Sun WorkShop 6 Installation and Licensing Reference

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Important Note on New Product Names

As part of Sun's new developer product strategy, we have changed the names of our development tools from Sun WorkShop™ to Forte™ Developer products. The products, as you can see, are the same high-quality products you have come to expect from Sun; the only thing that has changed is the name.

We believe that the Forte™ name blends the traditional quality and focus of Sun's core programming tools with the multi-platform, business application deployment focus of the Forte tools, such as Forte Fusion™ and Forte™ for Java™. The new Forte organization delivers a complete array of tools for end-to-end application development and deployment.

For users of the Sun WorkShop tools, the following is a simple mapping of the old product names in WorkShop 5.0 to the new names in Forte Developer 6.

Old Product Name	New Product Name
Sun Visual WorkShop™ C++	Forte™ C++ Enterprise Edition 6
Sun Visual WorkShop™ C++ Personal Edition	Forte™ C++ Personal Edition 6
Sun Performance WorkShop™ Fortran	Forte™ for High Performance Computing 6
Sun Performance WorkShop™ Fortran Personal Edition	Forte™ Fortran Desktop Edition 6
Sun WorkShop Professional™ C	Forte™ C 6
Sun WorkShop™ University Edition	Forte™ Developer University Edition 6

In addition to the name changes, there have been major changes to two of the products.

- Forte for High Performance Computing contains all the tools formerly found in Sun Performance WorkShop Fortran and now includes the C++ compiler, so High Performance Computing users need to purchase only one product for all their development needs.

- Forte Fortran Desktop Edition is identical to the former Sun Performance WorkShop Personal Edition, except that the Fortran compilers in that product no longer support the creation of automatically parallelized or explicit, directive-based parallel code. This capability is still supported in the Fortran compilers in Forte for High Performance Computing.

We appreciate your continued use of our development products and hope that we can continue to fulfill your needs into the future.

Contents

Figures

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Preface

Sun WorkShop Installation and Licensing Reference gives instructions for how to:

- Configure servers
- Manage and administer licenses
- Request additional licenses and upgrades

This book is designed for system administrators who install software and configure license servers so that users can access licensed software. Experience with the Solaris™ operating environment and UNIX® commands is required.

Multiplatform Release

This Sun WorkShop release supports versions 2.6, 7, and 8 of the Solaris™ *SPARC™ Platform Edition* and Solaris *Intel Platform Edition* Operating Environments.

Note – The term "x86" refers to the Intel 8086 family of microprocessor chips, including the Pentium, Pentium Pro, and Pentium II processors and compatible microprocessor chips made by AMD and Cyrix. In this document, the term "x86" refers to the overall platform architecture, whereas "*Intel Platform Edition*" appears in the product name.

Access to Sun WorkShop Development Tools

Because Sun WorkShop product components and man pages do not install into the standard `/usr/bin/` and `/usr/share/man` directories, you must change your `PATH` and `MANPATH` environment variables to enable access to Sun WorkShop compilers and tools.

To determine if you need to set your `PATH` environment variable:

1. **Display the current value of the `PATH` variable by typing:**

```
% echo $PATH
```

2. **Review the output for a string of paths containing** `/opt/SUNWspro/bin/.`

If you find the paths, your `PATH` variable is already set to access Sun WorkShop development tools. If you do not find the paths, set your `PATH` environment variable by following the instructions in this section.

To determine if you need to set your `MANPATH` environment variable:

1. **Request the `workshop` man page by typing:**

```
% man workshop
```

2. **Review the output, if any.**

If the `workshop`(1) man page cannot be found or if the man page displayed is not for the current version of the software installed, follow the instructions in this section for setting your `MANPATH` environment variable.

Note – The information in this section assumes that your Sun WorkShop 6 products were installed in the `/opt` directory. Contact your system administrator if your Sun WorkShop software is not installed in `/opt`.

The `PATH` and `MANPATH` variables should be set in your home `.cshrc` file if you are using the C shell or in your home `.profile` file if you are using the Bourne or Korn shells:

- To use Sun WorkShop commands, add the following to your `PATH` variable:

  `/opt/SUNWspro/bin`

- To access Sun WorkShop man pages with the `man` command, add the following to your `MANPATH` variable:

  `/opt/SUNWspro/man`

For more information about the `PATH` variable, see the `csh(1)`, `sh(1)`, and `ksh(1)` man pages. For more information about the `MANPATH` variable, see the `man(1)` man page. For more information about setting your `PATH` and `MANPATH` variables to access this release, see the Changing `PATH` and `MANPATH` Variables section in the *Sun WorkShop 6 Installation Guide* or your system administrator.

Contacting Technical Support

Sun Service Centers will assist you with installing and licensing problems. Contact the Sun Service Center at

  `http://www.sun.com/service/contacting/solution.html`

How This Book Is Organized

Chapter 1 "License Server Configurations for Floating Licenses," describes configurations for independent, multiple independent, and redundant servers.

Chapter 2 "License Management," describes the license files, license administration, file names and paths, and how to obtain additional help.

Chapter 3 "License Certificate Information," explains how to add additional licenses and get upgrades, and describes the warranty information.

Glossary defines key words and phrases used in this guide.

Typographic Conventions

TABLE P-1 shows the typographic conventions that are used in Sun WorkShop documentation.

TABLE P-1   Typographic Conventions

Typeface	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output	`%` **`su`** `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this.
AaBbCc123	Command-line placeholder text; replace with a real name or value	To delete a file, type `rm` *filename*.

Shell Prompts

TABLE P-2 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	`%`
Bourne shell and Korn shell	`$`
C shell, Bourne shell, and Korn shell superuser	`#`

Sun WorkShop Documentation

You can access Sun WorkShop documentation in the following ways:

- **Through the Internet at the** `docs.sun.com`^{sm} **Web site.** You can search for a specific book title or you can browse by subject, document collection, or product at the following Web site:

  `http://docs.sun.com`

- **Through the installed Sun WorkShop products on your local system or network.** Sun WorkShop 6 HTML documents (manuals, online help, man pages, component readme files, and release notes) are available with your installed Sun WorkShop 6 products. To access the HTML documentation, do one of the following:

  - In any Sun WorkShop or Sun WorkShop™ TeamWare window, choose Help ➤ About Documentation.

  - In your Netscape™ Communicator 4.0 or compatible version browser, open the following file:

    `/opt/SUNWspro/docs/index.html`

  (If your Sun WorkShop software is not installed in the `/opt` directory, ask your system administrator for the equivalent path on your system.) Your browser displays an index of Sun WorkShop 6 HTML documents. To open a document in the index, click the document's title.

TABLE P-3 lists related Sun WorkShop 6 manuals by document collection.

