

License Use Management



Using License Use Management Runtime for UNIX

Version 4.6

License Use Management



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Note

Before using this information and the product it supports, be sure to read the general information under "Notices".

ISO 9001 Certification

This product was developed using an ISO 9001 certified quality system. Certification has been awarded by Bureau Veritas Quality International (BVQI), (Certification No. BVQI-92053). BVQI is a world leader in quality certification and is currently recognized by more than 20 accreditation bodies.

Fourth Edition (November 2000)

This major revision obsoletes and replaces SH19-4361-02. The major changes are described in "Summary of Changes".

This edition applies to Version 4.6 of IBM License Use Management Runtime for UNIX, Program Numbers 5797-D34 (HP-UX), 5797-D36 (IRIX), 5797-D35 (Solaris) and to all subsequent releases and modifications until otherwise indicated in new editions. Make sure you are using the correct edition for the level of the product.

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Contents

| | | | |
|--|-------------|--|-----------|
| Figures | vii | License Policies | 12 |
| Tables | ix | Vendor Controlled Policies | 12 |
| Notices | xi | Capacity | 12 |
| Trademarks | xii | Try-and-Buy | 13 |
| About This Book. | xiii | Multiuse Rules | 13 |
| Who Should Use This Book | xiii | Product Wait Queues | 13 |
| How This Book is Organized | xiii | License Annotation. | 14 |
| Where to Find More Information. | xiv | Custom Configuration | 14 |
| README File | xiv | Bundle | 14 |
| man Pages for Command Syntax. | xiv | Product-Specific Program | 15 |
| HTML Files | xv | Customer Controlled Policies | 15 |
| LUM Web Site | xv | Hard Stop/Soft Stop | 15 |
| Notational Conventions | xv | User Access Restriction | 16 |
| Summary of Changes | xvii | Switching from Per-Server to Per-Seat Licenses | 16 |
| Chapter 1. Introduction | 1 | License-Enabling Models. | 16 |
| License Use Management at a Glance | 1 | Scalable Installation | 19 |
| License Use Management Vendor Perspective | 1 | Creating Licenses | 19 |
| License Use Management Customer | | Administering Licenses | 20 |
| Perspective. | 2 | High-Availability Licensing | 22 |
| Basic Concepts of License Use Management. | 2 | Backing Up Databases and Files | 23 |
| License-Enabling a Product | 2 | Working with Licensed Products | 23 |
| Nodelocked and Network Licenses. | 3 | Central Registry License Server | 24 |
| Managing Licenses | 3 | Working with Nodelocked Licenses (Non-Runtime-Based Enabling) | 24 |
| LUM Runtime Platforms | 4 | Working with Nodelocked Licenses (Runtime-Based Enabling) | 25 |
| License Passwords | 5 | Working with Use-Once Licenses | 26 |
| Use-Control Levels | 5 | Working with Concurrent Licenses | 28 |
| Vendor-Managed Use Products | 5 | Working with Reservable Licenses | 30 |
| Customer-Managed Use Products | 6 | Working with Per-Server Licenses. | 33 |
| License Types | 7 | Working with Per-Seat Licenses | 34 |
| Nodelocked Licenses | 7 | Chapter 2. Planning Network Licensing | 37 |
| Simple Nodelocked Licenses | 7 | Selecting Your Servers. | 37 |
| Concurrent Nodelocked Licenses | 7 | Network Computing System (NCS) | 39 |
| Use-Once Nodelocked Licenses | 8 | Installing on a Machine where NCS is Already Installed | 39 |
| Per-Server Licenses | 8 | Selecting a Type of Network Binding. | 40 |
| Network Licenses | 9 | Direct Binding | 40 |
| Concurrent Licenses | 10 | Namespace Binding | 41 |
| Reservable Licenses | 10 | Performance Considerations in Choosing a Binding | 42 |
| Use-Once Licenses | 11 | Planning Direct Binding | 43 |
| Per-Seat Licenses | 11 | Planning Namespace Binding | 43 |

