- Steps**
1. If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.
 2. Select the Containers view.
 3. In the navigation window, select the project name.
The project must be associated with a host to proceed.
 4. Select the Jobs tab from the right pane.
The Resource Change Job table is displayed.



FIGURE 4-3 Sample: Resource Change Job Table

5. **Click the New Resource Change Job button located in the table.**
The Resource Change Job wizard appears. The Overview panel appears.
6. **Provide a name for the resource change job. Providing a description is optional.**
The length of the name cannot exceed 32 characters. Spaces, dash (-), underscore (_), and dot (.) are all accepted. A space is converted to an underscore (_).

The Select Hosts panel appears. The names of all the hosts with which the selected container is associated appears in the Available list. You can change the resource limits for one or more hosts by selecting them from this window.
7. **Select each host from the Available list, and click Add to move each host to the Selected list. Or click Add All to move all hosts.**
The host names move to the Selected field.
8. **Provide a new minimum CPU reservation (CPU shares). A memory cap is optional.**
The new resource limits apply to all the hosts selected in the previous step.
9. **Provide a start date, start time, and interval for the resource change job.**
The changes to the resource limits are effective at the requested time.
10. **Review your selections in the Summary panel. To make any corrections, use the Previous button. When you have completed all changes, click Finish.**
The wizard is dismissed. The job is added to the Jobs table. The status is listed as queued until the day and time when the Job is scheduled to run. The changes to the resource limits become effective at the time requested.

▼ To Edit a Pending Resource Change Job

Use this procedure to make changes to a pending job whose status still shows as Queued in the Jobs table.

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the Containers view in the navigation window.**
 3. **Select the Jobs tab from the right pane.**
 4. **From the Resource Change Job table, select the job to be changed by selecting the check box next to the name.**
A check mark appears in the box.
 5. **To start the Update Resource Change Job wizard, click the Update Resource Change Job button.**
For a detailed description of the steps to move the panels, see “To Modify a Project Using a Resource Change Job” on page 99.

6. **When you have completed all changes, click Finish.**

The wizard is dismissed. The edits made to the job have been saved.

▼ To View a Resource Change Job Log

Use this procedure to view the log for a change job that has been completed. If the job included changes to multiple hosts, the status for the jobs per host is located in the log.

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the Containers view in the navigation window.**
 3. **Select the Jobs tab from the right pane.**
 4. **From the Resource Change Jobs table, select the completed job whose log you want to view by selecting the check box next to the name.**
A check mark appears in the box.
 5. **Click the View Log button.**
The log file for the resource change job appears.

Deleting Projects

You can delete a project and its container when both are no longer needed. Before deleting a project and its container, you must first remove the project from all the hosts with which it is associated. Deletion removes the container from the database, and the data previously collected for the project is no longer stored. Therefore, you cannot obtain any historical data for a deleted project as all data for the project is removed from the database. Being deleted is not considered a project state because the record and all historical data has been removed.

You cannot delete a project on the Solaris 8 OS unless all processes that are running in that project have been stopped.

When a project is deleted, the following happens depending on the Solaris version you are running:

Solaris 8 OS

The `lnode` is deleted, followed by the project.

Solaris 9 OS and Solaris 10 OS

Processes that are running in the project are moved to the default project, and the entry is deleted from the `/etc/project` database.

▼ To Delete a Container

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. Verify that no inactive or active projects exist for the container.
 3. Select the Containers view in the navigation window.
 4. Select the container that is to be deleted.
 5. Click Delete.
The container is removed from the Containers view and is removed from the database.

Managing Resource Pools

This chapter contains procedures for creating, using, and managing resource pools.

The following topics are discussed:

- “Resource Pool Overview” on page 103
- “Creating New Resource Pools” on page 104
- “Deleting Resource Pools” on page 107

Resource Pool Overview

In the Solaris 9 and Solaris 10 releases, a resource pool, or pool, is a configuration mechanism that is used to partition the resources of a host. Every host has a default pool, and all processes are initially bound to this pool. Newly created pools take their processors from the default pool. A host can be partitioned into more than one pool. Additionally, each entry in the `/etc/project` file has an associated pool. If the `/etc/project` entry does not have a pool specified, then that entry is bound to the default pool. Otherwise, the project is bound to the specified pool. New processes started in a project are bound to the corresponding pool.

If you are running the Solaris 8 release, only one resource pool is available. The container is automatically assigned to the `pool_default`. Because resource pools do not exist in this OS version, the `pool_default` is created artificially. All of the CPUs on a host that runs the Solaris 8 release are considered to be in a single pool by convention.

After installation of the software, the database is populated with information about the existing resource pools on the system. Container Manager enables you to manage and create resource pools through its GUI. Use the Hosts view to manage resource pools on a host. To access a pool from the navigation window, click the key symbol next to a host. The tree expands and lists the corresponding pools under the host name.

Note – You must be a pool administrator to manage (create, modify, delete) resource pools. The pool administrators are specified while setting up the Solaris Container Manager software.

Creating New Resource Pools

After the Container Manager software is installed on a host, all existing resource pools are discovered and loaded into the module's management information base (MIB) table. Newly created pools take their processors from the host's default pool, which is called `pool_default`. One full CPU is always assigned to the default pool. Therefore, the number of available CPUs for creating new pools is always the total number of available CPUs minus one.

The Resource Pools table is located in the Hosts view under the Resource Pools tab. Information about a pool is listed in a single row in this table. The following information is available for each resource pool:

Resource Pool Name	The name of the resource pool
CPUs	Total number of CPUs that are contained in the pool
Unreserved CPUs	The number of CPUs that are available or currently available for container creation
CPU Shares	The number of CPU shares in the resource pool to be distributed to its zones or projects.

▼ To Create a New Resource Pool

- Steps**
- 1. If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 - 2. Select the Hosts view by clicking the left tab in the navigation window.**
A list of hosts is displayed in the navigation window.
 - 3. Select the host name.**
The Resource Pools table is displayed in the right pane.
 - 4. Click the New Resource Pool button.**
The New Resource Pool dialog box is displayed. The Total Number of CPUs on the host and the Available CPUs are listed.

