System Administrator's Guide

Release 6.1

Part Number: 700439-001
http://www.rainbow.com

RAINBOW TECHNOLOGIES, INC
50 Technology Drive, Irvine, CA 92618
TEL: (949) 450-7300, (800) 852-8569 *FAX: (949) 450-7450*

RAINBOW TECHNOLOGIES LTD.
4 The Forum, Hanworth Lane, Chertsey, Surrey KT16 9JX, United Kingdom
TEL: (44) 1932 579200 *FAX: (44) 1932 570743*

RAINBOW TECHNOLOGIES
122, Avenue Charles de Gaulle, 92522 Neuilly-sur-Seine Cedex, France
TEL: (33) 1 41 43 29 00 *FAX: (33) 1 46 24 76 91*

RAINBOW TECHNOLOGIES GMBH
Lise Meitner Strasse 1, 85716 Unterschleissheim, Germany
TEL: (49) 89 32 17 98 0 *FAX: (49) 89 32 17 98 50*

10 9 8 7 6 5 4 3 2 1 980807

Contents

Preface . . . . . **v**
About This Guide vi
Typographic Conventions vi
Syntax Conventions vii
Getting Help vii

Chapter 1: Getting Started **1**
Basic Concepts 1
What is SentinelLM? 1
License Codes 2
Computer Fingerprints and Locking Codes 2
Stand-alone or Networked Licensing 3
Software Installation and Activation 4
How Do I Get a New or Upgraded License? 5
Fingerprinting Your Computer 6
To Fingerprint a Windows 95/98, Windows NT, or UNIX Computer 7
To Fingerprint a Windows 3.1x Computer 7
Installing License Codes 7
To Install a License on a Windows 95/98 or Windows NT Computer 8
To Install a License on a Windows 3.1x Computer 9
Using the SentinelLM Commands 9

Chapter 2: Configuring the License Server **11**
Overview 11
Additive and Exclusive License Codes 12
Location of the Applications and License Servers 12
Compatibility 13
License Server Structure 13
License Authorization Process 13
Step 1: License Server Configuration 13
Step 2: Load License Codes 14
Step 3: Client Identifies License Server 15
Step 4: Client Issues License Request 15

Step 5: License Server Responds . . . 16
Step 6: Client Renews License . . . 16
Step 7: License Server Responds . . . 16
Step 8: Client Returns License . . . 16
Step 9: License Server Adds License to License Pool . . . 16
Configuring the License Server . . . 17
Setting the License Code File . . . 18
Setting Usage Logging . . . 18
Setting Error Logging . . . 20
Setting License Server Quit Startup . . . 20
Starting the License Server . . . 21
System Requirements . . . 21
Windows NT Service . . . 21
Windows NT Event Logging . . . 22
Windows 95/98 License Server . . . 22
NetWare . . . 23
System Requirements . . . 23
Installing the Software . . . 23
UNIX . . . 24
Configuring the License Server Client . . . 24
Check the Network Protocol . . . 25
Locate the License Server Computer . . . 25
Test the “Broadcast Method” of Locating a License Server . . . 26
Test the “Named License Server Method” of Locating a License Server . . . 26

Chapter 3: Administrator Commands . . . 29
echoid, echoid16 - Fingerprint a Computer . . . 30
ipxecho - Display the IPX Network Address . . . 31
linstall - Install a License Code . . . 32
loadls - Install the License Server as an NT Service . . . 32
lsdecode - Decrypt and Display a License Code . . . 33
lserv, lserv9x, lservnt - Start the License Server . . . 34
lslic, lsic16 - Install/Delete a License Code . . . 35
lsmon, lsmon16 - Monitor License Server Transactions . . . 36
lsrvdown - Shut Down the License Server . . . 37
lsusage - Display the SentinelLM Usage Log File . . . 38

lswhere, lswher16 - Display a List of License Servers 39
wlsquery - Query License Server Transactions 39

Chapter 4: Setting User Options. 41
Setting User Alerts. 41
Alert Specification. 42
SCRIPT. 45
EMAIL 45
Setting Group Reservations 46
Including/Excluding Users 46
Including/Excluding Computers 47
Configuring the Reservation File. 47

Appendix A: Using Environment Variables to Configure a License Server 49
Client - Commonly Used Variables 50
LSHOST - Set the License Server Name 50
LSFORCEHOST - Select a Single License Server 51
License Server - Commonly Used Variables 51
LSERVOPTS - Set License Server Options 51
License Server - Infrequently Used Variables. 53
LSDEFAULTDIR - Set the Default Location of the License Server Files 53
LSERVRC - Set the License Code File 54
LSERVRCCNF - Set the License Server Configuration File 54
LSRESERV - Set the License Server Reservation File 55
Notes on Setting Environment Variables by Operating System. 55
Windows 3.1x 56
Windows 95/98. 56
Windows NT 56
UNIX - Bourne or Korn Shell 56
UNIX - C or TCSH Shell. 57
Stand-alone Application Use of Environment Variables 57
LSHOST - Disable a Network License 57
LSERVOPTS - Set Application License Management Options 58
LSDEFAULTDIR - Set the Default Location of License Management Files 58
LSERVRC - Set the License Code File 58
LSERVRCCNF - Set the Application License Management Configuration File . . . 58

LSRESERV - Not Used in Stand-alone Mode 58

Index 59

Preface

Welcome to the SentinelLM License Management system, which protects the application you are using. SentinelLM may limit, track, or meter application use depending upon the unique requirements of your software license agreement.

This book is intended for users and administrators of SentinelLM-protected applications. You will find that you need little or no knowledge of SentinelLM in order to use your protected application. The only time you will need to interact directly with Sentinel LM is when you purchase a new license or upgrade an existing one. The software license installation and upgrade procedures are described in “Installing License Codes” on page 7 in Chapter 1: “Getting Started.”

About This Guide

This guide gives all the steps for maintaining SentinelLM.

Chapter/Appendix	Description
Chapter 1: "Getting Started"	Introduces license management and discusses how to obtain a new license from your vendor.
Chapter 2: "Configuring the License Server"	Explains how to install and configure a SentinelLM license server.
Chapter 3: "Administrator Commands"	Contains instructions for using the SentinelLM administrator commands.
Chapter 4: "Setting User Options"	Provides information on licensing options that can be configured after the protected application is installed.
Appendix A: "Using Environment Variables to Configure a License Server"	Explains how to use environment variables to configure a license server.

Typographic Conventions

The following typographic conventions are used throughout this guide:

Convention	Purpose
italic	Used to signal a new term, for placeholders, variables, and file names, or for emphasis.
bold	Used for command-line options and utility, dialog box, checkbox, menu, and command names.
bold-italic	Used for keys such as ***Tab***, ***Shift***, and ***Backspace***.
`courier`	This font denotes syntax, prompts, and code examples.

Syntax Conventions

The following syntax conventions are used throughout this guide:

Convention	Purpose
[ ]	Square brackets enclose optional syntax.
...	Ellipses indicate that a clause can be repeated.
|	A pipe indicates that only one of the syntax choices it separates may be used.
{ }	Curly braces indicate that one of the options they enclose *must* be used in actual syntax.

Getting Help

For help with SentinelLM or with the protected applications that use it, please contact your vendor first. If additional assistance is needed, contact Rainbow Technologies at http://www.rainbow.com.

CHAPTER 1

Getting Started

This chapter contains basic information of interest to anyone who uses or administers software that has been protected using SentinelLM. If your vendor has referred you to this manual, this is the chapter that you will want to read first.

Basic Concepts

This section contains information on basic concepts you will need to know about to administer licenses on your stand-alone or network computer.

What is SentinelLM?

SentinelLM is a software toolkit and collection of software that your vendor used to create the protected application you are using. The application uses SentinelLM to support the license agreement. SentinelLM can authorize, meter, and report application use. Which of these capabilities is needed depends upon the type of application and details of the your license agreement. When you start a protected application, the application first makes a check with SentinelLM to verify use is permitted by the license agreement. If the use is authorized, then SentinelLM gives the application permission to run. If permission is granted, this process is invisible. If permission is denied, then you will be informed and the application exits. Permission may be denied because someone else is already using the application, the license has expired, or no license has been installed. If your license has expired or hasn't been installed, then you will want to continue reading this chapter. It tells how to obtain and install a license.

License Codes

SentinelLM captures your license rights in electronic form. These are stored as digital data called a *license code*. The license code indicates the maximum number of concurrent users of the application, on which computers it can be run, and the license expiration date, if there is one. License codes are generally stored in a file that is accessible to the SentinelLM software. Multiple license codes may be stored in a single file.

The application may use one or more license codes. One license code may provide, for example, the right for four users to use the application at once, while another provides the right to two users to use the application at once. In this case, six users would be able to run the application at once using both license codes. If you need to add another concurrent user, this can easily be done by obtaining an additional license code from your vendor.

Computer Fingerprints and Locking Codes

Many applications are licensed to run on specific computers. Any restrictions on which computers may run the application are stored in the license code. When you purchase the application, if there are any computer restrictions, a license code must be created which includes the information needed to uniquely identify each computer. Information that can be used to uniquely identify a computer is called its *fingerprint*. This information might include the computer's network address or attached Computer ID key. Your vendor can select how much of this information is required to establish a computer's identity. The first step in creating a license code that has a computer restriction is to run a command that collects the information your vendor requires for computer identification. This command collects this information and outputs a *locking code* that is a number based upon the collected information. You provide this locking code to your vendor using a telephone or the Internet and your vendor produces a license code that specifies all authorized uses and includes the locking code.

Stand-alone or Networked Licensing

A protected application can be licensed to run on a single computer without using a computer network. SentinelLM calls this a *stand-alone license*. This kind of license is most often used when an application is used by a single person on a particular computer. The software is installed on that computer along with any needed license codes. This kind of application is often installed directly by the users themselves on their own computers.