| | | | |
|---|-----------|--|-----------|
| Planning Cells | 43 | Before Installing License Use Runtime | 61 |
| Selecting the Global Location Brokers | 44 | Hardware and Software Requirements | 62 |
| Running the Location Brokers | 45 | Obtaining the License Use Runtime Code | 62 |
| Running the Global Location Broker | | Installing the License Use Runtime | |
| Database Cleaner | 45 | Package | 62 |
| Using NCS Tools | 45 | After Installing License Use Runtime. | 62 |
| Reaching a Global Location Broker in a | | Uninstalling License Use Runtime. | 63 |
| Different Subnetwork | 46 | Installing the Java GUI on Solaris | 63 |
| Planning the Central Registry | 46 | Before Installing the Java GUI | 63 |
| Planning for Java Products Using Java Client | | Obtaining the Java GUI Code | 63 |
| Support | 47 | Installing the Java Gui Package | 63 |
| Planning Clusters for High-Availability | | After Installing the Java GUI | 64 |
| Licensing | 47 | Uninstalling the Java GUI | 64 |
| Restrictions on Cluster Size and | | Installing LUM Java Client Support on Solaris | 64 |
| Composition | 47 | Before Installing LUM Java Client Support | 64 |
| Examples of Cluster Size Rules. | 49 | Software Requirements | 64 |
| Cluster Membership Considerations | 50 | Obtaining LUM Java Client Support Code | 65 |
| Verifying Network Connections | 51 | Installing the LUM Java Client Support | |
| Network Examples. | 51 | Package | 65 |
| | | Uninstalling LUM Java Client Support | 65 |
| Chapter 3. Installing License Use | | | |
| Management Runtime | 55 | Chapter 4. Configuring LUM Runtime. | 67 |
| Installing License Use Runtime on HP-UX | 55 | Setting Up Your Servers and Clients | 67 |
| Before installing License Use Runtime | 55 | Configuring to Handle Nodelocked | |
| Hardware and Software Requirements | 55 | Licenses | 67 |
| Obtaining the License Use Runtime Code | 56 | Configuring to Handle Network Licenses | 67 |
| Installing the License Use Runtime Code | 56 | Determining the Configuration Required | 68 |
| After Installing License Use Runtime. | 56 | Before You Configure | 69 |
| Uninstalling License Use Runtime. | 56 | Customizing Log Information | 70 |
| Installing the Java GUI on HP-UX. | 57 | Automatically Starting License Servers | 71 |
| Before installing the Java GUI | 57 | Disabling Remote Administration | 71 |
| Obtaining the Java GUI Code | 57 | Configuring Direct Binding | 72 |
| Installing the Java GUI Package | 57 | Configuring Namespace Binding | 72 |
| After Installing the Java Gui | 58 | Using the Configuration Tools | 73 |
| Uninstalling the Java GUI | 58 | Using the Configuration Tool Script | 73 |
| Installing License Use Runtime on IRIX. | 58 | Using the Configuration Tool GUI | 74 |
| Before installing License Use Runtime | 59 | Using the Configuration Tool | |
| Hardware and Software Requirements | 59 | Command-Line Interface. | 74 |
| Obtaining the License Use Runtime Code | 59 | Scenario 1: Configuring a Standalone | |
| Installing the License Use Runtime | | Nodelocked License Server | 74 |
| Package | 59 | Configuration Script Equivalent | 76 |
| After installing License Use Runtime. | 60 | Command-Line Equivalent | 76 |
| Uninstalling License Use Runtime. | 60 | Scenario 2: Configuring a Nodelocked | |
| Installing the Java GUI on IRIX | 60 | License Server in a Network | 76 |
| Before Installing the Java GUI | 60 | Configuration Script Equivalent | 80 |
| Obtaining the Java GUI Code | 60 | Command-Line Equivalent | 80 |
| Installing the Java GUI Package | 60 | Scenario 3: Configuring a Network License | |
| After Installing the Java GUI | 61 | Server | 80 |
| Uninstalling the Java GUI | 61 | Configuration Script Equivalent | 84 |
| Installing License Use Runtime on Solaris | 61 | Command-Line Equivalent | 84 |