TABLE P-3   Related Sun WorkShop 6 Documentation by Document Collection

Document Collection	Document Title	Description
Forte™ Developer 6 / Sun WorkShop 6 Release Documents	*About Sun WorkShop 6 Documentation*	Describes the documentation available with this Sun WorkShop release and how to access it.
	What's New in Sun WorkShop 6	Provides information about the new features in the current and previous release of Sun WorkShop.
	Sun WorkShop 6 Release Notes	Contains installation details and other information that was not available until immediately before the final release of Sun WorkShop 6. This document complements the information that is available in the component readme files.
Forte Developer 6 / Sun WorkShop 6	*Analyzing Program Performance With Sun WorkShop 6*	Explains how to use the new Sampling Collector and Sampling Analyzer (with examples and a discussion of advanced profiling topics) and includes information about the command-line analysis tool er_print, the LoopTool and LoopReport utilities, and UNIX profiling tools prof, gprof, and tcov.
	Debugging a Program With dbx	Provides information on using dbx commands to debug a program with references to how the same debugging operations can be performed using the Sun WorkShop Debugging window.
	Introduction to Sun WorkShop	Acquaints you with the basic program development features of the Sun WorkShop integrated programming environment.

TABLE P-3 Related Sun WorkShop 6 Documentation by Document Collection *(Continued)*

Document Collection	Document Title	Description
Forte™ C 6 / Sun WorkShop 6 Compilers C	*C User's Guide*	Describes the C compiler options, Sun-specific capabilities such as pragmas, the lint tool, parallelization, migration to a 64-bit operating system, and ANSI/ISO-compliant C.
Forte™ C++ 6 / Sun WorkShop 6 Compilers C++	*C++ Library Reference*	Describes the C++ libraries, including C++ Standard Library, Tools.h++ class library, Sun WorkShop Memory Monitor, Iostream, and Complex.
	C++ Migration Guide	Provides guidance on migrating code to this version of the Sun WorkShop C++ compiler.
	C++ Programming Guide	Explains how to use the new features to write more efficient programs and covers templates, exception handling, runtime type identification, cast operations, performance, and multithreaded programs.
	C++ User's Guide	Provides information on command-line options and how to use the compiler.
	Sun WorkShop Memory Monitor User's Manual	Describes how the Sun WorkShop Memory Monitor solves the problems of memory management in C and C++. This manual is only available through your installed product (see /opt/SUNWspro/docs/index.html) and not at the docs.sun.com Web site.
Forte™ for High Performance Computing 6 / Sun WorkShop 6 Compilers Fortran 77/95	*Fortran Library Reference*	Provides details about the library routines supplied with the Fortran compiler.
	Fortran Programming Guide	Discusses issues relating to input/output, libraries, program analysis, debugging, and performance.

TABLE P-3 Related Sun WorkShop 6 Documentation by Document Collection *(Continued)*

Document Collection	Document Title	Description
	Fortran User's Guide	Provides information on command-line options and how to use the compilers.
	FORTRAN 77 Language Reference	Provides a complete language reference.
	Interval Arithmetic Programming Reference	Describes the intrinsic INTERVAL data type supported by the Fortran 95 compiler.
Forte™ TeamWare 6 / Sun WorkShop TeamWare 6	*Sun WorkShop TeamWare 6 User's Guide*	Describes how to use the Sun WorkShop TeamWare code management tools.
Forte Developer 6/ Sun WorkShop Visual 6	*Sun WorkShop Visual User's Guide*	Describes how to use Visual to create C++ and Java™ graphical user interfaces.
Forte™ / Sun Performance Library 6	*Sun Performance Library Reference*	Discusses the optimized library of subroutines and functions used to perform computational linear algebra and fast Fourier transforms.
	Sun Performance Library User's Guide	Describes how to use the Sun-specific features of the Sun Performance Library, which is a collection of subroutines and functions used to solve linear algebra problems.
Numerical Computation Guide	*Numerical Computation Guide*	Describes issues regarding the numerical accuracy of floating-point computations.
Standard Library 2	*Standard C++ Class Library Reference*	Provides details on the Standard C++ Library.
	Standard C++ Library User's Guide	Describes how to use the Standard C++ Library.
Tools.h++ 7	*Tools.h++ User's Guide*	Discusses use of the C++ classes for enhancing the efficiency of your programs.
	Tools.h++ Class Library Reference	Provides details on the Tools.h++ class library.

TABLE P-4 describes related Solaris documentation available through the `docs.sun.com` Web site.

TABLE P-4   Related Solaris Documentation

Document Collection	Document Title	Description
Solaris Software Developer	*Linker and Libraries Guide*	Describes the operations of the Solaris link-editor and runtime linker and the objects on which they operate.
	Programming Utilities Guide	Provides information for developers about the special built-in programming tools that are available in the Solaris operating environment.

License Server Configurations for Floating Licenses

There are three license server configurations for floating licenses where developers can access licensed software simultaneously over the network through FLEXlm license manager software.

The following is one way of comparing the three license server configurations:

- Single independent server configuration—There are 100 licenses on one license server. If the license server is functioning, 100 licenses are available. If the license server is down, no licenses are available.

- Multiple independent server configuration—If all license servers are functioning, there are 25 licenses available on each of four license servers (a total of 100 licenses). If one license server goes down, 75 licenses are available. If two license servers go down, 50 licenses are available. If three license servers go down, 25 licenses are available. If four license servers go down, no licenses are available.

- Redundant server configuration—If all license servers are functioning, there are 100 licenses available on a three-server set (acting as one logical server). If one license server goes down, 100 licenses are available. If two license servers go down, no licenses are available (two servers must be available for any licenses to be available).

Single Independent Server Configuration

The single independent server configuration suits companies where the developer machines, license server, and application server are fairly close together on the network. This configuration is the default and the easiest to install and maintain.

FIGURE 1-1 shows how a single independent server configuration works.
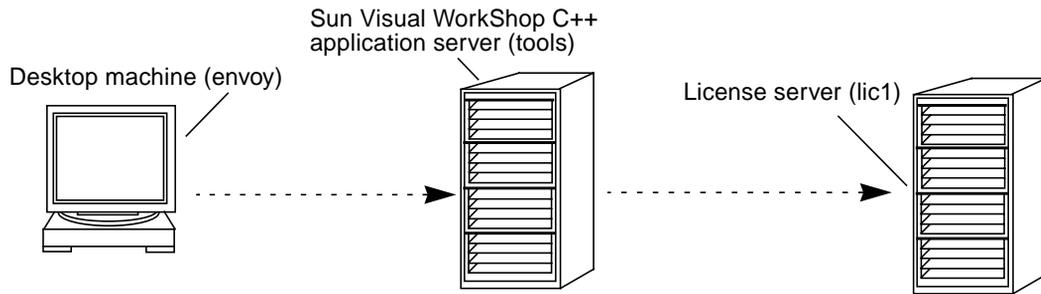
FIGURE 1-1 Process for Getting a License With a Single Independent License Server

This is the process for getting a license with a single license server:

1. A C++ developer wants to recompile a program. The developer is working from a desktop machine envoy. The developer mounts a copy of the Sun™ Visual WorkShop™ C++ from the machine tools. There is one license server lic1 on the network that manages the ten rights to use (RTUs) the department purchased.

2. When the developer starts a compile of a program, Sun Visual WorkShop C++ on tools sends a request to lic1 for a license token. If lic1 has a token available, then the request is granted, and the compile completes.

3. If all ten tokens are in use by other developers in the group, the developer is automatically put in a queue and will be granted the first available token released by another user.