As an alternative, a protected application can be licensed to run on multiple computers so that several computers can share it. In this case a computer network is required so that all computers that are authorized to run the software are connected. SentinelLM calls this a *network license*. A special SentinelLM program, called the SentinelLM *license server,* must be installed onto one or more computers in the network to coordinate the use of the application. The license server has access to copies of all license codes. When the application starts, instead of communicating with SentinelLM software that has been linked to the application, the application communicates instead with the license server.

The same procedure for software authorization takes place in both the stand-alone and networked case. The only important difference is whether the SentinelLM software is part of the protected application or provided as a separate program, the license server.

Note If you have a stand-alone license, you may skip the rest of the information in this section. It simply describes some additional SentinelLM capabilities that are available with a network license. This information is of most value to a system or network administrator.

A network license adds many capabilities to license management. The following is a quick summary:

1. License server execution can be restricted to one or more computers. License codes can be distributed to multiple servers. Protected applications may choose which license server to use. You can restrict the subnet that a protected application can use to talk to a license server if needed.
2. Application execution can be restricted to one or more computers.

3. SentinelLM commands may be used to display a summary of current and historical software use.
4. A network administrator may impose local restrictions on software use. A certain number of licenses may be reserved for particular departments or work groups.
5. A network administrator can configure the license server to report certain conditions such as approaching license expiration.

The license server may be automatically installed and configured when you install a protected application. If this has been done, all you need to do is to obtain and install any license codes. If the license server wasn't automatically installed, then you will need to install it before installing the license codes. Chapter 2: "Configuring the License Server" on page 11 tells how to install and configure the license server. The rest of this chapter tells how to obtain and install license codes.

Software Installation and Activation

A protected application won't run without a valid license code. Software is often licensed for a specific computer or network, but may be delivered and installed without a license code. To obtain a license code, you must provide your vendor with the locking codes for all computers that it will run on. Your vendor will use this information to create the license codes that SentinelLM needs to authorize use of the protected application. Your vendor will then give you the license code along with instructions on how to install it.

Your vendor may also choose that a hardware key be used to identify a computer. In this case, your vendor can generate the license code that matches the hardware key and ship the hardware key and license code to you along with the software installation media. When you install the software, the license code can be installed automatically. This is a very convenient solution when you want to move the software from computer to computer.

Some applications are licensed without computer restrictions. Demonstration software is often licensed in this manner. Typically, demonstration software is licensed for a limited period of time so computer restrictions aren't required.

This kind of software is often shipped with a license code that can be installed automatically. This software may then be used until the license expires. If you then try to run the application, you will be told the license has expired; to run the application again, you will need to contact your vendor to obtain a permanent license code.

Note If your application came with a license code, you can skip the next section. It describes the procedure for fingerprinting a computer and obtaining a license code.

How Do I Get a New or Upgraded License?

If your application didn't come with a license code or your previous license code has expired, then you will need to get and install a license code for that application. You may also wish to take advantage of additional features of the application or increase the number of authorized users. You can upgrade your software license by getting and installing a new license code.

In order to create a license code, the vendor may need some information about your computer. This is how the process works:

1. Contact your vendor following the instructions supplied. (Depending on your vendor, this may be by telephone or via the Internet.)
2. The vendor may tell you that a new license code has already been shipped with the application, and all you need to do is to install it. In this case, skip to the instructions in step #5, below.
3. If your vendor tells you a new license code is required, your vendor will probably ask you to fingerprint your computer. You can find the instructions for doing this in "Fingerprinting Your Computer" on page 6.
4. After you have the fingerprint, you must give it to the vendor. The vendor will create a license code using this information and provide you with a license code.
5. You will complete the license activation process by installing the license. If your application has been configured to accept the license code directly, the application will prompt you for the license code and install it

for you. To find out if your application supports this, try running the application. If it asks for a license code, type it in and wait for the application to install the license. Once the application has installed the license, it is ready to run without any further attention. If the application does not ask for a license code, you must use the SentinelLM **lslic** or **linstall** command to install the new license. See "Installing License Codes" on page 7 for instructions.

Once you have installed a valid license code, you are done configuring the license server.

Fingerprinting Your Computer

Note Depending on how your vendor has asked you to install the license code, you may not need to fingerprint the computer; the license installer may do it for you and display the locking code to you. However, it never hurts to use the **echoid** command to fingerprint the computer.

You use the SentinelLM **echoid** command to fingerprint a computer and produce any required locking codes. Your application vendor will provide you with instructions telling you what the locking code requirements and procedures are. (For details on **echoid**, see "echoid, echoid16 - Fingerprint a Computer" on page 30 in Chapter 3: "Administrator Commands.")

If you have a stand-alone license, you will generally be asked to provide a locking code for the computer that will run that software.

If you have a network license, you will generally be asked to provide a locking code for any computer which will run a copy of the license server. You may also be asked to provide a locking code for computers that will run the protected application.

It all depends upon your licensing requirements.

Sometimes your vendor will ask that you provide two different locking codes for a computer. This can be done to allow you to change the configuration of that computer sometime in the future.

Your vendor may have provided a hardware identification key. This key must be installed before you can produce a locking code.

To Fingerprint a Windows 95/98, Windows NT, or UNIX Computer

From the operating system command prompt, type:

```
echoid
```

To Fingerprint a Windows 3.1x Computer

From the operating system command prompt, type:

```
echoid16
```

Installing License Codes

Once you have been given a license code it must be installed where it can be found by the license management system. For a stand-alone application, the license code is installed on the same computer as the application. For a network application, license codes are installed on the computer running the license server. Your vendor may provide a program to automatically install the license code. Or your vendor may have configured the protected application to install the license code. If not, then the **lslic** SentinelLM command may be used to install the license code on a Windows or UNIX computer. For Windows 95/98 and Windows NT computers, your vendor may instead ask you to use the **linstall** command to install the license.

To Install a License on a Windows 95/98 or Windows NT Computer

linstall is a Windows-interface program that installs a license code. Depending on how your vendor has configured it, **linstall** may give you the choice of retrieving the license: from the Internet, from your vendor by talking on the telephone, or from a label on your product packaging.

To start **linstall**, click the Windows **Start** button and point to **Programs**. Then point to the program folder of the protected application and select the license installation shortcut. Or, use the Windows File Explorer to find the *linstall.exe* file and double-click it. **linstall** will guide you through the license installation process, step-by-step. Click **Next** to move through the screens until the license is installed; at that point, click **Finish**.

linstall fingerprints your computer and displays its locking code; your vendor may ask for the locking code before giving you a license.

To install the license code, at the operating system command prompt, type:

```
lslic -A [license-code]
```

where *[license-code]* is the string of characters given to you by your vendor.

If you need the licenses to be added to a remote host you can set the environment variable, *LSFORCEHOST* or *LSHOST*.

If you do not include the license code after the -A option, **lslic** asks you for it.

If your vendor has given you a license code *file* to install rather than a string of characters to type, at the operating system command prompt, type:

```
lslic -F <filename>
```

where <*filename*> is the name of the file given to you by your vendor containing the license code.

Both of these commands install the license code permanently. **lslic** provides other ways to install a license code. For example, you can add the license code to the license server temporarily to be in effect only until the license server is

restarted. For details on **lslic**, see “lslic, lsic16 - Install/Delete a License Code” on page 35 in Chapter 3: “Administrator Commands.”

To Install a License on a Windows 3.1x Computer

Follow the instructions in the section above for Windows 95/98, Windows NT, and UNIX computers, but use the command **lslic16**.

Using the SentinelLM Commands

One or more SentinelLM commands may have been provided with your protected application. These commands help in the installation or configuration of the license management system, and most users will not need to use them. They are primarily used by network administrators to support network-licensed software. A few of these commands give information on license use or status and may be used by anyone. These commands are described in Chapter 3: “Administrator Commands” on page 29.

CHAPTER 2

Configuring the License Server

This chapter describes how to start up and configure a license server. A license server is required when the protected application uses network license codes.

Note If the application only uses stand-alone license codes, then you may want to skip this chapter.

Overview

The SentinelLM license server is a program that coordinates use of a protected application by multiple users and computers. This program usually runs on a computer that is located on the same subnet as any computers that need to run the application. The computers that run the application are called *clients.* When a protected application is started on the client, it sends a request for a license across the network to the license server. The license server grants the request if possible and returns an authorization message back to the client. Note that a license server program need not run on a file server system or any specific hardware server. Any computer system that meets the system requirements is acceptable.

Application use is authorized by license codes. Each license server is provided with a license code file that contains one or more license codes. Each license code identifies the valid uses of a single application. There may be multiple license codes in a single license file. You generally add license codes to the license file by using the **lslic** command. They can also be added by manually editing the file, but this isn't often done since the license server only reads the file when it is started.

Additive and Exclusive License Codes

License codes are either *additive* or *exclusive*. There can be multiple exclusive license codes per product in the license file. Only the last exclusive license code added to the file is used by the license server, if exclusive licenses are used. All other license codes, additive or exclusive, are ignored by the license server.

There can also be multiple additive license codes per product in the license file. Unless there are exclusive license codes for the same product, then each additive license simply adds to the permitted uses defined by previous additive license codes. For example:

> Let's say there is a product with a feature name, WORD_SMITH and version 5.0.
>
> There may be two additive license codes for WORD_SMITH 5.0. One of these license codes may authorize five concurrent users. The other may authorize two concurrent users.
>
> A license server provided with both license codes will authorize up to seven concurrent users of version 5.0 of WORD_SMITH.

Additive license codes are only used to increase the number of available licenses or number of client computers. All other license code parameters such as expiration date are the same.

Location of the Applications and License Servers

The protected application is installed separately on each client. The license server can be installed and run on multiple computers. In this type of installation, the application running on a client may choose any available license server with a valid license code for that client.