| | | | |
|--|-----------|---|------------|
| Scenario 4: Configuring the Central Registry License Server | 85 | Adding a Cluster Member | 120 |
| Configuration Script Equivalent | 88 | Deactivating a Server | 121 |
| Command-Line Equivalent | 88 | Viewing Licenses Being Served | 121 |
| Scenario 5: Configuring a Network License Client | 89 | Enrolling and Removing Licenses on a Cluster | 122 |
| Configuration Script Equivalent | 91 | Command-Line Equivalent. | 122 |
| Command-Line Equivalent | 91 | Scenario 12: Upgrading a Custom Configuration | 123 |
| Configuring to Reach a Global Location Broker in a Different Subnetwork | 92 | Command-Line Equivalent. | 126 |
| Starting and Listing Your Subsystems | 93 | Scenario 13: Managing Bundles | 126 |
| Verifying Connections to Servers License Servers on a System with Multiple Network Interfaces. | 93 | Command-Line Equivalent. | 127 |
| Example 1: Network License Clients on Two LANs | 94 | Chapter 6. LUM Runtime CLI | 129 |
| Example 2: Network License Clients on One LAN | 95 | i4btl - Basic License Tool | 130 |
| Solution 1. | 95 | i4cfg - Configuration Tool | 159 |
| Solution 2. | 95 | LUM Runtime and NCS Tools | 164 |
| Example 3: Internet Gateway | 95 | lb_admin - Local Broker Administration | 166 |
| Chapter 5. Daily Tasks | 97 | drm_admin - GLBD Replicas Administration. | 171 |
| Using the Basic License Tool GUI | 97 | lb_find - GLBs List | 175 |
| Starting the Basic License Tool GUI | 97 | uuid_gen - UUID Generator | 177 |
| Refreshing License Information | 98 | i4tv - Test Verification Tool. | 178 |
| Selecting Servers, Vendors and Licenses. | 98 | i4target - Target View Tool. | 180 |
| Performing Basic Administration | 99 | LUM Runtime and NCS Subsystems | 180 |
| Scenario 6: Managing a Licensed Product | 99 | llbd - Local Location Broker Subsystem | 181 |
| Enrolling the Product | 99 | glbd - Global Location Broker Subsystem | 182 |
| Distributing the Licenses | 103 | i4lmd - Network License Server Subsystem | 184 |
| Generating Reports | 104 | i4llmd - Nodelocked License Server Subsystem | 186 |
| Checking the Number of Product Users | 106 | i4gdb - Central Registry License Server Subsystem | 188 |
| Command-Line Equivalent. | 106 | i4glbcd - Global Location Broker Database Cleaner Subsystem | 190 |
| Scenario 7: Managing Reservable Licenses | 107 | i4lct - License Creation Tool | 191 |
| Command-Line Equivalent. | 110 | Chapter 7. Tips and Hints | 205 |
| Exercising Customer-Controlled Policies | 111 | Using the Built-In Backup and Recovery Procedure | 205 |
| Scenario 8: Switching from Per-Server to Per-Seat Licenses | 111 | Causes for Corrupted Definition or Database Files | 205 |
| Command-Line Equivalent. | 112 | NCS-Related Issues | 205 |
| Scenario 9: Using the Hard Stop/Soft Stop Policy | 112 | LUM Runtime-Related Issues | 205 |
| Command-Line Equivalent. | 114 | Automatic Backup Procedure | 206 |
| Scenario 10: Restricting User Access. | 115 | Recovery Procedure | 206 |
| Managing High-Availability Licensing (HAL) | 116 | Manual Backup | 207 |
| Scenario 11: Creating and Managing a Cluster | 116 | Manual Recovery | 207 |
| Creating a Cluster. | 116 | Managing the Reports Log Files | 207 |
| Activating Cluster Members | 118 | Managing Trace Files | 208 |

| | | | |
|--|------------|---|------------|
| Managing Coexistence of NCS and DCE (HP-UN only) | 209 | Performance in a Direct Binding Environment | 222 |
| Tuning the Environment to Manage the Workload | 210 | Performance in a Namespace Binding Environment | 222 |
| Tuning and Monitoring Your Environment | 210 | Manual Cleanup of GLB Databases | 223 |
| Changing the Values of the Environment Variables | 211 | Periodic Cleanup of GLB Databases | 224 |
| Displaying the Trace Output on the Monitor | 211 | Troubleshooting Heavy Server Workloads | 224 |
| Allowing for Log File Growth. | 211 | Troubleshooting LUM Runtime Subsystems | 224 |
| Removing the Log Files. | 211 | Starting Required Subsystems. | 224 |
| The Effect on Performance | 211 | Automatic Startup of Subsystems | 225 |
| Measuring Performance. | 212 | Restart and Recovery | 226 |
| Suggested Parameter Tuning | 212 | Troubleshooting Network Connections. | 226 |
| Background Reference Information | 212 | Troubleshooting Namespace Binding | 226 |
| Tuning the timeout to detect a non responding server. | 213 | Quick Checklist | 227 |
| Managing a Custom Configuration | 214 | LUM Runtime Clients Fail to Communicate with Servers | 227 |
| Before Requesting a License Upgrade | 214 | LUM Runtime Servers Fail to Communicate with Global Location Broker | 228 |
| Deleting Products or Reducing Numbers | 214 | Troubleshooting Direct Binding | 229 |
| Deleting Keys | 214 | Troubleshooting the Hardware | 229 |
| Chapter 8. Troubleshooting | 215 | Collecting Error Log Data | 230 |
| Checking the Version of LUM Runtime | 215 | Running Subsystems in Traced Mode | 230 |
| Checking License Details | 215 | Running Enabled Applications in Traced Mode | 230 |
| Troubleshooting Licenses (All Types) | 217 | Running Tools in Traced Mode | 231 |
| Troubleshooting Nodelocked Licenses | 217 | Collecting Other Data | 231 |
| Products Enabled for LUM Runtime Version 4. | 217 | Troubleshooting LUM Java Client Support | 232 |
| Products Enabled for Earlier Versions of LUM Runtime | 218 | Web Server Fails | 232 |
| Troubleshooting Network Licenses (All Types) | 219 | Java Program Cannot Read the User Name. | 232 |
| Troubleshooting Reservable and Reserved Licenses | 220 | Incomplete View of an Applet | 232 |
| Troubleshooting Per-Server and Per-Seat Licenses | 220 | Installing More than One Web Server on the Same Machine | 233 |
| Troubleshooting Licenses of Customer-Managed Use Products | 221 | Installing Java Client Support after Installing a Web Server | 233 |
| Troubleshooting Licenses of Vendor-Managed Use Products | 221 | Appendix A. LUM Runtime Configuration File | 235 |
| Troubleshooting License Databases | 221 | Appendix B. Using the Nodelock File | 245 |
| Troubleshooting Custom Configuration Licenses | 222 | Appendix C. Operating Systems and License Use Management Support | 247 |
| Troubleshooting Performance Problems | 222 | Glossary | 251 |
| Basic License Tool Performance | 222 | Index | 259 |