Example: Single Independent Server

Company A is a small business developing scientific applications. There are 10 Sun workstations running the latest release of the Solaris operating environment with six RTUs for Sun WorkShop Professional™ C. Since Company A's resources are limited, the company is having the NFS™ server `sampson` act as both the license server and the application server. The NFS server is a file server everyone uses as a common work area. FIGURE 1-2 illustrates Company A's network.
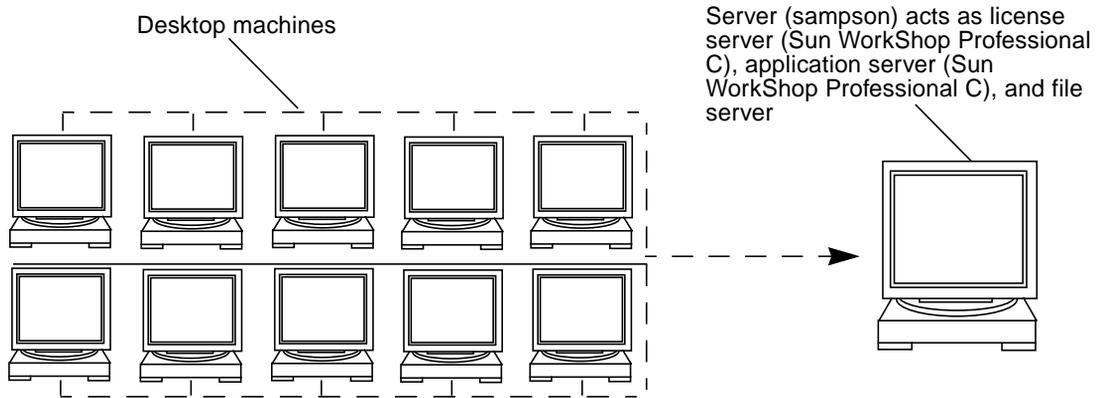
FIGURE 1-2   Using an NFS Server as a License Server

The machine `sampson` was picked to serve Company A's license tokens because it is a reliable machine that is neither upgraded nor rebooted frequently. Company A recognizes that any trouble with `sampson` would be noticed immediately since the common development area is stored there.

Example: Multiplatform Environment

Company B develops video games for the Solaris operating environment. A developer decided to port Company B's code to the Solaris *Intel Platform Edition* operating environment. Company B purchased a Pentium computer and Sun Visual WorkShop C++. The developer installed Sun Visual WorkShop C++ locally on an x86 machine, added license passwords to the existing SPARC license server `delight`, and was ready to recompile. FIGURE 1-3 illustrates Company B's network.

Desktop machines   x86 computer acts as
application server (Sun
Visual WorkShop C++)

Server (delight) acts as license
server (Sun Visual WorkShop C++)
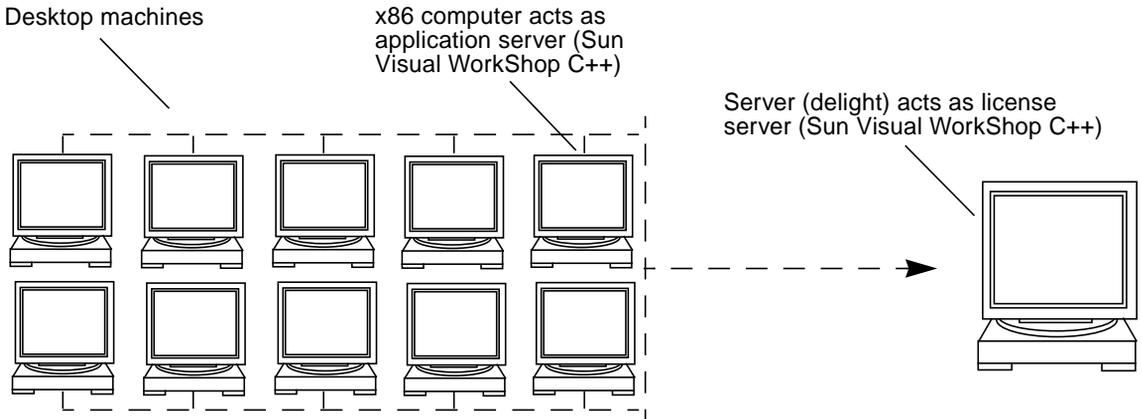
FIGURE 1-3   Using an x86 Application Server and a SPARC License Server

Multiple Independent Server Configuration

You can use two or more independent servers in a multiple independent server configuration where users can obtain a license token from any one of the servers. This scenario is most common for medium-to-large software development environments distributed over a network. Distributing the total number of license tokens purchased among multiple license servers increases the likelihood that some license tokens will always be available. As with single independent license servers, any license tokens served by computers that are offline are unavailable until those machines are returned to the network.

By placing license servers strategically throughout your network in a multiple independent server configuration, you maximize the responsiveness of license requests and minimize the administrative overhead. For example, you could buy 100 RTUs and distribute them over 10 independent servers with 10 license tokens each.

FIGURE 1-4 shows how a multiple independent server configuration works.
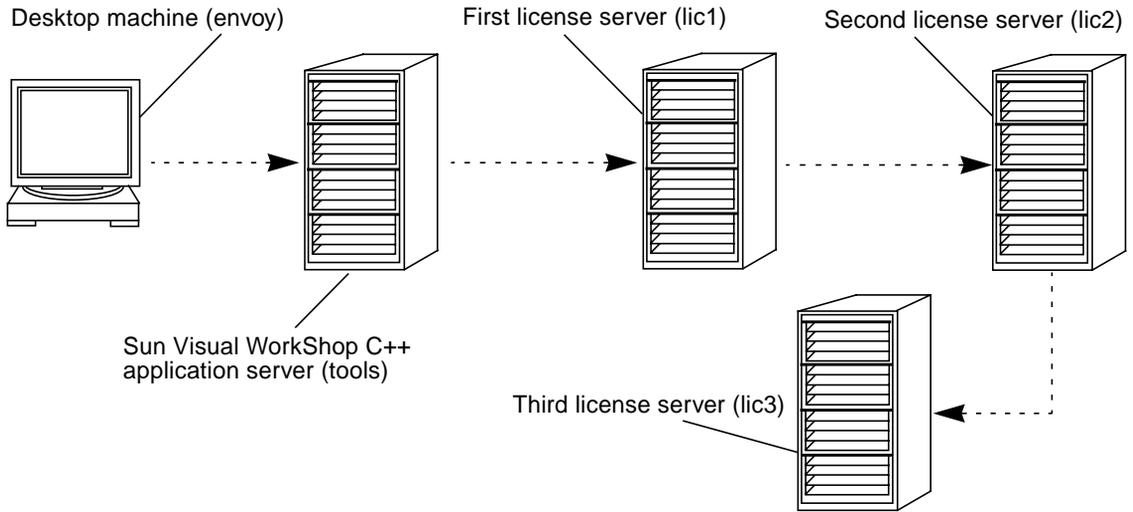
FIGURE 1-4 Process for Getting a License With Multiple Independent License Servers

This is the process for getting a license with multiple independent license servers:

1. A C++ developer is trying to recompile a program working from a desktop machine envoy. The developer has mounted a copy of Sun Visual WorkShop C++ from the machine tools. Two license servers, lic2 and lic3, have been put in service on the network in addition to the default server lic1. Each license server has ten license tokens.