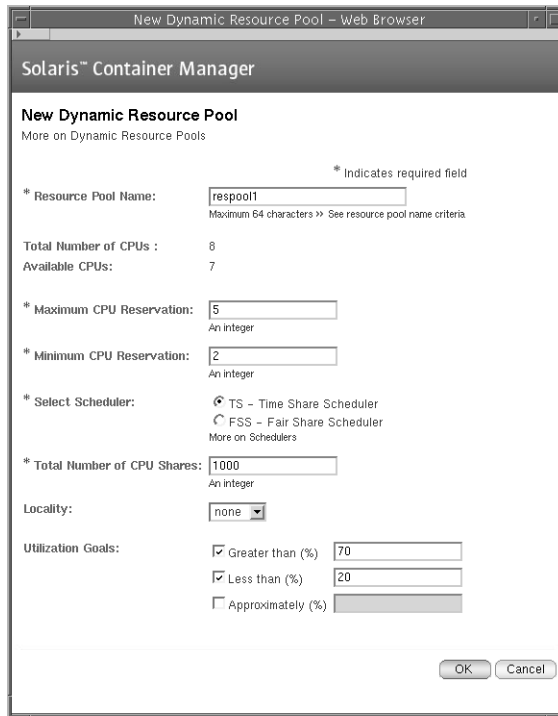


FIGURE 5–1 Resource Pool Window on a Solaris 10 Host

Note – The dialog box varies by operating system. If you are using a Solaris 10 host, the dialog box has more options.

5. **Provide a name for the new pool in the Resource Pool Name field.**
6. **(Solaris 8 and 9 only) Provide the number of CPUs for the pool.**
This number must be less than or equal to the number that is in the Available CPUs field and must be an integer.
7. **Select a scheduler, timesharing (TS) or fair share scheduler (FSS).**
For more information about the schedulers, see “Fair Share Scheduler (FSS)” on page 69 and “Timesharing Scheduler (TS)” on page 69.

8. Type the total number of CPU shares.

The total number of CPU shares is the basis for assigning ratios of the pool's resources to projects and should be an integer. For example, if you assign the pool 100 CPU shares, you can assign 50 shares of the pool to one project, 20 shares to another project, and 30 to another.

9. (Solaris 10 only) Type the maximum and minimum CPU reservation.

Minimum CPU reservation is the desirable minimum number of CPUs the pool must have. Maximum CPU reservation is the maximum number of CPUs the pool can have.

The minimum CPU value is (total number of CPUs) - (minimum CPUs of other pools). There is no limit on the maximum number of CPUs.

For more information about dynamic resource allocation, see the *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*

10. (Solaris 10 only - Optional) Select the locality factor for dynamic allocation of the pool.

None means do not factor in the physical location of the CPUs on a board.

Loose means to factor in the physical location of the CPUs on a board.

Tight means the CPU must be local, that is, on the same board as the initial CPU that is allocated to the pool.

11. (Solaris 10 only - Optional) Select a utilization goal.

Select from the following options:

- Type an integer value between 0 and 100 in Greater than field or Less than field or both to specify a range.
- Type an integer value between 0 and 100 in the Approximately field.

12. Click OK to save your changes.

The information in the Resource Pools table is updated with the new pool.

Modifying Resource Pools

When you want to change the CPUs, the scheduler type, or CPU shares, you modify the resource pool. If you use the Solaris 10 release, you can also change the maximum and minimum CPU reservation, the locality factor, and utilization goals for a pool.

Note – You cannot modify the default resource pool.

▼ To Modify a Resource Pool

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. Select **Hosts view** by clicking the left tab in the navigation window.
A list of hosts is displayed in the navigation window.
 3. Locate the desired host in the list, and click the expansion triangle next to the name.
The tree expands and all resource pools that are bound to the host are displayed.
 4. Select the resource pool by clicking its name in the navigation window.
 5. Select the **Properties tab**.
 6. Edit the attributes desired.
 7. Click **Save**.

Deleting Resource Pools

You cannot delete a host’s default resource pool. A resource pool cannot be deleted if any container is still associated with it.

▼ To Delete a Resource Pool

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. Select **Hosts view** by clicking the left tab in the navigation window.
A list of hosts is displayed in the navigation window.

3. Select the host name.

The Resource Pools table is displayed in the right pane.

4. To enable the Delete button, select the check box next to the resource pool.

If the Delete button does not become active, then containers are still using this pool and you cannot delete it.

5. Click the Delete button.

The selected resource pool is deleted and its name is removed from the tree.

Managing Zones

This chapter contains procedures for creating, using, and managing zones on Solaris 10 systems.

The following topics are discussed:

- “Zones Overview” on page 109
- “Non-Global Zone States” on page 110
- “Creating Non-Global Zones” on page 110
- “Copying Non-Global Zones” on page 116
- “Deleting, Booting, or Shutting Down Non-Global Zones” on page 117

Zones Overview

A Solaris 10 feature, zones provide an isolated and secure environment for running applications. Zones give you a way to create virtualized operating system environments within an instance of Solaris. Zones allow one or more processes to run in isolation from other processes on the system. For example, a process that runs in a zone can send signals only to other processes in the same zone, regardless of user ID and other credential information. If an error occurs, it affects only the processes that run within the zone.

Each zone can have its own IP address, file system, unique root user name and password file, and name server.

Every Solaris 10 system contains a global zone. The global zone is the default zone for the system and is used for system-wide administration. The global zone cannot be configured, installed, or uninstalled.

The upper limit for the number of zones on a system is 8192. The number of zones that can be effectively hosted on a single system is determined by the total resource requirements of the application software running in all of the zones.

Container Manager enables you to create, delete, modify, copy, halt and reboot non-global zones. Container Manager also can discover existing zones, detect zone changes, monitor and archive a zone's CPU, memory and network utilization, and generate zone up or zone down alarms.

Note – You must be a zone administrator to manage (create, modify, copy, delete, boot, shut down) non-global zones. The zone administrators are specified while setting up the Solaris Container Manager software.

For more information about zones, see Chapter 16, “Introduction to Solaris Zones,” in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

Non-Global Zone States

You can use Container Manager to create non-global zones.

A non-global zone can be in one of the following states:

- Configured
- Incomplete
- Installed
- Ready
- Running
- Shutting down
- Down

For more information about zone states, see “Non-Global Zone State Model” in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

Note – A global zone is always in “running” state.

Creating Non-Global Zones

You can create a non-global zone to keep the applications running inside this zone isolated from other applications.

Before You Begin

You must have a resource pool with available CPU shares. For instructions about creating a new resource pool, see “Creating New Resource Pools” on page 104.

▼ To Create a Non-Global Zone

- Steps**
1. If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.
 2. Select the Hosts view by selecting the Hosts tab in the navigation window. A list of hosts is displayed in the navigation window.
 3. Select a Solaris 10 host.
 4. Select the Zones tab.
 5. Click the New Zone button.
The New Zone wizard appears.