It's possible to install the protected application and the license server on the same computer. In this case, the license server may authorize program use on that computer or on any other client computers for which there is a valid license code. The protected application can be authorized by the license server on the same computer or by a license server on any other computer. This makes it possi-

ble to locate the server on any computer, even a computer that is used to run one of the protected applications.

Compatibility

A license server running on a computer with one operating system can communicate with a client running on another operating system. It's also possible to have a client communicate with a license server running on one operating system today and a license server running on a different operating system tomorrow. This is all transparent to the user of a protected application. As long as the protected application and license server can communicate, all license requests will be correctly handled. There is also no difference between the license codes generated for license servers running on different operating systems.

In some cases, the application has been designed to work with either stand-alone or network license codes. In this case you can choose which method of operation you prefer by providing the appropriate license code.

License Server Structure

The SentinelLM license server is a System Service on Windows NT. On Windows 95/98, the license server is a background program (although it optionally can be run in the foreground in a visible window). Under UNIX, the license server is a background process.

License Authorization Process

The next sections give a step-by-step description of the entire license authorization process.

Step 1: License Server Configuration

When the license server is started it is configured in three stages. First, any options selected by command line parameters are set. Next, any options for

which SentinelLM has defined a specific environment variable are set. Finally, any options that are provided in the *LSERVOPTS* environment variable are set.

Many of the license server options can be set using all three methods. When a setting is made using more than one method, the later methods override any settings made by an earlier method. This flexibility helps in some situations, but in general it isn't needed. When we talk about setting an option in this guide, we recommend which method should be used to set the option.

This chapter discusses how to set the basic configuration options needed for most installations. The options needed to take advantage of a few of the advanced capabilities are discussed in Appendix A: "Using Environment Variables to Configure a License Server" on page 49. We also discuss license server command line options in "lserv, lserv9x, lservnt - Start the License Server" on page 34 in Chapter 3: "Administrator Commands."

After configuration, the license server displays a startup banner unless the quiet startup option has been selected, in which case the license server starts without any messages.

Step 2: Load License Codes

After configuration, the license server reads the license code file. The name and location of this file can be set using the license server options. The license server reads the file from start to finish, processing each license code in order. All additive license codes add to the licensing rights already processed. All exclusive codes override all previously read codes and any future additive codes.

If the license server can't find the license code file, it will continue to run. When a license server is running it can also accept license codes across the network from other programs such as **lslic**. A server will process each received code as if it has just been read from the license code file. The license server will also add the license code to the end of the license code file if this was requested.

Step 3: Client Identifies License Server

If the application supports network licensing, when it is started it first tries to identify a license server. This is how it looks for a license server:

- If the *LSFORCEHOST* environment variable is set, the application looks for the specific license server host listed in that variable. If it cannot find that computer, the search ends and an error message is displayed. The application cannot run.
- If no *LSFORCEHOST* environment variable is set, the application looks for the *LSHOST* environment variable. If this variable has been set, then the application looks for any of the license server hosts listed. If *LSHOST* isn't set, then a check is made for a file with the name *LSHOST* or *lshost* in the directory where the application is located. If this file is found, then the application looks for any of the hosts listed in the first line of the file.
- If a license server isn't found using one of these methods, then a broadcast message will be sent out on the client computer's subnet requesting all license servers to identify themselves. The application will then choose one of these license servers. Using the broadcast method of finding the license server allows the server location to be changed without any actions on the part of the client computer. The broadcast is only used when the application starts, so it uses very little network bandwidth.

A protected application that has been built to support both stand-alone and network options can be converted to strictly stand-alone operation by setting *LSHOST* to NO_NET. (For instructions on setting environment variables, see Appendix A: "Using Environment Variables to Configure a License Server" on page 49.)

Step 4: Client Issues License Request

Once the application has identified the license server, it issues a request for one or more licenses to the license server. The server host name is translated to the network address of the license server computer. The application sends a license request to this address and the license server's port.

Step 5: License Server Responds

When a license server receives a license request, it checks to see if a license can be granted based upon the current license codes. If it can, then an authorization is sent back to the client computer. Otherwise, the request is rejected and a denial is sent back to the client computer. In both cases, the activity may be logged to a file if this capability has been enabled.

Step 6: Client Renews License

Each license code specifies the maximum time period that a license may be held by an application without renewal. After a client has received a license, it must periodically request a license renewal from the license server. Forcing a license to be renewed allows a license server to reclaim a license when there is a problem with an application or a client computer. If the application doesn't renew its license within the allowed time, it loses its license and the server may grant it to another user. This action is handled by the application and is transparent to the user on the client computer.

Step 7: License Server Responds

The license server responds to a license renewal request in the same manner as the initial license request.

Step 8: Client Returns License

When an application ends, it sends a message back to the license server indicating that the license is no longer needed. This lets the license server immediately reclaim the license and make it available to another user.

Step 9: License Server Adds License to License Pool

When the license server receives the license back it simply returns it to the pool of available licenses.

Configuring the License Server

If your application is being used with a network license then your vendor will provide you with a copy of the license server program and installation instructions. After you have installed the license server, you can then configure the license server options. If you are running the license server on several computers you need to complete this procedure separately for each computer.

If a copy of the license server has already been installed, perhaps for an earlier version of software or for a different application, then you only need to install a license server if your vendor provided you with a newer version. The way you determine the version number of the license server depends on the license server platform. For Windows 95/98, run the license server and select the **About** command on the **Help** menu. For UNIX computers, run the license server; it will display its version number. The newest SentinelLM license server can be downloaded from the Rainbow web page at http://www.rainbow.com.

The license server sets its configuration options only when it is first started. If your server is already running, you will have to stop it and restart it to make any configuration changes take effect.

You should review all of the configuration options that are described in this chapter during the initial license server configuration. In most cases, once these options are set they aren't changed. There are some advanced license server capabilities that can be enabled through other configuration options that are discussed in Chapter 4: "Setting User Options" on page 41. These advanced capabilities can be enabled or disabled as needed.

Even though most license server configuration options can be set in several different ways, only the recommended way is described here. If you want to set them in an alternate manner you should read Appendix A: "Using Environment Variables to Configure a License Server" on page 49 and "lserv, lserv9x, lservnt - Start the License Server" on page 34 in Chapter 3: "Administrator Commands."

Setting the License Code File

The license server must have read-access to a file that stores license codes. If you are going to use the **lslic** program to install license codes, the license server must have read/write access to the license code file when the **lslic** program is being executed. If you are having a problem installing license codes, then you should verify that the license server has read/write access to the license code file.

Recommended settings:

- The default location of the license code file is in the default license server directory. It's best to leave the location of the license code file there.
- The default name of the license code file is *lservrc*. It's best to use that file name.

Tip If the license server cannot find the license code file and error logging is enabled, it will log the error in the error log file.

Setting Usage Logging

The license server can generate a usage log file. The name and location of the usage file is set by the license server startup options. The license server records all license requests and returns in this file. Usage reports can be generated using **lsusage**. (For information on **lsusage**, see "lsusage - Display the SentinelLM Usage Log File" on page 38 in Chapter 3: "Administrator Commands.")

Information is recorded in the log file one entry per line in the following format:

Table 2-1: Log Entry Format

Date	Time-stamp	Feature	Ver	Trans	Numkeys	Keylife	User	Host	LSver	Currency	Comment

Table 2-2: Elements of a Log File

Element	Description
Date	The date the entry was made, in the format: Day-of-week Month Day Time (hh:mm:ss) Year
Time-stamp	The time stamp of the entry.

Table 2-2: Elements of a Log File (Continued)

Element	Description
Feature	Name of the feature.
Ver	Version of the feature.
Trans	The transaction type. 0 indicates an issue, 1 a denial, and 2 a return.
Numkeys	The number of licenses in use after the current request/release.
Keylife	How long, in seconds, the license was issued.
User	The user name of the application associated with the entry.
Host	The host name of the application associated with the entry.
LSver	The version of the SentinelLM license server.
Currency	The number of licenses handled during the transaction.
Comment	The text passed in by the protected application.

A typical entry might appear as:

```
Wed Jan 18 17:06:17 1999 850525577 DOTS v1 2 0 632 payrol wrs7 6.0 1 -
```

This entry indicates that Wed., January 18, 1999, at 5:06 p.m. the user, *payrol*, was done using the demo program, **dots1**, which is licensed with the feature name, DOTS, version 1. The license was returned after using the program for 632 seconds on the computer, *wrs7*. One unit of currency was used by the application. The entry was generated by a SentinelLM version 6.0 license server.

SentinelLM writes records to the log file until it reaches its maximum size. The default value for maximum size is 1 megabyte but this can be changed using the *LSERVOPTS* environment variable. Once the maximum size is reached, the oldest 10% of the entries in the file will be deleted unless the no-trim option has been selected. If the no-trim option has been selected, the license server will simply stop logging when the maximum size is reached.

Recommended settings:

- By default, usage logging is disabled. It’s best to enable usage logging. This log can be used to give you a very good idea of how much each application is being used. If you don’t have much disk space, you can restrict the size of the log.

- You should enable logging and set the log file name and location. A typical log file name is *lserv.log*.
- It's best to specify the maximum size limit for the log file and to leave enabled automatic trimming of the log file.
- You should set add the **-z** option to the settings for the *LSERVOPTS* environment variable. For a site with a 2 megabyte log file limit and no other license server options, *LSERVOPTS* would just be set to -z 2m.

Setting Error Logging

The license server can log unexpected conditions to a log file. The name of the error log file is specified by the license server **-f** startup option.

Normally error logging is disabled. If you are having a problem running or configuring the license server you may want to temporarily enable error logging. Then you will be able to capture all error messages in the log file.

Recommended setting:

- By default, error logging is disabled. It is recommended to leave it disabled.

Setting License Server Quit Startup

The license server normally displays a message upon program startup. This display can be suppressed if desired.

Recommended setting:

- By default, the startup message is enabled. It is recommended to leave the message enabled.