Figures

| | |
|---|-----|
| 1. Using a Nodelocked License (Non-Runtime-Based Enabling) | 24 |
| 2. Using a Nodelocked License (Runtime-Based Enabling) | 25 |
| 3. Using a Use-Once License | 26 |
| 4. Using a Use-Once License with Java Client Support | 27 |
| 5. Using a Concurrent License | 28 |
| 6. Using a Concurrent License with Java Client Support | 29 |
| 7. Using a Reservable License | 30 |
| 8. Using a Reservable License with Java Client Support | 31 |
| 9. Using a Per-Server License | 33 |
| 10. Using a Per-Seat License | 34 |
| 11. Using a Per-Seat License with Java Client Support | 35 |
| 12. NCS Cell with All the Subsystems on the Same Server | 51 |
| 13. NCS Cell with Network License Servers and Nodelocked License Servers | 52 |
| 14. NCS Cell with Three Network License Servers and Three Clients. | 53 |
| 15. Direct Binding with Network License Servers and Nodelocked License Servers. | 53 |
| 16. Direct Binding with Java Client Support | 54 |
| 17. Configuration Tool Notebook - Standalone Nodelocked License Server . | 75 |
| 18. Configuration Tool Notebook - Log Page | 76 |
| 19. Configuration Tool Notebook - Direct Binding Section | 78 |
| 20. Configuration Tool Notebook - Namespace Binding Section | 79 |
| 21. Configuration Tool Notebook - Network License Server | 81 |
| 22. Configuration Tool Notebook - Log Page | 81 |
| 23. Configuration Tool Notebook - Direct Binding Section | 82 |
| 24. Configuration Tool Notebook - Namespace Binding Section | 83 |
| 25. Configuration Tool Notebook - Central Registry License Server | 85 |
| 26. Configuration Tool Notebook - Direct Binding Section | 86 |
| 27. Configuration Tool Notebook - Namespace Binding Section | 87 |
| 28. Configuration Tool Notebook - Network License Client | 89 |
| 29. Configuration Tool Notebook - Direct Binding Section | 90 |
| 30. Configuration Tool Notebook - Namespace Binding Section | 91 |
| 31. Network License Clients on Two LANs | 94 |
| 32. Internet Gateway Connection | 96 |
| 33. Basic License Tool GUI - Main Window | 98 |
| 34. Import window for Custom Configuration | 100 |
| 35. Enroll Product Window (4102) | 101 |
| 36. Enroll Licenses Window | 102 |
| 37. Main Window with SMARTJava Enrolled | 102 |
| 38. Distribute Licenses Window | 103 |
| 39. Set Number of Licenses Window | 104 |
| 40. Reports Window | 105 |
| 41. Concurrent Users Page | 106 |
| 42. Details Notebook with Reservable Tab. Custom configuration serial number not shown. | 108 |
| 43. Reserving Reservable Licenses | 108 |
| 44. Details Notebook with Reserved Licenses | 109 |
| 45. Reserved Users Page with Reservable Licenses in Use. | 109 |
| 46. Un-Reserved Users Page. | 110 |
| 47. Reservable Page with Unreserved Licenses in Use. | 110 |
| 48. Enabling Per-Seat Licensing | 112 |
| 49. Main window with Soft-Stop Licenses in Use | 113 |
| 50. Update Licenses Window with High-Water Mark | 114 |
| 51. Create Cluster Window | 117 |
| 52. Define Cluster Members Window | 118 |
| 53. Clusters Window with New Cluster Added. | 118 |
| 54. Details of New Cluster | 119 |
| 55. Details of Cluster after Three Activations | 120 |
| 56. Clusters Window with Cluster ID | 120 |