The screenshot shows the 'New Zone' wizard in the Solaris Container Manager GUI. The window title is 'New Zone - Web Browser'. The main title is 'Solaris™ Container Manager'. Below that, it says 'New Zone'. There are 'Steps' and 'Help' tabs. The current step is 'Step 1: Provide zone creation attributes.' A list of 10 steps is shown on the left, with step 1 selected. The main area contains the following fields and options:

- * Zone Name : (Maximum 64 characters >> See zone name criteria)
- * Zone Host Name : (Maximum 64 characters >> See zone name criteria)
- * Zone Path :
- IP Address :
- Network Interface : (dropdown menu)
- Auto Reboot : Enabled

At the bottom, there are 'Previous', 'Next', and 'Cancel' buttons.

FIGURE 6-1 Zone Creation Parameters Window

6. **Type the appropriate values for the fields: zone name, zone host name, zone path, IP address, and network interface.**

The zone host name is the unique name for the zone as a virtual host. It is *not* the host name or the machine name.

The zone path is an absolute path and starts from the root (/) directory.

Note – If the directory given in the zone path field exists, the permission for the root directory must be 700. Otherwise, the zone is not created.

If the directory given in the zone path field does not exist, the Solaris Container Manager creates a directory with this name and assigns 700 permission to the root directory.

Each zone can have network interfaces that should be configured when the zone transitions from the “installed” state to the “ready” state.

7. **(Optional) Select the Enabled check box, if you want the zone to automatically reboot when the system reboots.**
8. **Type the root user name.**

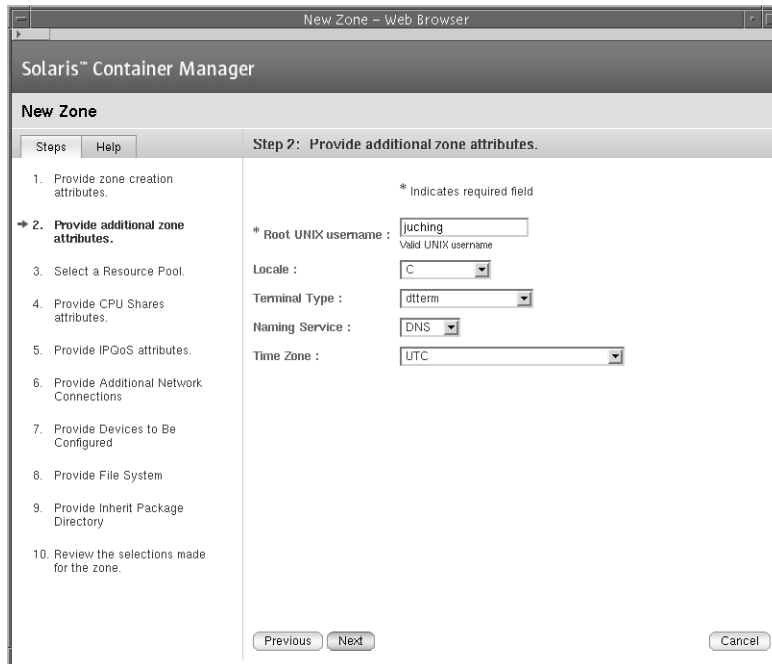


FIGURE 6-2 Zone Attributes Window

9. (Optional) Select the appropriate values in the Locale, Terminal Type, Naming Service, and Time Zone lists.

Locale specifies the language that will be used for this zone.

Terminal type specifies the type of the terminal.

Naming service translates host names to IP addresses and IP addresses to host names.

Time zone specifies the time zone for the zone.

10. Select a resource pool for the zone.

11. Type the appropriate values in the CPU Shares and Project CPU Shares fields.

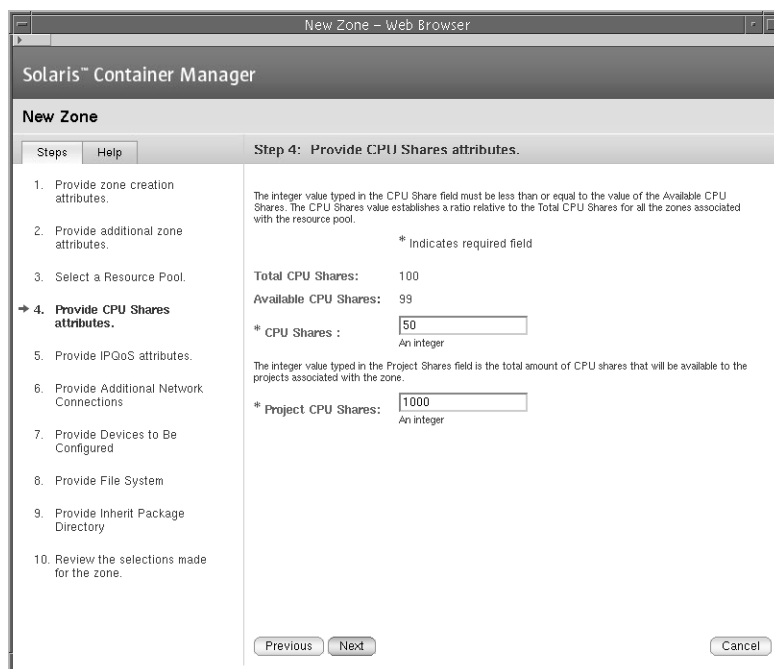


FIGURE 6-3 CPU Shares Window

The CPU Shares field specifies the number of CPU shares that is allocated to this zone from the resource pool. This number must be less than or equal to the CPU shares that are available for the resource pool.

The Project CPU Shares field specifies the number of CPU shares that is allocated to the projects in the zone.

12. (Optional) Type the minimum input bandwidth and output bandwidth for the IP quality of service feature.