Starting the License Server

License server installation and startup vary depending upon the operating system on the license server computer. The following instructions describe common server installation and start-up procedures. These instructions refer to license server command line options and environment variables. A detailed description of the command line options is provided in “lserv, lserv9x, lservnt - Start the License Server” on page 34 in Chapter 3: “Administrator Commands.” The environment variables are described in Appendix A: “Using Environment Variables to Configure a License Server” on page 49.

System Requirements

The SentinelLM modules run on PC 80386 or higher. If you are using network licensing, a supported network protocol is required on the target machine. To license Windows 3.1x programs using the TCP/IP protocol, SentinelLM requires the installation of a Winsock-compliant TCP/IP stack.

Windows NT Service

The license server installation is done using the **loadls** command. This command may be run explicitly or as part of an installer program. This program is described in “loadls - Install the License Server as an NT Service” on page 32 in Chapter 3: “Administrator Commands.”

Once loaded, the license server can be configured and started from the **Control Panel | Services** group. Automatic or manual license server startup can be selected.

If automatic startup is selected, the license server will be automatically started whenever Windows NT is started. The license server will remain running until Windows NT stops or the license server is stopped using the **Control Panel | Services** group.

If manual startup is selected, the license server must be started manually by using the **Control Panel | Services** group. When manually starting the license server, you may specify any license server command line options by using the **Startup Parameters** field in the **NT Services** window. This capability is not available when starting a service automatically. So, the recommended procedure is to select automatic startup and use the *LSERVOPTS* environment variable to configure the license server.

Note For Windows NT, the *LSERVOPTS* environment variable only takes effect after you reboot the computer, and only if it has been set as a System environment variable, not a user environment variable.

Administrative privileges are required to start and stop the license server service.

In **Service | Startup options**, use \\ in file paths instead of \. Or you can use /.

Windows NT Event Logging

For errors, look under **Applications** in the **NT Event Logger**. This log can be viewed using the Windows NT **Event Viewer** in the **Administrative Tools** group. After starting the E**vent Viewer**, click the **Log** menu and select **Application** to view messages logged by the SentinelLM license server.

Windows 95/98 License Server

A Windows 95/98 license server can be configured to be started automatically when Windows 95/98 starts or to be started manually.

To enable automatic license server startup, add the license server program, *lserv9x.exe*, to the Windows 95/98 system **StartUp** folder. You may use **Windows Explorer** to open this folder, select the *lserv9x.exe* shortcut, and display its properties. You can review and change license server command line parameters by changing the contents of the **Target** field on the Shortcut tab.

To start the license server manually, you simply run *lserv9x.exe*. You can do this from a MS- DOS window or by double-clicking the *lserv9x.exe* entry in **Windows Explorer**.

By default, when a user logs out, the license server exits. This can be changed by providing the **-B** command line option to the license server. When this option is used, the license server will keep running as a background process when a user logs out.

When the license server is started without the **-B** option, a status window is created which is used as a reminder that the license server is running. If you see this Window or an entry for it in the taskbar, you will know that if you log out the license server will stop. You can also stop the license server by closing this window.

NetWare

System Requirements

IPX clients can now be served by a Win32 server (*lserv9x.exe* or *lservnt.exe*) running on Windows 9x or Windows NT systems. This does not require an NLM or running any application on the NetWare server.

If you have received an NLM with the distribution, it requires a NetWare server version 3.11 or above running on Intel 386, 486, or 586-based computers (or clones). The NLM also requires the Novell-supplied *clib.nlm* version 3.11d or later to be loaded. (Free upgrades of this file are available from Novell.)

This distribution contains dynamically linked client libraries (DLLs) to be used with Windows 3.1 or above.

Installing the Software

You must load the SentinelLM NLM before any of its clients (such as the demonstration programs). If you installed SentinelLM on a client workstation in a directory that is not accessible from the NetWare server, copy the SentinelLM NLM, *LSERV.NLM*, on to the NetWare server. Usually, this would be copied to *F:\SYSTEM*. If you installed the SentinelLM package into the C drive of your machine, use the following command to copy to the F drive:

```
copy C:\LSERV\BIN\* F:\SYSTEM
```

Next, make sure the NetWare server is running and issue the following command on the NetWare server:

```
load sys:\system\lserv.nlm -s sys:\system\lservrc
```

This starts the license manager on the NetWare server machine. The SentinelLM license manager is now ready to handle licensing requests originating from clients running anywhere on your network.

UNIX

The license server, *lserv*, is placed in an appropriate directory and appropriate file permissions are set. The execution permission must be set so that only authorized users may execute the license server.

The license server must be granted read permission to the license code file and any other configuration files. The license server must also be granted read and write permission to any license serve log files that have been enabled.

The license server can be started automatically or manually.

To start the license server automatically when UNIX is started, the command line to execute the license server should be added to one of the operating systems startup files.

To start the license server manually, the command line can just be issued at any time.

Configuring the License Server Client

Protected applications which will be used with a license server and network license codes must be run on client computers that have been configured to communicate across the network with the license server.

Check the Network Protocol

The client computer and license server must support the same protocol.

To verify that TCP/IP is used on a Windows 95/98 or Windows NT 4.0 computer:

1. From the **Control Panel**, double-click the **Network** icon.
2. On the Configuration tab, look at the list of Network components installed to see if TCP/IP is listed.
3. Select the TCP/IP component and then bring up the **Properties** dialog box. Check the subnet mask. The client computer and any license servers it intends to use should be on the same subnet.

Note If you are using DHCP (dynamic host configuration protocol), contact your network administrator for help in determining this information.

To verify that TCP/IP is used on a Windows 3.1x computer:

If the client computer is using Windows 3.1x, contact the vendor from whom you purchased your TCP/IP protocol for information on verifying that TCP/IP is installed on the computer, and for information on whether that TCP/IP supports the required UDP protocol.

Locate the License Server Computer

The application program must be able to identify a license server. This can be done by having the application search the network for a license server or by providing the application with the name of the license server computer. In most cases, it's quicker to let the application use the broadcast method of finding a license server. With this method, you can change license servers at any time and no changes are required at the client computers.

Sometimes you may want to direct an application program to a specific license server. This may be to done to partition clients between license servers, or because the license server and client computer are located on a large network and broadcast messages are undesirable.

Test the "Broadcast Method" of Locating a License Server

You can test the configuration using the following steps:

1. Verify the *LSHOST* and *LSFORCEHOST* environmental variables aren't set and there isn't an *LSHOST* or *lshost* file in the same directory as the protected application.
2. Run either the **lswhere** or **wlsquery** commands on the client computer. These commands do a network broadcast for license servers and display a list of all license servers that are visible from the client computer. **wlsquery** also displays a list of applications; you can check that list to verify there is a server for the applications you want to run.
3. If all expected license servers are present, then the application will be able to run using the broadcast method. Of course, one of the license servers that is found must have a network license code that can be used to authorize use of the client computer.
4. If you are not able to see a particular license server, you should verify the network connection by using a network diagnostic program like **ping**. You can make this check by providing either the network address as a number (192.33.22.2) or as a name (license_host). If **ping** cannot find the server, then you have a network configuration problem that must be resolved before your SentinelLM-protected application can be used with a network license.

Test the "Named License Server Method" of Locating a License Server

You can test the configuration using the following steps:

1. Follow the steps given for the broadcast method until the client computer is able to find each license server that you want. If you are using the named license server method because the client computer and license server aren't on the same subnet, then you may want to skip right to the last step and just use **ping**.

2. If you can ping a license server when you specify its address by number but can't do this when you specify the address as a name, then your client computer has a problem with network domain name resolution. In this case you can either solve this problem or just provide the numeric form of the address to SentinelLM. Of course, if your license server is dynamically assigned a numeric network address, you will have to solve the name resolution problem. If you don't, then the next time the license server is assigned a new, numeric network address, the applications will no longer be able to find the license server.
3. Now set the *LSHOST* setting on the client computer to the name of the license server.

   The *LSHOST* naming conventions are:

   - Any valid name recognized by your network can be used.
   - Numeric names (192.22.11.33) can be used.
   - Symbolic names ("dept.computer") can be used.
   - You can provide a list of license server names. Each must be separated by a : symbol. The application program will search through the list from left to right to find a license server that can grant a license.

4. Test the *LSHOST* setting by running the **lsmon** command on the client computer. If the name is correct, **lsmon** will be able to report status on the selected license server.

An application that supports both stand-alone and network license codes treats *LSHOST* as advisory. The application will first try to obtain a license by checking with all license servers listed in *LSHOST*. If this fails, the application will try to get a stand-alone license. You can restrict the application to a network license by using the *LSFORCEHOST* environment variable instead of *LSHOST*. *LSFORCEHOST* overrides a *LSHOST* or *LSHOST/lshost* file, and prevents a network broadcast from being done.

5. You can now test the application. It should be able to obtain a license. If it doesn't then you should run **wlsquery** (for Windows) and verify that

the license server has a license that authorizes use of an application on the client computer.

CHAPTER 3

Administrator Commands

Your application may have been delivered with several SentinelLM administrator commands which are used to install, configure, or to report on the license management system.

Many of these commands provide information but do not alter the license management system. These commands may be run by an end user without administrative privileges or a detailed knowledge of SentinelLM. A description of these commands is provided in this chapter. Each description tells when the command should be used and what level of system knowledge is required to use it.

Note In addition to the commands discussed here, license tracking and reporting tools which support UNIX and PC platforms and Java are available from Rainbow. The Sentinel Track product is a sophisticated and comprehensive graphical reporting tool that can be used by your customers to monitor and control usage for all their software products. If usage reports are important to you, ask your Rainbow representative for information on Sentinel Track.