2. When the developer starts a compile of a program, Sun Visual WorkShop C++ on tools sends a request to lic1 for a license token. If lic1 has a token available, then the request is granted, and the compile completes.

3. If all ten license tokens on lic1 are in use by other developers in the group, tools automatically looks for a token on lic2 and, if that fails, lic3. If the developer still cannot get a token, the developer's request will be queued on lic1, where the developer will get the first available token.

Example: Multiple Independent Server Configuration

Company C is a financial services broker. It is essential that at least some of its Sun WorkShop Professional C license tokens always be available. In addition, Company C purchased Sun™ WorkShop™ TeamWare and Sun Visual WorkShop C++. There are three large servers, `bull`, `bear`, and `crash`, which will be license servers among their other duties, and two other servers, `dollars` and `cents`, which will be application servers.

FIGURE 1-5 illustrates Company C's network.
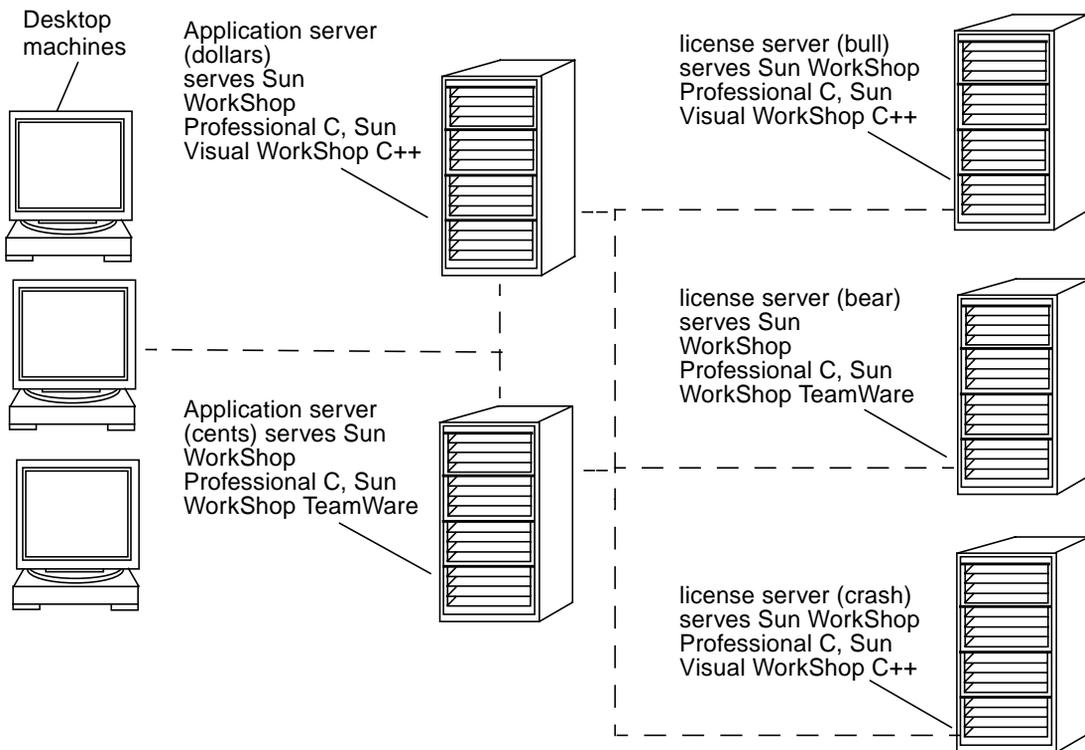
FIGURE 1-5   Multiple Independent License Servers Supporting Two Application Servers

By splitting its license tokens between `bull`, `bear`, and `crash`, Company C maximizes the chances that some Sun WorkShop Professional C tokens will always be available. If a license server is unavailable, Company C has also taken the precaution of putting the three license servers on different subnets. Company C considered a redundant server configuration (see "Redundant Servers" on page 18)

but preferred a multiple independent server configuration because the company would rather have some license tokens at all times rather than all tokens most of the time.

To set up the multiple independent license server pool described in this example (where a user will check several license servers as necessary to find an available license token), the system administrator for Company C would follow these steps:

1. **Fill out the License Request Form.**

   The system administrator needs to complete a separate License Request Form for each license server. Instructions for filling out the License Request Form and contacting the Sun License Center are in Chapter 2 of *Sun WorkShop 6 Installation Guide*.

   You will receive a separate license file from the Sun License Center for each licensed product.

2. **Install Sun WorkShop Professional C and Sun WorkShop TeamWare on the application server** `cents`**.**

   Installation instructions are in Chapter 3 of *Sun WorkShop 6 Installation Guide*.

3. **Install Sun WorkShop Professional C and Sun Visual WorkShop C++ on the application server** `dollars`**.**

4. **Install FLEXlm license manager software on the license server** `bull`**.**

   Installation instructions are in Chapter 3 of *Sun WorkShop 6 Installation Guide*.

5. **Install the licenses for Sun WorkShop Professional C on the license server** `bull`**.**

   Instructions are in Chapter 3 of *Sun WorkShop 6 Installation Guide*.

   The script `/etc/opt/licenses/LIC_CONFIG_SCRIPT` will make a router file for these licenses when you copy and run the script on an application server. For more information about router files, see Chapter 2.

6. **Install the licenses for Sun Visual WorkShop C++ on the license server** `bull`**.**

7. **Install FLEXlm license manager software on the license server** `bear`**.**

8. **Install the licenses for Sun WorkShop Professional C on the license server** `bear`**.**

9. **Install the licenses for Sun WorkShop TeamWare on the license server** `bear`**.**

10. **Install FLEXlm license manager software on the license server** `crash`**.**

11. **Install the licenses for Sun WorkShop Professional C on the license server** `crash`**.**

12. **Install the licenses for Sun Visual WorkShop C++ on the license server** `crash`**.**

13. **Create or update** *install-dir*/SUNWspro/license_dir/lic_router **on the application server** dollars **to contain entries for the license servers (in this order)** bull**,** bear**, and** crash**.**

    Because the application server dollars is closest to the license server bull, you might want the users on dollars to check the license servers for tokens in this order: bull, bear, and then crash. Make sure you use the TCP port number specified in the SERVER line of the /etc/opt/licenses/licenses_combined file of each license server. For example, if all three license servers use TCP port 7588, the lic_router file would contain:

        7588@bull:7588@bear:7588@crash

14. **Create or update** *install-dir*/SUNWspro/license_dir/lic_router **on the application server** cents **to contain entries for the license servers (in this order)** crash**,** bear**, and** bull**.**

    Because the application server cents is closest to the license server crash, the system administrator might want the users on cents to check the license servers for tokens in this order: crash, bear, and then bull. Make sure you use the TCP port number specified in the SERVER line of the /etc/opt/licenses/licenses_combined file of each license server. For example, if all three license servers use TCP port 7588, the lic_router file would contain:

        7588@crash:7588@bear:7588@bull

    Whenever new licenses are added to any of the three license servers, the router files do not need to be updated. Only update the router files when new license servers are added to the network.