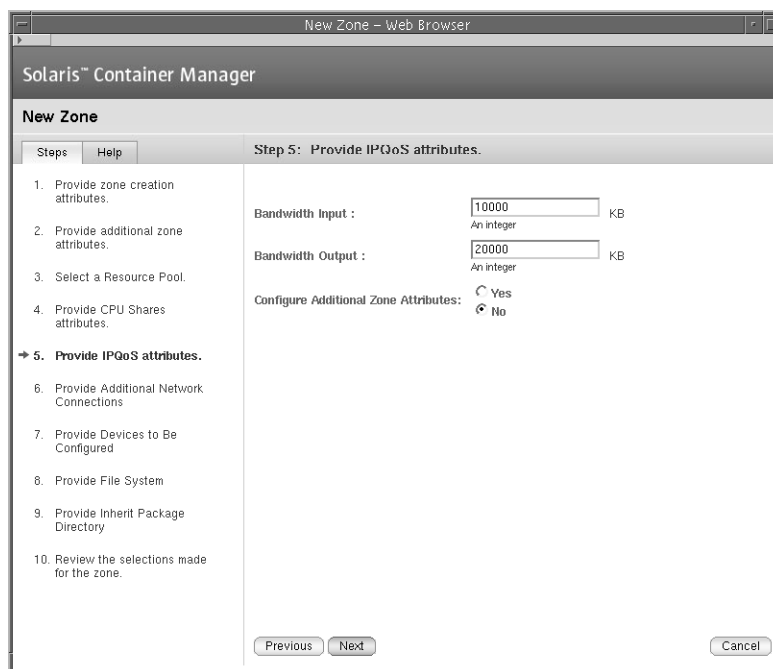


FIGURE 6-4 IPQoS Attributes Window

13. Choose whether to configure additional attributes for the zone.

- **If you want to configure additional attributes for the zone, select the Yes option and click Next.**

Type the additional IP addresses for this zone and select the appropriate network interfaces.

Type the device directories that are to be configured for this zone.

Type the details of the additional file systems that are to be mounted in this zone.

Type the directories that contain packaged software that this zone shares with the global zone.

For more information about these additional zone attributes, see “Zone Configuration Data” in *System Administration Guide: Solaris Containers-Resource Management and Solaris Zones*.

Review the selections that you made for the zone and Click Finish to save your changes.

- **If you do not want to configure additional attributes for the zone, select the No option and click Next.**

Review the selections that you made for the zone and Click Finish to save your changes.

The information in the zones table is updated with the new zone. When a zone is created, it will be in an “incomplete” state. After inheriting certain packages from the global zone, the zone will be changed to the “running” state.

Copying Non-Global Zones

When a non-global zone is copied, its properties are inherited to the new zone.

▼ To Copy a Non-Global Zone

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the Hosts view by selecting the Hosts tab in the navigation window.**
A list of hosts is displayed in the navigation window.
 3. **Select a Solaris 10 host.**
 4. **Select the Zones tab.**
 5. **Select the option button next to the non-global zone name.**
 6. **Click the Zone Copy button.**
 7. **Type the appropriate parameters and click OK.**

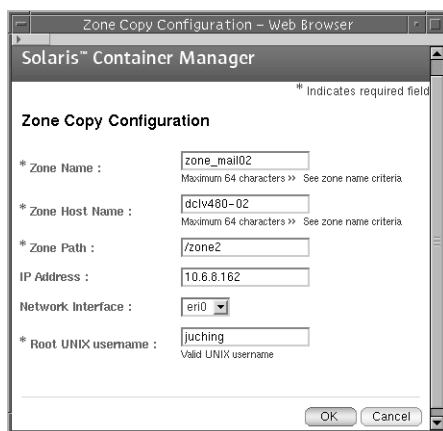


FIGURE 6-5 Zone Copy Window

During zone copy, the following attributes take their default values.

Attribute	Default Value
Terminal type	dtterm
Locale	C
Time zone	GMT

You can change the default values of these attributes when the zone is copied and is in “running” state.

The information in the zones table is updated with the new zone. When a zone is copied, it will be in the “configured” state. After inheriting certain packages from the global zone, the zone will be changed to the “running” state.

Deleting, Booting, or Shutting Down Non-Global Zones

You can change the state of a zone according to your needs.

▼ To Delete, Boot, or Shut Down a Non-Global Zone

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. Select the Hosts view by selecting the Hosts tab in the navigation window.
A list of hosts is displayed in the navigation window.
 3. Select a Solaris 10 host.
 4. Select the Zones tab.
 5. Select the option button next to the non-global zone name.
 6. Click the Delete, Boot, or Shutdown button.
When a zone is booted, it will be changed to the “running” state from the “installed” state. When a zone is shut down, it will be changed to the “installed” state from the “running” state.

Viewing the Log Files of Zones

▼ To View the Log File of a Zone

- Steps**
1. If the Container Manager GUI is not already open, access it as described in [“To Start the Container Manager GUI” on page 51](#).
 2. Select the Hosts view by selecting the Hosts tab in the navigation window.
A list of hosts is displayed in the navigation window.
 3. Select a Solaris 10 host.
 4. Select the Zones tab.
 5. Type the name of the zone in the field (located beneath the Zones table.)
 6. Click the Zone Log button.
The log file for this zone appears.

Managing Alarms

This chapter describes how to manage alarms.

Alarm Management

Note – You must install the Java Console layer of Sun Management Center 3.6 to manage alarms. For more information, see Chapter 12, “Managing Alarms,” in *Sun Management Center 3.6 User’s Guide*. Users might also be using other products to manage alarms.

About Setting Alarms

Alarms can be set to alert you when CPU or memory has reached a predetermined threshold. These alarms provide the feedback necessary to adjust the resource reservations to more appropriate levels.

You can set alarm thresholds for a container’s use of CPU and physical memory resources. Three levels of alarms are available: Critical, Major, and Minor. You can also request that an email be sent when alarms are generated. The alarms are displayed as icons in the navigation window and in the Containers table. Each icon displays a tool tip that contains alarm details when the cursor is placed over it.

The Container Manager GUI displays only those alarms that are generated by its own module. Alarms that are generated by the Container Manager module are visible in both the Sun Management Center Java and Web consoles. If you use Sun Management Center to view the Container Manager alarms, the alarm names match up according to the following table.

TABLE 7-1 Alarm Threshold Names

Container Manager	Sun Management Center
Critical	Critical
Major	Alert
Minor	Information

▼ To Set an Alarm Threshold

- Steps**
- 1. If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 - 2. In the Hosts view, select the host with which the container is associated.**
 - 3. Select the Projects tab.**
A table appears that lists all containers that are associated with that host.
 - 4. In the table, click the appropriate project in the Project Name column for which you want to set an alarm.**
The Properties page for the container appears.
 - 5. Select the Alarm Thresholds tab.**
The Alarm Thresholds page appears. Three levels of alarms are available: Critical, Major, and Minor.
 - 6. Locate the level of alarm to be set, and provide the alarm values in the text fields.**
Three alarm settings are available:
 - CPU Threshold Less Than – Provide an integer or decimal value. The alarm is triggered when the CPU usage falls below this value.
 - Memory Threshold Greater Than – Provide an integer in Mbytes. The alarm is triggered when the memory usage exceeds this value.
 - Mail To – Provide a valid email address. An email alert is sent to this address when the alarm is triggered.
-
- Note** – You can set one, two, or three levels of alarms at once. If more than one alarm is triggered, the alarm with the highest value appears as an icon in the GUI. Likewise, an email alert is sent for the alarm with the highest value.
-
- 7. Click Save.**
The alarm is now set. The Container Manager monitors this container against the alarm values that are provided.