Table 3-1: Summary of SentinelLM Administrator Commands

Utility	Description	Where Documented
echoid	Obtains information about a computer that will be used to generate a license. This process is called "fingerprinting."	"echoid, echoid16 - Fingerprint a Computer" on page 30.
ipxecho	Used on Windows95/98 and NT computers to display the IPX network address. Use on the computer on which the license server resides.	"ipxecho - Display the IPX Network Address" on page 31.

Table 3-1: Summary of SentinelLM Administrator Commands (Continued)

Utility	Description	Where Documented
linstall	Used for Windows 95/98 and Windows NT computers only to install a license. Fingerprints your computer and displays its locking code during the installation process. Intended for use on a stand-alone computer to install a stand-alone license.	"linstall - Install a License Code" on page 32.
loadls	Used with Windows NT only. Installs/uninstalls the license server into the System Services registry.	"loadls - Install the License Server as an NT Service" on page 32.
lsdecode	Decrypts part of the information in a license code.	"lsdecode - Decrypt and Display a License Code" on page 33.
lserv, lserv9.x, lservnt	Starts the license server.	"lserv, lserv9x, lservnt - Start the License Server" on page 34.
lslic	Installs a license. You need the license code from your application developer.	"lslic, lsic16 - Install/Delete a License Code" on page 35.
lsmon	Monitors license server transactions. The command-line version of **wlsquery**.	"lsmon, lsmon16 - Monitor License Server Transactions" on page 36.
lsrvdown	Shuts down the license server.	"lsrvdown - Shut Down the License Server" on page 37.
lsusage	Displays information from a license server log file.	"lsusage - Display the SentinelLM Usage Log File" on page 38.
lswhere	Displays the names of the computers on the network running license servers.	"lswhere, lswher16 - Display a List of License Servers" on page 39.
wlsquery	Monitors license server transactions. Gives information on license servers, licensed applications, and application users.	"wlsquery - Query License Server Transactions" on page 39.

echoid, echoid16 - Fingerprint a Computer

Format `echoid`

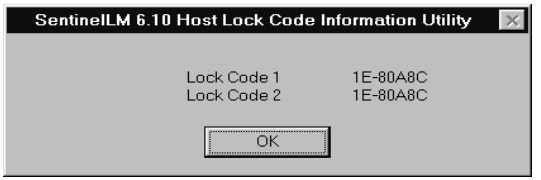
Compatibility Windows 95/98, Windows NT, and UNIX: **echoid**.
Windows 3.1x: **echoid16**.

Who/Where Run from the operating system command prompt by an administrative or application user on a stand-alone, client, or license server computer.

Options None.

Description An application or license server may be restricted to operation on certain computers. These restrictions are included in the license codes when they are created. Before a license code with any computer restrictions can be created by your vendor, you must take a fingerprint of your computer with the **echoid** program. Your vendor will tell you which computers you must run **echoid** on. The **echoid** command outputs either one or two hexadecimal locking codes depending upon how your vendor has it configured. You will send all locking information to your vendor. Your vendor will use this information, which is specific to your computers, to generate new license codes.

Display The **echoid** display looks like this:



See Also The discussion of the **lslic** command in “Installing License Codes” on page 7 and “Computer Fingerprints and Locking Codes” on page 2 in Chapter 1: “Getting Started.”

ipxecho - Display the IPX Network Address

Format `ipxecho`

Compatibility Windows 95/98 and NT only: **ipxecho**.

Who/Where Run by an administrative user on the computer containing the license server.

Options None.

Description Displays the IPX network address. When using the IPX network protocol, the license server host name must be the IPX address of the computer on which the license server resides. Use this utility to display that address. The address is returned in the form of four hexadecimal bytes (network-node address) followed by six hexadecimal bytes (IPX-address), for example:

```
00-00-12-34,00-00-86-1A-23-A3
```

linstall - Install a License Code

Format `linstall`

Compatibility Windows 95/98 and NT only: **linstall**.

Who/Where Run by an administrative user on a stand-alone computer to install a license code.

Options None.

Description Installs a license on the stand-alone computer.

See Also See “lslic, lsic16 - Install/Delete a License Code” on page 35.

loadls - Install the License Server as an NT Service

Format `loadls`

Compatibility Windows NT only.

Who/Where Run by an administrative user on a license server computer. User must have administrative privileges to load or remove an NT System Service.

Options None.

Description Installs or uninstalls the SentinelLM license server into the System Services registry.

See Also See "Windows NT Service" on page 21 in Chapter 2: "Configuring the License Server."

lsdecode - Decrypt and Display a License Code

Format

```
lsdecode [ -s <License-file> ]
[ -e <License-configuration-file> ]
```

Compatibility Windows 95/98, Windows NT, and UNIX: **lsdecode**

Who/Where Run from the operating system command prompt by an administrative or application user on a stand-alone, client, or license server computer.

Options One of the following options may be supplied:

Option	Description
-s *<License-file>*	The name of the license code file. If this is not specified, **lsdecode** uses the default file name, *lservrc*, in the current directory. The location of the license file can also be provided by the environment variable, *LSERVRC*.
-e *<License-configuration-file>*	The name of the configuration file, which may be needed in case readable license strings have been customized by remapping of fixed strings. By default, **lsdecode** looks for *<License-file>.cnf* file. The location of the configuration file can also be provided by the environment variable, *LSERVRCCNF*.

Description The **lsdecode** command decrypts part of the information in license code strings. This utility can be useful in determining the details of licensing agreements. It also enables you to decipher unknown codes.

lserv, lserv9x, lservnt - Start the License Server

Format `lserv [options]`

Compatibility Windows 95/98: **lserv9.x.**
Windows NT: **lservnt.**
UNIX: **lserv.**

Who/Where Run from the operating system command prompt by an administrative user on license server computers.

Options Below is a list of the most commonly used options. For a complete list, see see "LSERVOPTS - Set License Server Options" in Appendix A: "Using Environment Variables to Configure a License Server." It is recommended that you use the *LSERVOPTS* environment variable to make configuration changes to the license server, since options used at license server startup are in effect only until the license server is restarted.

Option	Description
-z *<usage-log-file-size>*	The maximum size of the usage log file. The size can be specified in bytes, kilobytes, or megabytes. For instance, **-z** 2000 means 2000 bytes, **-z** 2k means 2 kilobytes, **-z** 2m means 2 megabytes. The default value is 1 megabyte. Once the maximum size of the file is reached, the license server may trim the file or stop writing to it, depending upon the **-x** option. In case the license server starts up and finds an existing usage log file that is more than 10% larger than the maximum size specified by the **-z** option, the license server will *not* trim the file, to avoid inadvertently losing precious usage data, even if the **-x** option is not specified.

Option	Description
-x	By default, on overflow of the usage log file, the file will be trimmed by removing the first (oldest) 10% lines of the file. New usage records can then be appended to the file until it overflows again. If the **-x** option is specified, the file will not be trimmed on overflow, instead the license server will simply stop writing further records to the file.
-q	Quiet mode. When this option is specified, the license server will start up quietly without displaying its banner. Unexpected conditions will still be logged as usual. (UNIX only.)

Description Starts the license server and sets various license server options. Command line options are designed for temporary changes; these changes are only in effect until the license server is restarted. To make permanent changes, use the *LSERVOPTS* environment variable.

See Also Chapter 2: “Configuring the License Server” on page 11. Also see Appendix A: “Using Environment Variables to Configure a License Server” on page 51.

lslic, lsic16 - Install/Delete a License Code

Format

```
lslic { -a <license-code> | -A <license-code> | -d
<feature> <version> | -f <filename> | -F <filename> |
-removeall }
```

Compatibility Windows 95/98, Windows NT, UNIX: **lslic**.
Windows 3.1x: **lslic16**.

Who/Where Run from the operating system command prompt by an administrative user on a stand-alone, client, or license server computer. Works for stand-alone or network computers.

Options One of the following options must be specified:

Option	Description
-a	Adds a license code to the contacted license server without updating the license code file. (Change is temporary until the license server is restarted.)
-d	Deletes a feature/version from the contacted license server. (Change is temporary until the license server is restarted.)
-A	Adds a license code to the server's license code file and communicates the change to the contacted license server. (Change is permanent.)
-F	Adds all the license codes in the supplied file to the license server's license code file and communicates the new information to the contacted license server. (Change is permanent.)
-f	Adds all the license codes in the supplied file to the contacted license server without updating the license code file. (Change is temporary until the license server is restarted.)
-removeall	Removes all license codes from the license server but does not delete them from the license code file. (Temporary change.)

Description The **lslic** command installs or deletes a license. If you do not include necessary information on the command line, **lslic** will ask for the missing information. When you enter a license code, if you are entering an encrypted license code, type only the characters before the # symbol.

lslic can add or delete licenses without stopping and restarting the license server, but the change is temporary unless you use an option that makes the change to the license code file.

See Also "Installing License Codes" on page 7 in Chapter 1: "Getting Started."

lsmon, lsmon16 - Monitor License Server Transactions

Format `lsmon [ <Poll-interval_in_seconds> ] [ <Server-host> ]`

Compatibility Windows 95/98, Windows NT, UNIX: **lsmon**.

Windows 3.1x: **lsmon16**.

Who/Where Run from the operating system command prompt by an administrative or application user on a stand-alone, client, or license server computer.

Options One of the following options may be supplied:

Option	Description
<Poll-interval_in_seconds>	Enable periodic update at indicated rate. This option is supported on UNIX only.
<Server-host>	The name of the computer on which the license server is running.

Description **lsmon** retrieves information about all features currently licensed by the SentinelLM license server and clients using those features. If *<Server-host>* is omitted, **lsmon** will attempt to talk to the SentinelLM license server on the computer indicated in the *LSHOST* environment variable or in the *LSHOST* (or *lshost*) file. If the variable or the file does not exist, then it will attempt to contact a license server using the broadcast mechanism. If **lsmon** fails to find a SentinelLM license server, it will display an error message and exit.