Redundant Servers

A redundant server configuration enables you to have three servers managing the same set of license tokens acting as one logical server. This configuration requires that two redundant license servers be operative and able to contact each other. If two redundant license servers are not operative, none of the license tokens will be available. A three-server configuration requires that two servers be available for *any* tokens to be available. The main advantage of redundant servers is an increased likelihood that if *any* tokens are available, then *all* tokens are available. The cost is additional administration.

One of the redundant servers is the *master server*, the server that issues license tokens and has a heavier processing load. If the master server becomes unavailable, then the next available peer in the configuration becomes the master server.

FIGURE 1-6 shows the process for getting a license in a redundant server configuration.
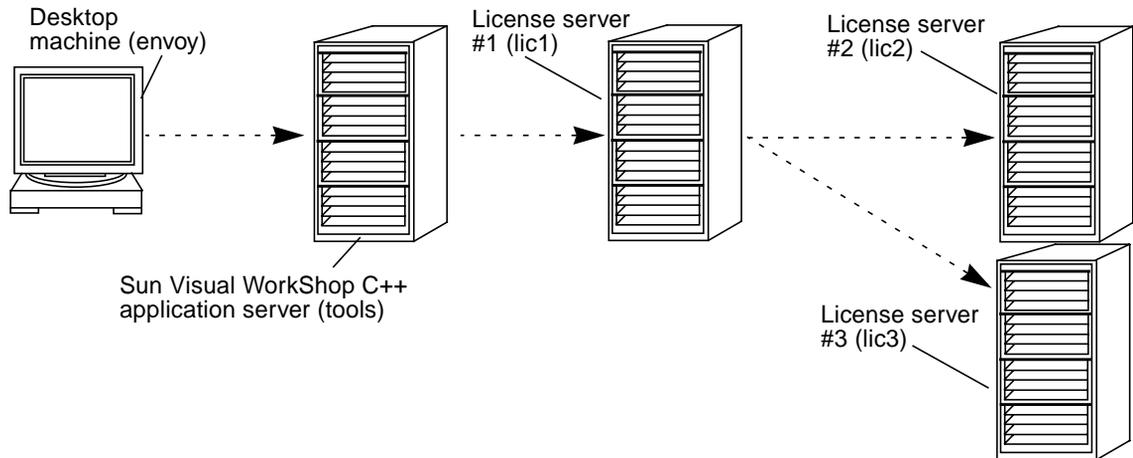
FIGURE 1-6   Process for Getting a License With Redundant License Servers

This is the process for getting a license with redundant license servers:

1. A C++ developer is trying to recompile a program from a desktop machine envoy. The developer has mounted a copy of Sun Visual WorkShop C++ from the machine tools. The developer's system administrator has set up a redundant server configuration on the network: lic1 is the master server, and lic2 and lic3 are alternate servers. The redundant server configuration brokers the 30 license tokens the group purchased.

2. When the developer starts a compile of a program, Sun Visual WorkShop C++ mounted from tools sends a request to lic1 for a license token. The server lic1 first checks for the presence of lic2. If lic2 is not found, then it looks for lic3. If either lic2 or lic3 is found *and* a license token is available, then the request is granted, and the compile completes.

3. If all 30 license tokens are in use by other developers in the group, the developer would be put in a queue to get the first available license token. If lic1 cannot find *either* lic2 or lic3 (if both machines were down for repairs), no license tokens would be available. If lic1 is down but lic2 and lic3 are functional, all license tokens are available.

License Management

This chapter describes Sun's user licensing scheme and gives detailed information about administering licenses.

Answers to Sun WorkShop™ licensing frequently asked questions (FAQ) are available through the World Wide Web by visiting the following web page:

`http://www.sun.com/workshop/workshopFAQ.html`

Sun's User License Scheme

Sun uses GLOBEtrotter Software, Inc.'s FLEXlm license manager software to manage Sun WorkShop user licenses.

The machine running the license manager daemon is called the *license server*. Requests come from *application servers*. An application server is any computer on which an application is installed.

The License File

The license administrator installs the license file (`licenses_combined` file), which is a text file that contains licensing data. This file contains information about the server nodes and vendor daemons and at least one line of data (`FEATURE` or `INCREMENT`) for each licensed product.

Note – `FEATURE` is available in Sun WorkShop versions prior to Sun WorkShop 5.0.

The license file, or a copy of it, must be accessible to every machine running the licensed software and each machine designated as a license server. This file is located on the license server in the /etc/opt/licenses directory.

To display all installed licenses, type:

```
% cd /etc/opt/licenses

% lmstat -a -c licenses_combined
```

For more information, see the lmstat man page.

Router File

Note – The router file is new in Sun WorkShop™ 6.

The router files are ASCII files that list the license servers on the network that should be checked for licenses. The license servers are referenced using *port@host* format, where *port* is the TCP port used by the Sun WorkShopFLEXlm lmgrd.ste daemon (the fourth field in the SERVER line in the licenses_combined file) and *host* is the license server hostname. Each router file contains only one line that is a colon-separated list of these license servers. The router file location is on the application server, in the file *install-dir*/SUNWspro/license_dir/lic_router.

Sun WorkShop software checks the installation directory above for the presence of a router file, then checks each file server listed for licenses. The product software automatically looks for the router file relative to where it was installed.

In a multiple independent license server configuration, application servers might be served by more than one license server, hence the ability to list multiple license servers using a colon-separated list.

In many cases, once a router file has been set up with the appropriate list of license servers, adding additional licenses or licenses for new versions of WorkShop software will not require any updating of the router file. Router files do not need to be updated unless a new license server is added to the network.

Elementary License Files

The elementary license files are subsets of the `licenses_combined` file. Elementary license files are located in the *install-directory*/`SUNWspro/license_dir` directory on each application server (the default *install-directory* is /`opt`). License files for Sun WorkShop products have file names in the form `sunpro.lic,`*n* (for example, `sunpro.lic,1`). The *n* is a string, usually an integer, assigned during installation to identify a particular license file.

Sun WorkShop software checks the installation directory for licenses. The product software automatically looks for the elementary license file relative to where it was installed.

In a multiple independent license server configuration, application servers might be served by more than one license server. Each license server is represented by an elementary license file on the application servers. Each application server must contain at least one elementary license file. Each elementary license file contains the license server information and the product license.

The License Manager Daemon

The license manager daemon starts and restarts the vendor daemons, which grant or deny licenses to the licensed software. When a user starts an application, the application looks at the router file for the name and TCP port of the license server and contacts the license manager daemon (`lmgrd.ste`) on that server. If a license token is available, the user is granted the use of the application. If a license token exists but is not currently available (for example, if other users have checked out all the license tokens), the user will be put into a queue.

Note – Sun uses the `lmgrd.ste` license manager daemon, which is identical to FLEXlm's `lmgrd` license manager daemon.

The Vendor Daemon

The license manager daemon handles communication between the application and the *vendor daemon*. The vendor daemon, which runs on the license server, tracks which users have licenses for a given product, how many licenses are checked out, and how many licenses are currently available. Sun WorkShop 6 (and 5.0) products use the `sunwlicd` vendor daemon (releases prior to Sun WorkShop 5.0 used the `suntechd` vendor daemon). If the vendor daemon terminates, users lose their licenses. When the license manager daemon restarts the vendor daemon, users regain their licenses automatically.