You can add actions that will be executed when alarms are generated. You can add actions using the Java Console layer of Sun Management Center 3.6. For example, when a host running zones is not responding, the Container Manager generates a critical alarm. This alarm will be propagated to the host, where the action for critical alarms has been set.

▼ To Remove an Alarm Threshold

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **In the Hosts view, select the host with which the container is associated.**
 3. **Select the Projects tab.**
A table appears that lists all containers that are associated with that host.
 4. **In the table, click the appropriate project in the Project Name column for which you want to remove an alarm.**
The Properties page for the container appears.
 5. **Select the Alarm Thresholds tab.**
The Alarm Thresholds page appears. The values for the alarms that are set for the container are displayed.
 6. **Remove the alarm values from the text fields.**
 7. **Click Save.**
The alarm is no longer set.

▼ To View Open Alarms

- Steps**
1. **If the Container Manager GUI is not already open, access it as described in “To Start the Container Manager GUI” on page 51.**
 2. **Select the Open Alarms tab.**
The Open Alarms table lists all the alarms that are currently open for a Container Manager module.

The Open Alarms table shows the severity of the alarm, the alarm message, the agent or host name (managed object), start time of the alarm, and whether the alarm has been acknowledged in the Sun Management Center console.
 3. **Click the appropriate link in the Managed Object column to navigate to the object that is in an alarm condition.**

Creating Reports and Using Extended Accounting Data

This chapter describes how to create reports and use extended accounting data.

The following topics are discussed:

- [“About Reports” on page 123](#)
- [“Data Collection Process” on page 126](#)
- [“Requesting a Report” on page 126](#)

About Reports

If you have the Performance Reporting Manager software installed, you can generate reports that detail the CPU and the memory resources that are used per container, host, or resource pool. For zones, you can generate reports that detail the CPU, memory, input bandwidth, and output bandwidth. All of these graph reports are available from the Utilization tab located in the Container Manager GUI. These graph reports become available in the GUI two hours after the Performance Reporting Manager software is installed. This waiting period is needed to allow data to be collected and stored in the database for use in the graph reports. The waiting period for weekly and monthly graphs is 24 to 48 hours.

You can generate two types of utilization reports.

- **Total utilization report.** This report displays the resource utilization of all resource objects.
- **Cumulative utilization report.** This report displays the resource utilization of top 5 resource objects.

TABLE 8-1 Types of Utilization Reports

Resource Object	Total Utilization Report	Cumulative Utilization Report
Host	Utilization of all projects	Utilization of top 5 resource objects. On Solaris 10, resource objects might be resource pools, zones, or projects. On Solaris 8 and 9, resource objects might be resource pools or projects.
Pool	Utilization of all projects	Utilization of top 5 resource objects. On Solaris 10, resource objects might be zones or projects. On Solaris 8 and 9, resource objects are projects.
Zone	Utilization of all projects	Utilization of top 5 projects. On Solaris 10, resource objects are projects.
Container	Utilization of all projects	Utilization of top 5 hosts.
Project	Utilization of the project	Not applicable

The following types of resource usage graph reports are available from the Container Manager GUI.

Container	Data returned is the average of the resources used by all containers, which can include both active and inactive containers. Historical data is provided for inactive containers. The addition of historical data enables you to determine whether your containers are controlling resource consumption effectively. The data is represented as a percentage of the resource reservations for minimum CPU and memory cap for all active containers. This percentage compares the actual resources used to the resources reserved.
Active Container	Data returned is the number of CPUs and memory currently being used for the selected active container.
Container Group	Data returned is the average of the resource used for all containers in the selected group. This percentage compares the actual resources used to the resources reserved for the selected containers.

Host	Data returned is the aggregation of all active containers on the selected host.
Host Group	Data returned is the average resource utilization of all hosts located in that group. The data is represented as a percentage used of the total host resources.
Resource Pool	Data returned is the aggregation of all the active containers in the selected resource pool.
Zone	Data returned is the aggregation of all the active projects in the selected zone.

If the requested graph is for multiple containers across different hosts, the data returned is the average of the percentage being used on each host.

Report data can also be exported to a text file in comma-separated values (CSV) format for an active container, zones, resource pool, or host. The text file can be used as an interface file for a billing and accounting application, for example. A report in CSV format is available 2 hours after installation of the Performance Reporting Manager software. This waiting period enables report data to be collected and stored in the database for use in a CSV report. The exported data is more detailed and granular than the data that appears in the graph reports. Data for the last 24 hours is available in a CSV report.

The exported CSV reports contains the following categories of information:

Host name	Name of the host with which the container is associated
Timestamp	Date and time for the record.
CPU Reservation	CPU reservation of the container
CPU Usage	Combined CPU usage of all processes in the container
CPU Return of Investment	CPU utilization compared to CPU reserved, expressed as a percentage.
CPU Extended Accounting Information	CPU extended accounting information
Memory Cap	Physical memory cap
Memory Usage	Physical memory used
Percentage of Memory Used	Physical memory utilized of the host expressed as a percentage
Memory Return of Investment	Memory utilized compared to memory reserved, expressed as a percentage.
Container Project ID	Project ID of the container
Project Name	Project name of the container

Data Collection Process

Container Manager uses the Performance Reporting Manager data collection service, which is located on the server layer. This data collection service in turn uses the history logging capabilities of Sun Management Center, which is located on the agent layer. The data collection service on the server layer collects the data from the agent machines and stores it in the database. Additionally, data collected by Performance Reporting Manager is summarized, or “rolled-up,” at predefined intervals. The minimum, maximum, and average values for data are calculated and are stored as hourly data, weekly data, or monthly data. Finally, the minimum, maximum, and average values are calculated for these same intervals.

The reports generated with Container Manager can incorporate any of this data, depending upon the report request parameters. For more information about Performance Reporting Manager data collection methods, see “Data Collection Process” in *Sun Management Center 3.5 Update 2 Performance Reporting Manager User’s Guide*.

Requesting a Report

Both CPU and memory resource utilization reports are available for host, host group, container, container group, resource pool, zone, and active container. Before trying to view a report, be sure to set the browser’s cache to refresh every time. For a list of the six types of reports available, see “[About Reports](#)” on page 123. Reports for CPU and memory resources used are available for the following intervals:

- Daily – Shows data for the last 24 hours, one point per hour
- Weekly – Shows data for the last 7 days, one point per day
- Monthly – Shows data for the last 30 days, one point per day
- Real Time - Shows data every 30 seconds per graph point. Available for active projects only.