On UNIX computers, you can use *<Poll-interval-in-seconds>* to specify that **lsmon** should keep monitoring and reporting usage activity instead of displaying information once and stopping. If specified, **lsmon** will wait for that many seconds between re-polls of the license server. **lsmon** monitors all licensed applications supported by a license server. If the license server supports protected applications from multiple vendors, then all licenses for all vendors will be displayed.

See Also “wlsquery - Query License Server Transactions” on page 39.

lsrvdown - Shut Down the License Server

Format `lsrvdown <host-name>`

Compatibility Windows 95/98, Windows NT, UNIX: **lsrvdown**.

Who/Where Run from the operating system command prompt by an administrative user on a client or license server computer. On Windows NT, user must have administrative privileges.

Options *<host_name>* specifies the name of the computer that is running the license server that you want to shut down.

Description Shuts down the named license server. The computer on which you are running **lsrvdown** must be in the same network domain as the license server computer. You must have administrative privileges, be logged in as user ADMIN, or be logged in as the same user who started the license server to use this utility.

lsusage - Display the SentinelLM Usage Log File

Format `lsusage <logfile>`

Compatibility Windows 95/98, Windows NT, UNIX: **lsusage**.

Who/Where Run from the operating system command prompt by an administrative or application user on a stand-alone, client, or license server computer.

Options *<logfile>* is a license server-generated usage log file.

Description **lsusage** displays a summary of application usage using a SentinelLM-generated log file. **lsusage** provides information on: Ratio of requests for licenses denied to total requests received. Average number of licenses in use at a time. Minimum time (in minutes) a license was issued. Maximum time (in minutes) a license was issued. Average time (in minutes) a license was issued. The log file may have been generated by either a stand-alone application or a network license server.

See Also Chapter 2: “Configuring the License Server” on page 11 and “wlsquery - Query License Server Transactions” on page 39.

lswhere, lswher16 - Display a List of License Servers

Format `lswhere`

Compatibility Windows 95/98, Windows NT, UNIX: **lswhere.**
Windows 3.1x: **lswher16**.

Who/Where Run from the operating system command prompt by an administrative or application user on a stand-alone, client, or license server computer.

Options None.

Description Use **lswhere** to display the network names of the computers running the license server.

wlsquery - Query License Server Transactions

Format `wlsquery`

Compatibility Windows 95/98, Windows NT: **wlsquery.**

Who/Where Run by an administrative user on a stand-alone, client, or license server computer. Select the **Server Status** shortcut or icon from the application program group or double-click *wlsquery.exe* in **Windows Explorer**.

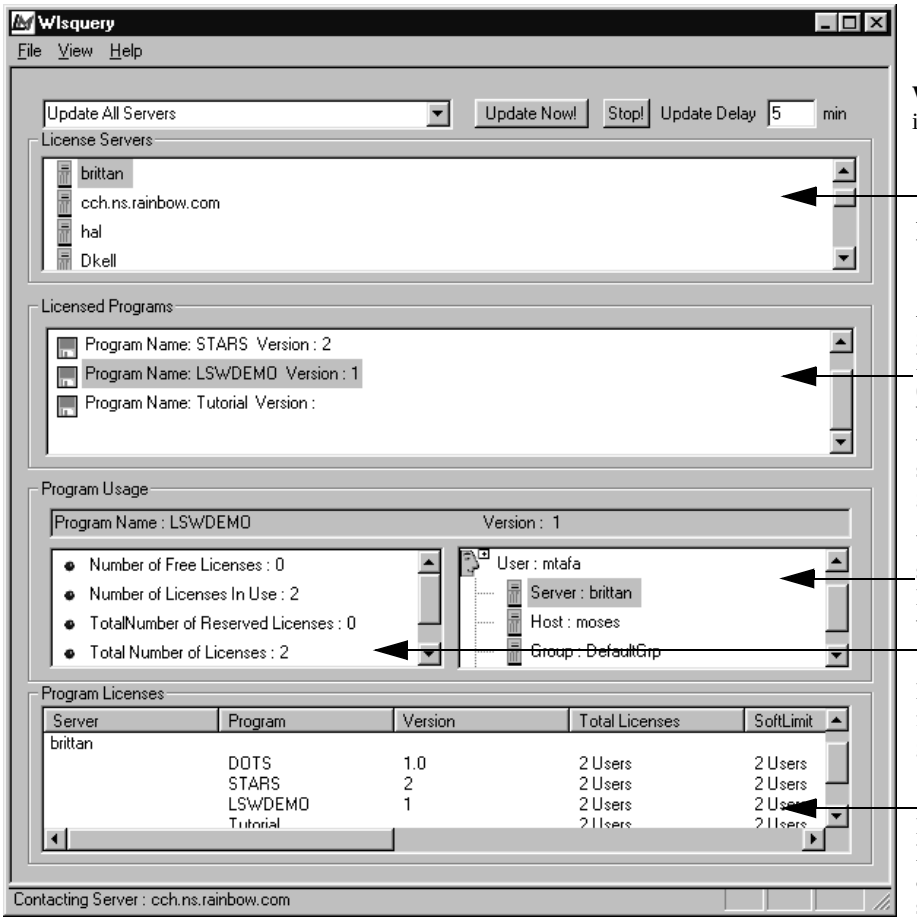
Options None

Description Provides information on licensing activities. Includes information on license servers detected, licensed programs running, details on active licenses, and information on licensed users. See below for a description of the **wlsquery** display.

The drop-down box at the top of the screen allows you to selectively update the display for all license servers, a particular license server, a particular program, or a particular license server and program. You may also select the

interval at which the display updates by using the **Update Display** text box. Or you may request an immediate update by clicking the **Update Now** button. You may interrupt **wlsquery**'s search for license servers by clicking **Stop**.

The **wlsquery** display looks like this:



Wlsquery shows information on:

All license servers on the network.

All licensed programs active on all license servers. (One program may be licensed by more than one license server.) Click a program to select it.

Users using the selected program. Double-click a user to see user details.

Details on licenses for the selected program.

Details on all licensed programs active on all license servers.

CHAPTER 4

Setting User Options

The following advanced options are available for SentinelLM users:

- Alerts
- Group allocation

An alert lets you know about license events, such as when a license reaches its expiration date. You specify alerts using a configuration file. There are seven alerts including hard and soft limits that can be generated. The reporting mechanisms are e-mail and script. For more information about alerts, see “Setting User Alerts” on page 41 below. Alerts are most frequently used with a network license server. This capability is also available, however for a stand-alone license application.

You can also use group reservations to restrict the right to run applications to particular users, computers, or groups. For more information, see “Setting Group Reservations” on page 46. The group reservations capability is only meaningful with a network license server.

Setting User Alerts

You can specify/configure alerts through a simple file interface.

The alerts handled are:

- Soft limit exceeded
- Hard limit reached (the maximum number of licenses allowed)

- License issued
- License returned
- License denied (occurs on the next request after the hard limit has been reached)
- License time-out
- License expiration date reached

The alert reporting mechanisms are:

- E-mail (UNIX only)
- Script

Alert Specification

To enable alerts, you need a configuration file with information on the license codes in the license code file.

Configuration information can be readable license remap statements, alert action statements, etc. The license server is the only entity that deals with alerts. The configuration file is read by the license server, **lsdecode**, and the license code generator, which ignore statements in the configuration file that they are not interested in. If the configuration file does not exist, no alerts will be reported. The file can contain the information on what to do with the alerts. If the configuration file is changed while the license server is running, the license server will need to be restarted in order for the changes to take effect.

The configuration file, *lservrc.cnf*, is a general-purpose configuration file associated with a particular license file. The environment variable, *LSERVRCCNF*, can specify the path to the configuration file. The path for *<LicenseFile>.cnf* is constructed from the license file path the user is using. *LicenseFile* can be specified using existing methods such as the license server startup **-s** option, or the *LSERVRC* environment variable. It is not an error for the configuration file to be missing.

The configuration file is broken into sections, headed by feature and version:

```
[feature_name1 feature_version1]
remap-statement-11
remap-statement-12
. . .
alert-action-11
alert-action-12
. . .
[feature_name2 feature_version2]
remap-statement-21
remap-statement-22
. . .
alert-action-21
alert-action-22
. . .
```

For more detailed information about the configuration file format, contact your vendor.

Each alert-action looks like:

```
<alert-type>=<reporting-mechanism1> ON/OFF
<reporting-mechanism2> ON/OFF
```

Each section can contain further customizing statements:

```
SCRIPT=<script-path>
EMAIL=<email-addr1> <email-addr2>...
```

<*alert-type*> can be:

- softlimit—Soft limit exceeded
- hardlimit—Hard limit reached
- appstart—License issued
- appstop—License returned
- denied—License denied
- apptimeout—License time-out
- expired—License expiration date reached

Note appstart and appstop may generate a lot of network traffic.

An expired alert will occur when either condition occurs:

- An expired license is added to the license server and the server does not already have an unexpired license for the same feature.
- license expires due to passage of time.

<*reporting-mechanism*> can be:

- script—The script given after SCRIPT= will be invoked
- email—E-mail will be sent to recipients given after EMAIL=

Line continuation is not supported, so all email addresses must fit on one long line. The maximum length of a line is 512 characters.

An example configuration file is shown below:

```
   # This file remaps the keyword “LONG” to “lng” for all readable
   # licenses for feature DOTS (any version).
   # It also provides alert actions for all features licensed
   # by the license server.
   # Note that the alert actions that apply to all non-DOTS
   # features do NOT apply to DOTS since DOTS has its own section.
[DOTS  *]    # For DOTS, we generate only the denied alert
   LONG=lng                          # Remap statement
   denied = Script OFF  Email ON
   EMAIL = britta@jupiter

[*  *]       # For non-DOTS apps, we generate most of the alerts
   softlimit = SCRIPT OFF EMAIL ON   # Alert action statement
   hardlimit = SCRIPT On  EMAIL On
   denied = Script on  Email ON       # This better not happen
   apptimeout = script on  Email off
   expired = SCRIPT on  email on
   EMAIL = mark@jupiter   # britta@jupiter -- she’s already overworked!
   SCRIPT = /usr/local/etc/lsalertscr
```

One section of the file can specify only a single alert script and a single e-mail address. For all alerts enabled in one section, the same alert script will be invoked.