Sun WorkShop Software

Sun WorkShop software is linked with the program module (the license library) to communicate with the license server. When the software is in use, it communicates with the vendor daemon to request a license.

The `daemon_options` File

The `daemon_options` file is installed in the `/etc/opt/licenses` directory. The `daemon_options` file allows you to:

- Reserve licenses for specified users, hostnames, or display names
- Allow or deny use of applications based on user, hostname, or display name.
- Control the information logged about license use

When `lmgrd.ste` starts the vendor daemon, the vendor daemon receives the location of the `daemon_options` file. This location is identified in the product's license file on the DAEMON line. If no file is listed, the daemon will not use any options file. Only one options file per vendor daemon is allowed.

To modify the `daemon_options` file, use the options listed in TABLE 2-1. For feature names, see Appendix A in *Sun WorkShop 6 Installation Guide*.

TABLE 2-1   `daemon_options` Options

Command	Description
EXCLUDE	Denies a user access to a feature
EXCLUDEALL	Denies a user access to all features of this vendor daemon
GROUP	Defines a group of users for use with other options
HOST_GROUP	Defines a group of hosts for use with other options

TABLE 2-1 `daemon_options` Options *(Continued)*

Command	Description
INCLUDE	Allows a user access to a feature
INCLUDEALL	Allows a user to access all features served by this vendor daemon
LINGER	Causes licenses to be held by the vendor daemon for a period of time after the application checks them in or exits
MAX	Limits use for a particular feature/group and prioritizes use among users
NOLOG	Turns off logging of certain items
RESERVE	Saves licenses for a user
#	Specifies that the text that follows is a comment, not a command

The following is an example of a `daemon_options` file:

```
#Don't log IN, OUT, and QUEUED
NOLOG IN
NOLOG OUT
NOLOG QUEUED
LINGER workshop.c.sparc 300
LINGER workshop.cc.sparc 300
#RESERVE number feature {USER | DISPLAY | GROUP} name
#INCLUDE feature {USER | DISPLAY | GROUP} name
#EXCLUDE feature {USER | DISPLAY |GROUP} name
RESERVE 1 workshop.c.sparc USER pat
RESERVE 3 workshop.tools.sparc USER lee
EXCLUDE workshop.c.sparc USER joe
```

The sample `daemon_options` file was edited to specify:

- The license log will not record licenses checked in, checked out, or queued.
- The C and C++ compiler licenses will delay for 300 seconds before returning licenses to the license server for use by other developers.
- One C compiler license is for use only by `pat`.
- Three Sun WorkShop IPE licenses are for use only by `lee`.
- No C compiler license is for use by `joe`.

Note – For redundant server configurations, the `daemon_options` file must be the same on each server. For multiple independent server configurations, the `daemon_options` file can be different on each server.

To minimize server down time when changing the `daemon_options` file, follow these steps:

1. **Make the needed changes to the** `daemon_options` **file.**

2. **Stop the license daemon.**

   See "Stopping and Restarting the License Daemons" on page 30.

3. **Restart the license daemon.**

   See "Stopping and Restarting the License Daemons" on page 30.

Note – If you modify the `daemon_options` file, your changes do not take effect until the license daemon is started or restarted.

For more information about the options file, visit the GLOBEtrotter Software, Inc. site on the World Wide Web:

```
http://www.globetrotter.com/chap6.htm
```

License Administration

Various licensing issues can arise that might prohibit use of your licensed software. This section refers you to relevant man pages or gives you instructions to:

- Use `lmhostid` to report the hostid for a system
- Use `lmver` to identify your FLEXlm version
- Check that licenses are installed
- Log licensing activities
- Stop and restart the license daemons
- Use `lmdiag` to diagnose license problems
- Use `lmstat` to monitor the status of licensing activities
- Change the license server hostname
- Change license servers
- Get license information
- Upgrade your operating system
- Use `lmreread` to reread the license file
- Use `lmremove` to remove a user's license
- Recover a lost license
- Release a license

In addition, this section lists important file names and paths and how to get additional help.

TABLE 2-2 describes the license administration utilities that are available to you in
/etc/opt/licenses

TABLE 2-2 License Administration Utilities in /etc/opt/licenses

Utility	Description
lmdiag	Diagnoses licensing problems when you cannot check out a license
lmdown	Takes down the license daemons
lmhostid	Reports a hostid for a system
lmremove	Removes a user's license
lmreread	Rereads the license files
lmstat	Monitors the status of network licensing activities
lmver	Identifies the FLEXlm version

For more information about license administration, see the man pages for the
utilities listed in TABLE 2-2 or visit the GLOBEtrotter Software, Inc. site on the World
Wide Web at:

http://www.globetrotter.com/chap7.htm

Explanations of FLEXlm error messages are available through the
licenses_errors man page and the GLOBEtrotter site on the World Wide Web at:

http://www.globetrotter.com/chap12.htm

For feature names, see Appendix A in *Sun WorkShop 6 Installation Guide*.

Using lmhostid to Get the Hostid for a System

Use lmhostid to report a system's hostid. See the lmhostid man page for more
information.

Note – You do not have to be a superuser to use the lmhostid utility.

Using `lmver` to Identify Your FLEXlm Version

The `lmver` utility reports the FLEXlm license manager software version that you are using. See the `lmver` man page for usage and options.

Note – You must be a superuser or a designated user through the `adjust_flexlm_owner` script (see the `adjust_flexlm_owner` man page) to use the `lmver` utility.

Checking That Licenses Are Installed

To find out if your licenses are installed, follow these steps:

1. **On the license server, make sure there is a** `licenses_combined` **file in the directory** `/etc/opt/licenses`**.**

2. **On each application server, make sure all router files or elementary license files are in the directory** *install-dir*`/SUNWspro/license_dir`**.**

   The router file is `lic_router`.

   The elementary license file name is similar to `sunpro.lic,`*n*.

   If your licenses are not installed, see Chapter 4 in *Sun WorkShop 6 Installation Guide*.

Logging Licensing Activities

There are two log files:

■ `/usr/tmp/license_errors` provides a list of errors that occurred during the license installation process.

■ `/usr/tmp/license_log` provides day-to-day license activity information.

Follow these steps to enable logging of license checkouts and checkins:

1. **Open the** `/etc/opt/licenses/daemon_options` **file in your preferred text editor.**

2. **Put a pound sign (#) in front of the** NOLOG IN, NOLOG OUT, **and** NOLOG QUEUED **lines so that the lines look as follows:**

```
#NOLOG IN
#NOLOG OUT
#NOLOG QUEUED
```

The pound sign (#) comments out these lines.

To discontinue logging, remove the pound sign from the NOLOG IN, NOLOG OUT, and NOLOG QUEUED lines in the daemon_options file.

3. **Stop and restart the license daemons.**

See "Stopping and Restarting the License Daemons" on page 30.