You must wait two hours after installation of the Performance Reporting Manager software for the daily graph reports to become available. Data first must be collected and stored in the database from which the report can be drawn. You can also view CPU and memory resource utilization reports for inactive containers and containers that are based on historical data.

Real time reports for CPU and memory resources being used are available for active projects only.

▼ To Request a Resource Utilization Report For a Host

Use this procedure if you want to obtain a daily, weekly, or monthly report for a host.

- Steps**
1. **Set the browser's cache to refresh every time.**
 2. **In the Hosts view, select the host from the navigation window.**
 3. **Select the Utilization tab.**
The CPU usage and memory usage of the host for the last 24 hours are displayed.

Note – (On Solaris 10) The CPU usage and the memory usage are displayed.

4. **Click the Graph Properties link.**
5. **Choose whether to generate a report for the entire host or only for a resource object in the host.**

Note – The resource object for a host might be a resource pool or a project.

(On Solaris 10) The resource object for a host might be a resource pool, zone, or a project.

- To generate a report for the entire host, select the Total Utilization option.
Select the appropriate time interval from the Time Interval list.
Click the Update Graph button.
The CPU and memory resource utilization graphs appear.
- To generate a report for a resource object in the host, select the Cumulative Utilization by Object option.
Select the appropriate resource object.
Select the appropriate time interval from the Time Interval list.
Click the Update Graph button.
The CPU and memory resource utilization graphs appear for a maximum of 5 resource objects that have high utilization.

6. **(Optional) To export the last 24 hours of data to a CSV file, click the Export Data button.**

You must wait at least 2 hours after installation of the Performance Reporting Manager software for a CSV report to be available. Data must first be collected and stored in the database from which the report can be drawn. You cannot preview this data in a graph.

Data exported contains the hourly data for the container for the last 24 hours. Therefore, it is not identical to the data obtained from a daily graph.

▼ To Request a Resource Utilization Report for an Active Project

Use this procedure if you want to obtain a daily, weekly, monthly, or real time report for an active project.

- Steps**
1. **Set the browser's cache to refresh every time.**
 2. **In the Hosts view, select the host from the navigation window.**
 3. **Select the Projects tab in the right pane.**
A list of projects on this host appears.
 4. **Select the active project for which you need a report.**
 5. **Select the Utilization tab.**
The CPU usage and memory usage of the active project for the last 24 hours are displayed.
 6. **Click the Graph Properties link.**
 7. **Select the Total Utilization option.**
 8. **Select the appropriate time interval from the Time Interval list.**
You can also obtain a real time report for an active project.
 9. **Click the Update Graph button.**
The CPU and memory resource utilization graphs appear.
 10. **(Optional) To export the last 24 hours of data to a CSV file, click the Export Data button.**
You must wait at least 2 hours after installation of the Performance Reporting Manager software for a CSV report to be available. Data must first be collected and stored in the database from which the report can be drawn. You cannot preview this data in a graph.

Data exported contains the hourly data for the container for the last 24 hours. Therefore, it is not identical to the data obtained from a daily graph.

▼ To Request a Resource Utilization Report for a Container

Use this procedure to request CPU and memory utilization reports for a container. The data is based on historical data and is an average of the resources used by active containers that are based on the container.

- Steps**
1. **Set the browser's cache to refresh every time.**
 2. **In the Containers view, select the container.**
 3. **Select the Utilization tab.**
The CPU usage and memory usage of the container for the last 24 hours are displayed.
 4. **Click the Graph Properties link.**
 5. **Choose whether to generate a report for the entire container or for a resource object in the container.**

Note – The resource object for a container is a host.

- To generate a report for the entire container, select the Total Utilization option. Select the appropriate time interval from the Time Interval list. Click the Update Graph button. The CPU and memory resource utilization graphs appear.
- To generate a report for a resource object in the container, select the Cumulative Utilization by Object option. Select the appropriate resource object. Select the appropriate time interval from the Time Interval list. Click the Update Graph button. The CPU and memory resource utilization graphs appear for a maximum of 5 resource objects that have high utilization.

▼ To Request a Resource Utilization Report for a Resource Pool

Use this procedure if you want to obtain a daily, weekly, or monthly report for a resource pool.

- Steps**
- 1. Set the browser's cache to refresh every time.**
 - 2. In the Hosts view, select the host to which the resource pool is bound.**
A list of all resource pools bound to this host appears in the Resource Pools table in the right pane.
 - 3. Select the name of the resource pool in the table.**
A table listing all containers that are bound to this resource pool appears.
 - 4. Select the Utilization tab.**
The CPU usage and memory usage of the resource pool for the last 24 hours are displayed.

Note – (On Solaris 10) The CPU usage and memory usage are displayed.

- 5. Click the Graph Properties link.**
- 6. Choose whether to generate a report for the entire resource pool or for a resource object in the resource pool.**

Note – The resource object for a resource pool is a project.

(On Solaris 10) The resource object for a resource pool will be zones and projects.

- To generate a report for the entire resource pool, select the Total Utilization option.
Select the appropriate time interval from the Time Interval list.
Click the Update Graph button.
The CPU and memory resource utilization graphs appear. Also, utilization report and bandwidth reports are generated.
- To generate a report for a resource object in the resource pool, select the Cumulative Utilization by Object option.
Select the appropriate resource object.
Select the appropriate time interval from the Time Interval list.

Click the Update Graph button.

The CPU and memory resource utilization graphs appear for a maximum of 5 resource objects that have high utilization. Also, utilization report and bandwidth reports are generated.

7. (Optional) To export the last 24 hours of data to a CSV file, click the Export Data button.

You must wait at least 2 hours after installation of the Performance Reporting Manager software for a CSV report to be available. Data must first be collected and stored in the database from which the report can draw from. You cannot preview this data in a graph.

Data exported contains the hourly data for the container for the last 24 hours. Therefore, it is not identical to the data obtained from a daily graph.

▼ (Solaris 10 Only) To Request a Resource Utilization Report For a Zone

Use this procedure if you want to obtain a daily, weekly, or monthly report for a zone.