SCRIPT

SCRIPT will receive the following command-line arguments:

```
SCRIPT <alert-type> feature,version user-name client-host-name limit
```

If a certain argument is not applicable to the alert that occurs, the value NONE is passed in place of that argument.

To be more specific, the values for limit will be:

- softlimit—Soft limit
- hardlimit—Hard limit
- appstart—Number of licenses checked out after the event
- appstop—Number of licenses checked out after the event
- denied—Number of licenses checked out when the event occurred
- apptimeout—Number of licenses checked out after the event
- expired—NONE

If script mechanism is ON, and there is no SCRIPT statement in the same section, script mechanism will be turned off.

If e-mail mechanism is ON, and there is no EMAIL statement in the same section, e-mail mechanism will be turned off.

EMAIL

E-mail alerts are available only on UNIX systems.

The mail sending program to use can be customized via the *MAILPGM* environment variable. If *MAILPGM* is not set, the first program found from the following locations will be used. Search the path in the license server's start-up environment (*PATH* environment variable). Any command/shell aliases will be ignored.

- "/usr/bin/mailx"

- “/usr/ucb/mail”
- “/usr/bin/mail”
- “/bin/mail”

If no program is found via search or *MAILPGM*, the e-mail mechanism will be off.

The mail program will be invoked in a manner equivalent to:

```
MAILPGM email-recipient-list <text-of-alert-message>
```

No subject is provided.

If your mail program accepts a subject via the **-s** option, you could use:

```
MAILPGM= /usr/ucb/mail -s “Alert message”
```

to receive a subject for outgoing alert email.

The configuration file is read once per feature&version on the first addition of that feature (not necessarily at the license server start time), and the statements for that feature&version are cached. If you change the entries applicable to a feature, you should restart the license server.

Setting Group Reservations

Group reservations give you the ability to exercise local administrative controls by associating a series of groups with each feature and reserving for each group a pool containing a certain number of licenses. Any licenses not specifically reserved fall into the general pool.

Including/Excluding Users

Selected users can be allowed to run certain applications or can be prevented from accessing applications. This can be used as an additional security measure.

Including/Excluding Computers

Certain computers can also be allowed to run or prevented from running applications. This can help to balance application usage when you want to prevent users from running applications on heavily loaded computers or file servers.

Configuring the Reservation File

A group specification consists of:

- The name of the feature for which the reservation applies;
- The name of the group;
- The number of licenses reserved for that group;
- And the login names of users or host IDs of computers that belong to that group.

The groups must be mutually exclusive. Different groups for the same feature should not have common users or computers. The number of licenses reserved for a feature cannot exceed the number of concurrent copies specified in the license code for that feature.

When the license server receives a request, it checks whether the user making the request belongs to a group. If so, and licenses are available for that group, the license server will issue the license(s) and remove them from that group's pool. Otherwise, requests will be serviced with licenses from the general pool until no licenses are available.

At start up, the license server consults the environment variable, *LSRESERV,* for the path and file name of the reservation file. If the variable is not set, the local directory is searched for the file, *lsreserv.* If no file is found, the license server assumes that no reservations exist.

Group reservations should be entered according to the following format, with one group per line:

```
feature_name[ ,ver ]:group_name:num_of_licenses:{ user_name | computer }
```

One or more of *user_name* and/or *computer* may be specified, but at least one value must be specified in the last field. Version number is optional. If no version number is specified, only the feature name is used.

The characters $ and ! have special meaning: $ indicates the computer name, and ! indicates a logical NOT.

For example, two users, one computer in group 1:

```
stars:group1:2:tom bryant $athena
```

One user, one computer in group 2:

```
stars:group2:1:doug $0x4f3c5801
```

One computer to be excluded from dots, two licenses to be reserved for jill:

```
dots:group1:2:!$0x592ae8b0 jill
```

In these examples, the two groups denoted as group1 are distinct because they specify different feature names.

The following apply to groups:

- A maximum of 256 groups with 256 members (user names or computer IDs) each are supported.
- Groups must be mutually exclusive.
- Different groups for the same feature should not have common users of computers.
- Group names and member names cannot exceed 16 characters each.
- The number of licenses reserved for a feature cannot exceed the number of concurrent copies specified in the license code for that feature.
- If the number of licenses reserved is zero or greater than the number of concurrent copies specified for the feature in the license code, the number of licenses specified in the license code will be used.

APPENDIX A

Using Environment Variables to Configure a License Server

This appendix contains information on configuring the license server through the use of the following environment variables:

Table A-1: Run-time Environment Variables

Variable	Where Documented
LSDEFAULTDIR	See “LSDEFAULTDIR - Set the Default Location of the License Server Files” on page 53.
LSERVOPTS	See “LSERVOPTS - Set License Server Options” on page 51.
LSERVRC	See “LSERVRC - Set the License Code File” on page 54.
LSERVRCCNF	See “LSERVRCCNF - Set the License Server Configuration File” on page 54.
LSFORCEHOST	“LSFORCEHOST - Select a Single License Server” on page 51.
LSHOST	See “LSHOST - Set the License Server Name” on page 50.
LSRESERV	See “LSRESERV - Set the License Server Reservation File” on page 55.

A Sentinel LM license server can be configured using operating system environment variables. There is also an environment variable that can be used to tell a protected application which license server to use. These variables are only used when you have a protected application that is used with network license codes. An application that is used exclusively with stand-alone license codes doesn’t require a license server. In this case, these configuration variables have no meaning.

This appendix describes the environment variables that can be used to configure a license server. Only a few of these variables are commonly used. The others are not used in most installations.

Note The method of setting an environment variable varies by operating system. A summary of the method for each supported operating system is included in “Notes on Setting Environment Variables by Operating System” on page 55. The examples below show how to set the variable in a Windows 95/98 environment. Be sure to follow the formats below exactly. For example, do not place a space before or after the equal sign in the SET variable statement. Also, all environment variables must be in all uppercase.

An application which has been built to support stand-alone license codes actually includes most of the capabilities of a license server. These capabilities do not include the ability to authorize license codes for other applications. They do include most of the server capabilities that can be selected using the environment variables. Most stand-alone installations never use these capabilities but they are available for those installations with special requirements. You will find a summary of which license server capabilities may be used with a stand-alone application in “Stand-alone Application Use of Environment Variables” on page 57.

Client - Commonly Used Variables

LSHOST - Set the License Server Name

The *LSHOST* environment variable is used on a computer that is running a protected application. It tells the application one or more license server computers to search for.

If this variable is not set then the application will search the network for any license server that can authorize the application to run. When the variable is set, the application will search for license servers beginning at the first license server in the list and moving down the list. If none of the specified license servers are found, the application will broadcast a search to the network, looking for any license servers.

Example:

To tell protected applications running on a Windows 95/98 based computer to send license requests to a computer on the same subnetwork called ACCT_SERVER and, if ACCT_SERVER is not found, to FINANCE_SRV, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSHOST=ACCT_SERVER:FINANCE_SRV
```

LSFORCEHOST - Select a Single License Server

You can use the *LSFORCEHOST* environment variable to force the application to look for only one license server computer. If the license server listed in the variable cannot be found, the application stops searching and returns an error. *LSFORCEHOST* overrides a *LSHOST* or *LSHOST/lshost* file, and prevents a network broadcast from being done.

Example:

To tell protected applications running on a Windows 95/98 based computer to send license requests to a computer on the same subnetwork called ACCT_SERVER and no other license server, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSFORCEHOST=ACCT_SERVER
```

License Server - Commonly Used Variables

LSERVOPTS - Set License Server Options

The *LSERVOPTS* environment variable is used to set license server options. All options that can be set using this variable can also be set via command line parameters when the operating system permits. If any command line parameters are present, then the *LSERVOPTS* variable is ignored by the license server. There are some environments in which it isn't possible to provide command lines parameters. To avoid contradictory settings and to use the same method of con-

figuring all servers, it's recommended to always use *LSERVOPTS* to set these options instead of providing them directly on the command line:

Table A-2: *LSERVOPTS* Options Summary

Option	Description
-s *<license-file>*	Specifies the name and location of the license code file. By default, the license server will use the file, *lservrc*, in the local directory. The location of the license code file can also be specified by the environment variable, *LSERVRC*.
-e *<license-configuration-file>*	Specifies the name and location of the optional license configuration file, which can contain configuration information for alerts, readable license codes, etc. By default, the license server will use the file, *<license-file>*.cnf (appends extension *.cnf* to the license file path it uses). The location of the configuration file can also be provided by the environment variable, *LSERVRCCNF*.
-l *<usage-log-file>*	Specifies the name and location of the license server's usage log file, which enables usage logging. By default, usage logging is disabled.
-z *<usage-log-file-size>*	The maximum size of the usage log file. The size can be specified in bytes, kilobytes, or megabytes. For instance, **-z** 2000 means 2000 bytes, **-z** 2k means 2 kilobytes, **-z** 2m means 2 megabytes. The default value is 1 megabyte. Once the maximum size of the file is reached, the license server may trim the file or stop writing to it, depending upon the **-x** option. In case the license server starts up and finds an existing usage log file that is more than 10% larger than the maximum size specified by the **-z** option, the license server will *not* trim the file, to avoid inadvertently losing precious usage data, even if the **-x** option is not specified.
-x	By default, on overflow of the usage log file, the file will be trimmed by removing the first (oldest) 10% lines of the file. New usage records can then be appended to the file until it overflows again. If the **-x** option is specified, the file will not be trimmed on overflow, instead the license server will simply stop writing further records to the file.
-f *<error-file>*	Specifies the name and location of the error file where the license server will log occurrences of unexpected conditions. By default, this is disabled until the option is specified. Then the license server will append to the *lservlog* file in the current directory.
-u *<group-reservations-file>*	Specifies the name and location of the optional group reservations file. By default, the license server uses the *lsreserv* file in the current directory. The location of the reservations file can also be provided by the environment variable, *LSRESERV*.