Circular Logging Feature

Sun WorkShop 6 has a new circular logging feature that moves the contents of the current license log file to a backup log file when the current log size reaches 5 Mbytes. The license server generates up to five log files, which includes the current log file and up to four backup logs. The license log file names are:

- license_log
- license_log.0
- license_log.1
- license_log.2
- license_log.3

Note – The backup log files, license_log.*n*, where $n = 0, 1, 2, 3$, are created only if necessary.

When license_log reaches 5 Mbytes, the file contents of license_log.2 are moved to license_log.3 (the contents of license_log.3 will be lost), the contents of license_log.1 are moved to license_log.2, the contents of license_log.0 are moved to license_log.1, and the contents of license_log are moved to license_log.0. After this sequence of events, license_log is empty and ready to begin receiving new license log data. The file license_log.3 will contain the oldest log activities, and license_log will contain the most current log activities.

Installing Sun WorkShop 5.0 Licenses

You may want to install a Sun WorkShop™ 5.0 license after you have installed Sun WorkShop 6.

1. **Log in as root.**

2. **Copy** `LIC_CONFIG_FILE.WorkShop5.0` **to the WorkShop 6 location of the licensing software located in** `SUNWste/license_tools`**. The default location is** `/opt/SUNWste/license_tools`

   ```
   # cp /cdrom/devpro_v6n1_sparc/licensing\
   /LIC_CONFIG_FILE.WorkShop5.0/opt/SUNWste/license_tools
   ```

   Note – Do not type the backslash (\). The backslash indicates that the command must be typed as one line.

   ---

3. **Invoke either** `lit` **or** `lit_tty`**.**

   The 5.0 licenses will appear.

Stopping and Restarting the License Daemons

Under the following circumstances, you must stop and restart the license daemons:

- If you edit the `daemon_options` file
- If you move your license server from one machine to another

Using `lmdown` to Stop the License Daemons

When you run the `lmdown` command, the following events occur:

1. A message is sent to the license daemon requesting that it shut down.

2. The license daemons complete the current log file message and close the file.

3. The license daemons remove all the licenses that have been given out. The next time a user calls a program and the client server goes to verify the license, the license will be invalid.

Note – If you have a redundant server configuration, using the `lmdown` utility takes down all of the redundant servers.

See the `lmdown` man page for usage and options.

Restarting the License Daemons

To restart the license daemon, type the following at the command line:

```
# /etc/rc2.d/S85lmgrd
```

The output of this command is directed to the /usr/tmp/license_log file. See also the lmgrd.ste man page.

Note – If you use a redundant license server configuration, restart the license daemon on each server.

Using `lmdiag` to Diagnose License Problems

Using the lmdiag utility, you can investigate why users cannot check out a license. See the lmdiag man page for usage and options (for feature names, see Appendix A in *Sun WorkShop 6 Installation Guide*).

Note – You must be a superuser or a designated user through the adjust_flexlm_owner script (see the adjust_flexlm_owner man page) to use the lmdiag utility.

Using `lmstat` to Monitor Licensing Activities

The lmstat utility monitors:

- Which daemons are running
- The users of individual features
- The users of features served by a specific daemon

See the lmstat man page for usage and options.

Note – You do not have to be a superuser to use the lmstat utility.

Changing the License Server hostname

If you must change the hostname on your license server, modify the hostname listed in the `/etc/opt/licenses/licenses_combined` file and the router file or the elementary license file(s). You must shutdown and restart the license server to change the hostname. See *Stopping and Restarting the License Daemons* on page 30.

Changing License Servers

If the license server referred to in the router file (`lic_router`) or elementary license file (`sunpro.lic,`*n*) is down and you have a second license server, copy and run the second license server's `/etc/opt/licenses/LIC_CONFIG_SCRIPT` file on the application server, which creates a router file or elementary license file on the application server for the second license server.

If you need a new password because you are upgrading or repairing your license server, contact the same Sun License Center that you originally contacted for your original password. You are allowed two moves of a license from one license server to another per calendar year. Sun may grant additional moves at its discretion. Moves are recorded and subject to audit. At the time of the request, the Sun License Center operator might require written confirmation that the old license password has been deleted.

Getting License Information

To get information about the licenses used by a compiler, use the `-xlicinfo` parameter. For example, for the C compiler type:

```
% cc -xlicinfo
```

Upgrading Your Operating System

If you upgrade your operating system, you must save the `/etc/rc2.d/S85lmgrd` file and everything in the `/etc/opt/licenses` directory. Restore the files when you have completed the system upgrade.

Using `lmreread` to Reread the License File

When you run the `lmreread` utility, the license daemon starts any new vendor daemons and signals all pre-existing daemons to reread the license files for changes in feature licensing information. See the `lmreread` man page for options and usage.

Under the following circumstances, you cannot use `lmreread` to restart the license daemons (see "Stopping and Restarting the License Daemons" on page 30):

- If you edit the `daemon_options` file
- If you move your license server from one machine to another

---

Note – You must be a superuser or a designated user through the `adjust_flexlm_owner` script (see the `adjust_flexlm_owner` man page) to use the `lmreread` utility.

Using `lmremove` to Remove a User's License

There may be times when checked-out licenses are not able to be returned to the license server because an application quits abnormally. To regain use of the license token, remove a user's license with the `lmremove` utility. See the `lmremove` man page for more information.

Note – You must be a superuser or a designated user through the `adjust_flexlm_owner` script (see the `adjust_flexlm_owner` man page) to use the `lmremove` utility.

Recovering a Lost License

A license may be reported in use when it is not. This can be caused by the length of time licenses are held by the vendor daemon after the application checks licenses in or exits (the length of time set by the `LINGER` option in the `daemon_options` file) or if a system goes down while licensed software is in use. Use the `lmstat` command to get the status of the active licenses (see the `lmstat` man page for usage and options). If a license is reported in use when it is not being used, use the `lmremove` man page to recover the license (see the `lmremove` command for usage and options).

Releasing a License

If a user checks out a license and then the user's machine crashes, the license will be unavailable until the next refresh time, usually only a few minutes. If the linger period has expired (the length of time set by the `LINGER` option in the `daemon_options` file) and the license is still unavailable, use the `lmremove` command to free the license (see the `lmremove` man page for usage and options).