- Steps**
- 1. Set the browser's cache to refresh every time.**
 - 2. In the Hosts view, select the Solaris 10 host from the navigation window.**
 - 3. Select the Zones tab.**
A list of zones on this host appears.
 - 4. Select a zone for which you need a report.**
 - 5. Select the Utilization tab.**
The CPU usage, memory usage, and bandwidth usage of the zone for the last 24 hours are displayed.
 - 6. Choose whether to generate a report for the entire zone or only for a resource object in the zone.**

Note – The resource object for a zone is a project.

- To generate a report for the entire zone, select the Total Utilization option. Select the appropriate time interval from the Time Interval list. Click the Update Graph button. The CPU and memory resource utilization graphs appear.

- To generate a report for a resource object in the zone, select the Cumulative Utilization by Object option.

Select Projects in the list.

Select the appropriate time interval from the Time Interval list.

Click the Update Graph button.

The CPU and memory resource utilization graphs appear for a maximum of 5 resource objects that have high utilization.

7. (Optional) To export the last 24 hours of data to a CSV file, click the Export Data button.

You must wait at least 2 hours after installation of the Performance Reporting Manager software for a CSV report to be available. Data must first be collected and stored in the database from which the report can draw from. You cannot preview this data in a graph.

Data exported contains the hourly data for the container for the last 24 hours. Therefore, it is not identical to the data obtained from a daily graph.

Installing At the Command Line

This appendix contains procedures for installing, setting up, and removing the Solaris Container Manager 3.6 (Container Manager) software at the command line. Command-line installation is an alternative to using the installation wizard.

For the latest information about installing, setting up, and using the software, see the *Solaris Container Manager 3.6 Release Notes*.

For information about using the installation wizard, see [Chapter 2](#).

- “Installing Container Manager Software” on page 133
- “Setting Up Container Manager” on page 135
- “Removing the Container Manager Software” on page 138

Installing Container Manager Software

Installation of Container Manager at the command line follows the standard Sun Management Center add-on software installation procedures. For more information about installation of add-on software at the command line, see Appendix B, “Using the Command Line for Uninstall, Install, and Setup,” in *Sun Management Center 3.6 Installation and Configuration Guide*.

Container Manager must be installed on the following layers of Sun Management Center 3.6:

- Server layer
- Agent layer, on all hosts for which you want to generate reports

The interactive `es-inst` installation script installs the correct Container Manager software packages on the server and agent layers. For all layers, the packages, module configuration files, and libraries are installed in standard Sun Management Center 3.6 locations. For more information about the supported platforms and installation requirements, see “Container Manager Software Description” on page 33.

The Container Manager software can be installed at the following times:

- At the same time that you install the Sun Management Center 3.6 software.
- At the same time that you upgrade your existing Sun Management Center as part of the upgrade procedure.
- After you have completed your installation of, or upgraded to, Sun Management Center 3.6. In this case, you install the Container Manager software individually.

The Performance Reporting Manager software must also be installed if you want to use the performance and accounting data features of Container Manager. For more information about installation and setup of this software at the command line, see Appendix B, "Installing Using the Command Line," in *Sun Management Center 3.5 Update 2 Performance Reporting Manager User's Guide*. If you do not intend to use these features, you do not need to install this add-on software.

▼ To Install Container Manager During Sun Management Center Installation

- Step** ● For more information and detailed steps using the command line, see Appendix B, "Using the Command Line for Uninstall, Install, and Setup," in *Sun Management Center 3.6 Installation and Configuration Guide*. You can also install additional add-on software, such as Performance Reporting Manager, at the same time.

▼ To Install Container Manager During Upgrade to Sun Management Center 3.6

- Step** ● For more information and detailed steps, see Chapter 5, "Upgrading Previous Versions of SyMON and Sun Management Center on the Solaris Platform," in *Sun Management Center 3.6 Installation and Configuration Guide*. You can also install additional add-on software, such as Performance Reporting Manager, at the same time.

▼ To Install Container Manager Individually

- Steps** 1. As superuser (su -), run the Sun Management Center 3.6 installation script by typing:

```
# /opt/SUNWsymon/sbin/es-inst
```

where `/opt` is the directory in which Sun Management Center 3.6 is installed. Substitute the name of the actual directory if it is different on your system.

2. Provide the source directory of the Container Manager files when prompted.

Please enter the source directory:

- On SPARC systems, choose from the following:
 - If installing from the software CD, type:
`<DiskMountDir>/image`
 - If installing from a directory to which the software has been copied, type:
`disk1/image`

disk1 is the location where the software was copied.

- On x86 systems, choose from the following:
 - If installing from the software disk, type:
`<DiskMountDir>/x86/image`
 - If installing from a directory to which the software has been copied, type:
`disk1/x86/image`

disk1 is the location where the software was copied.

3. To install the Container Manager software, answer “Yes” when prompted.

The `es-inst` script installs Container Manager. The `es-inst` script then automatically displays setup prompt.

4. Determine whether you want to set up Container Manager now or at a later time.

The following is an example of the output you might see:

```
You must perform setup before using Sun Management Center 3.6.  
Do you want to run setup now (y|n|q)
```

- To set up the software at a later time, answer `n` for “No”. When you are ready to run the setup process, see [“To Set Up Container Manager Individually” on page 41](#).
- To set up the software now, answer `y` for “Yes”.

Setting Up Container Manager

After installation is complete, you must run the Container Manager setup script to configure the server and agent layers. As with installation of the software, you can run the setup process at the time you set up the Sun Management Center 3.6 installation or upgrade. You can also set up the software individually, at a later time.

The configuration file changes that occur during the setup process when initiated from the command line are identical to the configuration file changes that occur when using the setup wizard. For more information, see [“Setting Up Container Manager Software”](#) on page 39.

▼ To Set Up Container Manager During Sun Management Center Installation or Upgrade

- Step** ● For more information and detailed steps, see Appendix B, “Using the Command Line for Uninstall, Install, and Setup,” in *Sun Management Center 3.6 Installation and Configuration Guide*.

▼ To Set Up Container Manager Individually

Note – This procedure assumes that you chose not to set up Container Manager at the end of the installation process.

- Steps**
1. Run the Sun Management Center 3.6 `setup` script as superuser (`su -`). Choose one of the following options:
 - To run setup on all components that are not yet set up, type:

```
# /opt/SUNWsymon/sbin/es-setup
```
 - To run setup on the Container Manager add-on software only, type:

```
# /opt/SUNWsymon/sbin/es-setup -p SCM
```

where `/opt` is the directory in which Sun Management Center 3.6 is installed. Substitute the name of the actual directory if it is different on your system.
 2. Review the list of components that must be stopped for the set up process to continue.
 3. Confirm that Container Manager is the product to be set up.
 4. When setting up the agent layer, if processor sets are detected on the system that are not associated with a resource pool, select from the following:
 - Yes – These particular processor sets will be deleted from the system. For Container Manager to function correctly, any processor set that is not associated with a resource pool must be removed as the set might cause problems with pool management. After this selection, these processor sets are automatically deleted, and the setup process continues.