Table A-2: *LSERVOPTS* Options Summary (Continued)

Option	Description
-q	Quiet mode. When this option is specified, the license server will start up quietly without displaying its banner. Unexpected conditions will still be logged as usual. (UNIX only.)

Some license server options have a specific environment variable which can be used to set them. You can also set any of these options using *LSERVOPTS* but this isn't recommended. Any settings made with *LSERVOPTS* override any settings made using a specific environment variable. To avoid contradictory settings, it's recommended that the specific environment variables be used whenever possible.

Example:

To tell the license server running on a Windows 95/98 based computer to set a 2 megabyte limit on the log file, to stop logging when the file size limit is reached, and to start the license server in quiet mode, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSERVOPTS=-z 2m -x -q
```

License Server - Infrequently Used Variables

LSDEFAULTDIR - Set the Default Location of the License Server Files

The *LSDEFAULTDIR* environment variable can be used to set the default location of the license server files. It's recommended that the license server default directory not be changed. By default, the default directory is set to the directory the license server executable is located in.

Example:

To tell the license server running on a Windows 95/98 based computer that the default directory for license server files is a directory named, *C:\LS_FILE*S, place the following in the Windows 95/98 *autoexec.bat* file:

```
SET LSDEFAULTDIR=C:\LS_FILES
```

LSERVRC - Set the License Code File

The *LSERVRC* environment variable can be used to set the name and location of the license code file. It's recommended that the default name and location are used for this file. By default, this file will be called *lservc* and reside in the license server default directory.

Examples:

To tell the license server running on a Windows 95/98 based computer that license code file is in the current directory but named, *network.lic*, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSERVRC=NETWORK.LIC
```

To tell the license server running on a Windows 95/98 based computer that license code file name and path is, *C:\LS_FILES\NETWORK.LIC*, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSERVRC=C:\LS_FILES\NETWORK.LIC
```

LSERVRCCNF - Set the License Server Configuration File

The *LSERVRCCNF* environment variable can be used to set the name and location of the license server configuration file. This file is used in setting up user alerts and other options. It's recommended that the default name and location are used for this file. In most installations, this file will be called *lservc.cnf* and reside in the license server default directory. If *LSERVRCCNF* isn't used to specify the configuration file then the name and location of this file will be based upon the name and location of the license code file. In this case the configuration

file will reside in the same directory as the license code file and have the same base name as the license code file but with the extension .cnf.

Example:

To tell the license server running on a Windows 95/98 based computer that configuration file is in the default directory but named, *network.cnf*, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSERVRCCNF=NETWORK.CNF
```

LSRESERV - Set the License Server Reservation File

The *LSRESERV* environment variable can be used to set the name and location of the license server reservation file. This file is used by a system administrator to specify the computers and users are authorized to run a protected application. It's recommended that the default name and location be used for this file. By default, this file will be called *lsreserv* and reside in the license server default directory.

Example:

To tell the license server running on a Windows 95/98 based computer that the license code file is in the current directory but named, *reserve*, place the following in the Windows 95/98 *autoexec.bat* file.

```
SET LSRESERV=RESERVE
```

Notes on Setting Environment Variables by Operating System

The method used to set an environment variable varies depending upon the operating system. The following is a summary of the methods used for each operating system.

Windows 3.1x

Environment variables are set in Windows 3.1x by using the SET statement inside the *autoexec*.*bat* file.

In some installations, an environment variable setting will work differently under Windows 3.1x and Windows 95/98. This isn't true in the recommended installation but may be true if you have special installation requirements. For example, under Windows 95/98 the default location for many files, like *lshost*, is the directory the application was started from. In Windows 3.1x, the default location is the directory the SentinelLM DLL is located in. Since the recommended installation places the DLL and protected application in the same directory, this won't result in any differences on most installations.

Windows 95/98

Environment variables are set in Windows 95/98 by using the SET statement inside the *autoexec*.*bat* file.

Windows NT

In Windows NT, environment variables are set using the **Control Panel | System | Environment** dialog box. Windows NT Administrator privileges are needed to change these settings. Each environment variable should be added as an NT System Variable. On Windows NT, environment variables are read by the System Services when the computer boots. If you make changes to variables, you may need to reboot for them to take effect.

UNIX - Bourne or Korn Shell

On UNIX computers using the Bourne or Korn shell, environment variables are set by using the SET command at the command prompt, in a format similar to that for Windows 95/98. However, remember to enclose the environment variable parameters in quotation marks, and follow the SET command with an export command.

For example:

To set the default license code file name to *net2lic*, type:

```
SET LSERVRC=”net2lic”
;export LSERVRC
```

UNIX - C or TCSH Shell

On UNIX computers using a C or TCSH shell, environment variables are set by using the SETENV command at the command prompt in this format:

```
SETENV <variable> parameters
```

For example:

To set the default license code file name to *net2lic*, type:

```
SETENV LSERVRC net2lic
```

Stand-alone Application Use of Environment Variables

When running in stand-alone mode, the license serve code that is part of the application can be configured using most of the environment variables. These variables are used in the same way as they would be with a network license server. Those variables which are only appropriate for a network configuration are ignored by the stand-alone application. The differences between the use of these variables in stand-alone and network mode is described below.

LSHOST - Disable a Network License

Your application may have been built to support both stand-alone and network licensing. If it includes this capability then it will first try to obtain a stand-alone license using the license server capability that is built into the application. If unsuccessful then the application will try to obtain a network license by communicating with a license server located somewhere on the same subnet. You can

disable the network search by setting *LSHOST* to NO_NET. With this setting, the application only looks for a stand-alone license code.

LSERVOPTS - Set Application License Management Options

This variable can be set to configure the application license management options in a way that is similar to its use on a server computer to configure a license server. It's recommended that the **-z** and **-x** options be used to control the size of the usage file if logging has been enabled. The **-u** and **-q** options aren't meaningful in a stand-alone configuration and shouldn't be used. The remaining options are better set using a specific environment variable.

LSDEFAULTDIR - Set the Default Location of License Management Files

This variable can be used to set the default location of the license code and log files.

LSERVRC - Set the License Code File

This variable can be used to specify the file that is used to store the stand-alone license codes used by the application.

LSERVRCCNF - Set the Application License Management Configuration File

This variable can be used to specify the configuration file that is used with the stand-alone application.

LSRESERV - Not Used in Stand-alone Mode

This variable is only meaningful when used with a license server.

Index

A

additive licenses 12
alerts 41
  notification 45
  setting 41
autoexec.bat file 56

C

client 11
  configuring 24
communication protocols, checking 25
conventions
  syntax vii
  typographic vi

E

echoid command 30
environment variables
  LSDEFAULTDIR 53
  LSERVOPTS 20, 52
  LSERVRC 33, 42, 52, 54
  LSERVRCCNF 33, 42, 52, 54
  LSFORCEHOST 27, 51
  LSHOST 26, 27, 50
  LSRESERV 47, 52, 55
  MAILPGM 45
  stand-alone computers 57
error logging 20
event logging, Windows NT 22
exclusive licenses 12

F

files
  lservlog 20, 52
  lservrc 52
  lshost 26
  lsreserv 52, 55
fingerprint 2
  computing 30

G

group reservations 46, 55
  including/excluding computers 47
  including/excluding users 46
  reservation file 47
  setting 46
  specifying 47

H

hard limits 41

I

including/excluding computers and users 47
IPX protocol 31
ipxecho 31

L

license code 2
  adding/deleting 35
  decrypting 33
  displaying 33
  installing 35
  loading 13
license code file 11, 18
  location 18
  lservrc 18
  setting location 54
license server 3
  broadcast method identification 26
  client 24
  configuration file 54
  configuring 13, 17
  display information 39
  display list 39
  identifying 25, 51
  installing 21, 32
  monitoring 37

named license server identification 26
network address, IPX 31
platform compatibility 13
setting location 53
setting name 50
setting options 52
shutting down 38
starting 21, 34
licenses
adding and deleting 35
additive 12
authorization process 13
exclusive 12
installing 31, 32
renewing 16
linstall 31, 32
loadls command 21, 32
locking code 2
logging events, Windows NT 22
lsdecode command 33
LSDEFAULTDIR 53
lserv command 34
lserv.log 20
lserv9x command 34
lserv9x.exe 22
lservc file 54
lservlog file 52
lservnt command 34
LSERVOPTS 20, 52
LSERVRC 33, 42, 52, 54
lservrc file 52
lservrc.cnf 42
LSERVRCCNF 33, 42, 52, 54
LSFORCEHOST 27, 51
LSHOST 26, 27, 50
lshost file 26
lslic command 35
lslic16 command 35
lsmon command 27, 37
lsmon16 command 37
LSRESERV 47, 52, 55
lsreserv file 47, 52, 55
lsrvdown command 38
lsusage command 18, 38
lswher16 command 39
lswhere command 26, 39

M

MAILPGM 45

N

NetWare 23
license server 23, 31
network license 3

R

reservation file 47

S

Sentinel Track 29
soft limits 41
stand-alone computer 57
stand-alone license 3
syntax conventions vii
system requirements
NetWare 23
Windows 95/98 21
Windows NT 21

T

typographic conventions vi

U

usage log file 18, 38
file name 20
lserv.log 20
user alerts 41

W

warning messages 41
Windows NT 21
  event logging 22
  installing license server 21, 32
wlsquery command 26, 39
  display 40