File Names and Paths

The following is a list of file locations you might need:

- License file:
  `/etc/opt/licenses/licenses_combined`
- Router file:
  install-dir`/SUNWspro/license_dir/lic_router`
- Elementary license file:
  install-dir`/SUNWspro/license_dir/sunpro.lic,`*n*
  where *n* is a string (usually an integer) assigned by the license manager.
- File containing the location of all application software on the current server:
  `/etc/opt/licenses/sunpro.loc`
- Router file or elementary license file creation script to be run on all application servers that are not license servers:
  `/etc/opt/licenses/LIC_CONFIG_SCRIPT`
- License manager daemon:
  `/etc/opt/licenses/lmgrd.ste`
- License installation tool:
  `/etc/opt/licenses/lit` (GUI)
  `/etc/opt/licenses/lit_tty` (command-line executable)
- Vendor daemons:
  `/etc/opt/licenses/sunwlicd`
  `/etc/opt/licenses/suntechd`
- `daemon_options` file:
  `/etc/opt/licenses/daemon_options`
- License manager log file:
  `/usr/tmp/license_log`
- License installation log file:
  `/usr/tmp/license_errors`

- License daemon start-up script:
  `/etc/rc2.d/S85lmgrd`
- FLEXlm license manager utilities (for example, `lmstat`):
  `/etc/opt/licenses`
- License Request Form:
  `/cdrom/devpro_v7n1_`*platform*`/License_Request_Form`

Additional Help

Answers to frequently asked questions (FAQ) about Sun WorkShop licensing are available through the World Wide Web by visiting the following web page:

`http://www.sun.com/workshop/workshopFAQ.html`

If you have licensing questions that are not answered in this reference or through the FAQ, contact your Sun authorized service provider and have the following information available:

- A detailed description of the symptoms of the problem, including a detailed description of how to recreate the problem
- Output of the **which** *command*

  % which cc
- Output of the **-xlicinfo** switch from the same compiler used in the first two items

  % cc -xlicinfo

  Send the line that begins with `LM_LICENSE_FILE =`
- Your FLEXlm version number, which can be obtained by logging on as root and typing the following commands:

  # cd /etc/opt/licenses

  # ./lmver lmgrd.ste

  # ./lmver sunwlicd (for WorkShop 5.0 or 6)

  # ./lmver suntechd (for WorkShop 4.2 and earlier)
- A copy of the file `/usr/tmp/license_log` you receive after typing the following commands:

a. **Log on as root.**

b. Take down the license manager by using the `lmdown` command.

`cd /etc/opt/licenses`

`./lmdown -c licenses_combined`

c. Turn on license logging in the /etc/opt/licenses/daemon_options **file, and comment out the following three lines by using # as the comment character:**

`#NOLOG IN`

`#NOLOG OUT`

`#NOLOG QUEUED`

d. Restart the license manager:

`/etc/rc2.d/S85lmgrd`

e. Repeat the steps that produced the error. The log file /usr/tmp/license_log **will record the error.**

■ A copy of your licenses_combined file

■ A copy of the daemon options file /etc/opt/licenses/daemon_options from the license server

■ A copy of the router file *install-dir*/SUNWspro/license_dir/lic_router

■ A copy of the elementary license file, from WorkShop 5.0 or earlier versions, *install-dir*/SUNWspro/license_dir/sunpro.lic,*n*

■ Output from the lmstat utility on the license server

% `cd /etc/opt/licenses`

% `./lmstat -a -c licenses_combined`

(You do not need to be root to obtain this output.)

■ The operating system version of your machine, the license server, and the application server

% `uname -a`

License Certificate Information

License certificates for Sun WorkShop products are issued in denominations of 1, 10, 25, and 100 rights to use (RTUs). Sun allows you to split multi-RTU license certificate denominations into multiple passwords. This means that you are not required to install all of the RTUs on a multi-pack certificate (10, 25, or 100 denominations) on a single license server.

Adding Rights for Additional Licenses

An additional password is required each time you add additional RTUs to an existing license file on the same computer for the same version of a product. For example, if you have a password that authorized five users for WS Professional C and you wish to add support for five more concurrent users, you would need to add a new incremental password authorizing five additional users. Acquire additional passwords for additional RTUs through your authorized Sun reseller.

Getting Upgrades

Most software releases require new passwords. Sun might release an upgrade that operates with an existing password. Patches are available through your Sun authorized support provider and sometimes through your Sun authorized reseller. Upgrades are usually available through your reseller.

Start of Warranty

Sun provides a 90-day free replacement for any product for which parts are missing, the media is unreadable, or the Proof of License Certificate is missing or incorrect. This warranty period starts from the time you receive the Sun product. Sun resellers may offer additional services for products acquired through them. Contact them directly for details.

All returns should be handled through your reseller. Contact your reseller for their Return Materials Authorization (RMA) procedure.

Glossary

application server A machine on which the software is installed. The application server can be the same as the license server.

daemon options file A file that is stored on your license server and allows you to control access to products. The default file is /etc/opt/licenses/daemon_options.

data checksum (DC) A number you receive from the Sun License Center to help you verify you have entered all license information correctly into the license installation tool lit and lit_tty. The DC is made from the license feature name, feature version, license server node name, license server hostid, and node-locked hostid.

demonstration license See *Try and Buy license*.

device name A name referring to hardware. For example, /dev/dsk/c0t6d0s2 is a CD-ROM device name. The name may differ depending on your machine and how you configure it.

diskless client A machine on a network that does not have a disk and relies on a server for file storage and other basic services. Do not install the licensing software on a diskless client.

elementary license file A subset of the licenses-combined file that is located on each application server. It contains the license server information and the product license. The elementary license file is available for releases prior to WorkShop 6.

floating license A concurrent user license that makes software available to any user on any computer on a network.

hostid An eight-digit hexadecimal number that is unique to each system and is used to identify that system.

hostname An identifying name given to a computer.

installation directory The directory where you decide to install Sun WorkShop products and licenses. The default is /opt.

license daemon	The license manager daemon (`lmgrd.ste`) monitors the requests for access to Sun WorkShop software. This daemon also handles the communication between the software application requested for use and the vendor daemon.
license server	The workstation or machine running the license daemon.
local installation	Where you perform the installation on the machine with the CD-ROM drive where you loaded the product CD and install the product software on that same machine; where you download the product software and install the product software on the same machine. In a local installation, the source computer and the target computer are the same machine. See *source computer* and *target computer*.
node	An addressable point on a network. Each node in a network has a different name. A node can connect a computing system, a terminal, or various other peripheral devices to the network.
node locked	Refers to an application that can run only on the licensed machine (the node).
package dependency	The dependence of one package on the installation of other packages. For example, if you install a compiler, you must also install the backend component, header file, and front-end component packages.
password checksum (PC)	A number you receive from the Sun License Center to help you verify you have entered all license information correctly into the license installation tool lit and lit_tty. The expiration date, vendor string, password, and RTU all contribute to the generation of this number.
product server	See *application server*.
redundant license servers	Three servers acting as a single logical license server.
remote installation	Where you perform the installation or download the product software on one machine (source computer) and install the software on another machine (target computer). See *source computer* and *target computer*.
router file	An ASCII file that lists the license servers on the network that should be checked for licenses. It has the `port@host` format.
server	A machine that provides a network service. For example, license checkouts and checkins must be performed on a server.
source computer	The machine with the CD-ROM drive where you loaded the product CD; the machine where you downloaded the product software. See also *local installation*, *remote installation*, and *target computer*.
target computer	The machine where the product software is installed. See also *local installation*, *remote installation*, and *source computer*.

Try and Buy license A license that allows you to evaluate free of charge any Sun WorkShop software for a specified period of time (also called demonstration or demo licenses). A Try and Buy license does not need a license daemon to run and allows an unlimited number of concurrent users.

server pool Two or more independent servers combined so that users can obtain a license token from any one of the servers.

vendor daemon The daemon that tracks which users have licenses for a product, if they are checked out, and how many licenses are available. The Sun WorkShop daemon, `sunwlicd`, runs on the license server.

vendor string (VS) A code used to ensure license passwords are unique. For ScholarPASS and GoldPASS domain licensed customers, this code contains the customer's domain name.

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