- No – These particular processor sets will not be deleted from the system. After this selection, the setup script exits and the Container Manager software is not set up on the system. You are unable to use the Container Manager software on any host on which exist processor sets that are not associated with a resource pool.
 - Cancel – The setup script exits. The Container Manager software is not set up on the system.
5. **Type the valid user names separated by commas. These users must already be present in the `/var/opt/SUNWsymon/cfg/esusers` file on the server machine, and must be assigned to either `esadm` or `esdomadm` group.**

These users will be added to the required profiles (Project Management, Pool Management, Zone Management) if both users and profiles are present as expected. The profiles are based on the Solaris version.

On each agent machine, run the `/opt/SUNWsymon/addons/SCM/sbin/scm-poolprof-script.sh` script to create the profiles. `/opt` is the directory in which Container Manager is installed. To run this script, the `JAVA_HOME` environment variable must have been set to `/usr/j2se`, or Java must have been installed in `/usr/java`.

This script will *NOT* create any Zone Management or Project Management profiles for S9 and S10. This script will *ONLY* create Pool Management profile for S9 and S10 and Project Management profile for S8.



Caution – If any of the predefined Solaris profiles are removed, then Container Manager might not work as expected.

Note – Only the users added in this step will be able to manage zones on S10, resource pools on S9 and S10, and projects on S8, S9, and S10.

6. **If you have previously completed the setup process for other Sun Management Center products, indicate whether you want to run setup again for all software or just the newest add-on software.**
7. **When setting up a server layer installation, provide the full path to a directory that has at least 300 Mbytes of free disk space for the database.**
8. **Indicate whether you want to start the Sun Management Center agent and server components by answering Y or N.**
You receive confirmation when the software is set up.

After the setup procedure is complete, you have the option to start the Sun Management Center processes. For more information, see Chapter 8, “Starting and Stopping Sun Management Center,” in *Sun Management Center 3.6 Installation and Configuration Guide*.

Example A-1 Example Output After Setup Is Complete

The following is an example of the output you see after setup is complete and the Sun Management Center agent and server layers have been started:

```
Do you want to start Sun Management Center agent and server components now (y|n|q) y

Java server started successfully.
Grouping service started successfully.
Agent started successfully.
Topology service started successfully.
Trap-handler service started successfully.
Configuration service started successfully.
Event-handler service started successfully.
Metadata Service started successfully.
Hardware service started successfully.

Web server started successfully.

Setup of Sun Management Center is complete.
Setup logfile is : /var/opt/SUNWsymon/install/setup_host_name.040408141450.12822

Install logfile is : /var/opt/SUNWsymon/install/install_host_name.040408140547.10929

                End of Installation

Exiting Sun Management Center installation.

#
```

Removing the Container Manager Software

The `es-uninst` script removes the Container Manager add-on software. The script removes the Container Manager packages and all the data and configuration changes that are made during setup. The following are removed in addition to the software packages: the module entry from `base-modules-d.dat` and the application registration from Java Web Console. During the removal process, you are prompted on whether the you want the system to retain the data stored in the database. System resource configuration changes that are made during installation are not removed when the Container Manager software is uninstalled.

▼ To Remove Container Manager Using `es-uninst`

Steps 1. As superuser (`su -`), type:

```
# /opt/SUNWsymon/sbin/es-uninst
```

where `/opt` is the directory in which Sun Management Center 3.6 is installed. Substitute the name of the actual directory if it is different on your system.

2. **Select Container Manager from the list of add-on software.**

3. **Indicate whether to preserve the data files.**

The following is an example of the output that is displayed:

```
Select Save Data to save all user and configuration data. Your data is
saved and can be restored when you re-install Sun Management Center.
Do you want to preserve data (y|n|q)
```

After the `es-uninst` script is finished, the Container Manager packages and configuration files are removed. If you chose not to preserve the data files, they are removed as well.

Glossary

active project	A project that has been associated with a host and whose minimum CPU reservation and memory cap have been set. An entry for the active project exists in the <code>/etc/project</code> file on the host with which it is associated. The kernel enforces the resource boundaries of an active project. An active project can also be referred to as being deployed, meaning that the project has been pushed out and is now active on a host.
associate	To bind a project to a host.
container	A project that has been created, named, and saved for future use. The project has not been associated with a host, nor have the resource boundaries been set. In the 1.0 version of this product, a container was known as a container definition.
deployed	See <i>active project</i> .
dynamic resource pools	A Solaris 10 feature, dynamic resource pools enable you to adjust each pool's resource allocation in response to system events and application load changes.
fair share scheduler (FSS)	A scheduling class that enables you to allocate CPU time that is based on shares. Shares define the portion of the system's CPU resources that are allocated to a project.
host	A host is a system on which the Container Manager agent software has been installed and which is part of the Sun Management Center server context. When installation is complete, the host is automatically discovered and the name is added to the navigation window in the Hosts view.
inactive project	A project that has been associated with a host and for which resource boundaries are set, but not currently enforced by the kernel.

IPQoS	The IP quality of service feature enables you to provide consistent levels of services to network users by controlling the inbound and outbound traffic of a Solaris zone.
limit node (lnode)	In the Solaris 8 release, the mechanism by which per-user data is held.
match expression	An expression used to identify the processes that are associated with an application.
pool	See <i>resource pool</i> .
project	A container that has been associated with a host. An abstraction layer that helps organize and manage the collection of physical system resources. In the Solaris 9 release, the project provides a network-wide administrative identifier for related work.
project identifier (ID)	The means by which the Solaris kernel tracks resource usage. All the processes that run in a container have the same project ID.
resource	In resource management, an aspect of the computing system that can be manipulated with the intent to change application behavior.
resource management	A functionality that enables you to control how applications use available system resources.
resource pool	In resource management, a configuration mechanism that is used to partition machine resources. Also referred to as a pool.
shared memory	Total amount of memory that is allowed to be used by the processes that run within a project.
time-sharing scheduler (TS)	A scheduling class that tries to provide every process with relatively equal access to the available CPUs, allocating CPU time on a priority basis.
zone	A virtualized operating system environment that you can set up for systems that run the Solaris 10 Operating System. Every Solaris system contains a global zone, the default zone for the system. You can create, delete, modify, halt, and reboot non-global zones.

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