| | | | | | |
|-----|--|-----|-----|---|-----|
| 57. | Details of Servers Serving HAL Test Product | 122 | 60. | Enroll Product Window for Custom Configuration | 125 |
| 58. | Initial State of the Concurrent Page for a Custom Configuration License . . . | 123 | 61. | Bundle Enrolled | 127 |
| 59. | Import Window for Custom Configuration | 124 | | | |

Tables

| | | | |
|---|----|---|-----|
| 1. LUM Runtime Platforms | 4 | 8. Configuration Options. | 69 |
| 2. License Types and Policies Available for LUM Products | 18 | 9. Valid Uses of i4lct | 192 |
| 3. NCS Tools. | 45 | 10. Optimizing Environment Variables | 210 |
| 4. Number of Servers in a Cluster. | 48 | 11. LUM Runtime and NCS Subsystems | 225 |
| 5. Example - Cluster with Three Initial Members | 49 | 12. Operating Systems and LUM Versions 4.5.2 and 4.5.5 Support | 248 |
| 6. Example - Cluster with Six Initial Members | 50 | 13. Operating Systems and LUM Versions 4.5.8, 4.5.9, and 4.6.0 Support | 249 |
| 7. Configuration Required to Support All Types of Licenses | 68 | | |

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About This Book

This book describes License Use Management Runtime for HP-UX, IRIX and Solaris (*LUM Runtime*). It contains information about how to set up:

- The servers where product licenses are to be installed
- The clients that use the products
- An environment that can support network licensing

It also explains how to manage the licenses for the products you install. Before reading this guide, read the documentation supplied with the licensed product.

Who Should Use This Book

This book is intended for:

- The system administrator who is responsible for setting up and administering the license management environment. This person must have general knowledge of:
 - HP-UX, IRIX and Solaris
 - The TCP/IP transport protocol
 - The network environment
- The end users who run the software products and the LUM Runtime product. End users require only general knowledge of the HP-UX, IRIX and Solaris operating environment.

How This Book is Organized

This book is organized into the following sections:

Chapter 1. Introduction provides an overview of License Use Runtime features and benefits, describes supported license types, license policies, and license-enabling models, and presents some simple scenarios of the use of licensed products.

Chapter 2. Planning Network Licensing provides the basic NCS concepts you need to set up your network and manage licenses.

Chapter 3. Installing License Use Management Runtime explains how to install, uninstall, and upgrade License Use Runtime components.

Chapter 4. Configuring LUM RuntimeChapter 4. Configuring LUM Runtime provides scenarios for configuring License Use Runtime, administering product licenses, and exercising customer-controlled policies, using the License Use Runtime tools.

Chapter 5. Daily Tasks describes daily tasks such as administering product licenses, and exercising customer-controlled policies.

Chapter 6. LUM Runtime CLI documents the License Use Runtime command line interface (CLI).

Chapter 7. Tips and Hints explains how to better take advantage of License Use Runtime.

Chapter 8. Troubleshooting explains how to improve performance and handle problems, should they arise when you use license-enabled products.

Appendix A. LUM Runtime Configuration File provides reference information on the configuration file.

Appendix B. Using the Nodelock File explains how to edit a nodelock file.

Appendix C. Operating Systems and License Use Management Support identifies the operating systems supported by License Use Management and, where appropriate, the conditions of their support.

The Glossary explains terms used in this manual.

Where to Find More Information

This section lists other sources of information for LUM Runtime.

README File

For changes to LUM Runtime that were made after the book was finished, see the README.ARK file in the download package from the LUM Web site.

man Pages for Command Syntax

To display the man pages, you may need to add an entry to the MANPATH environmental variable in the .profile . The new entry must specify the directory

```
opt/lum/1s/os/hpux/doc/en_US
opt/lum/1s/os/svr4.sgi/doc/en_US
opt/lum/1s/os/solaris/doc/en_US
```

To get help with the syntax of a particular command, go to the *language* directory and type:


```
man command_name
```

This displays the command syntax. For example, to get help with the command `i4blt`, type:

```
man i4blt
```

HTML Files

To view an HTML file, open it in your Web browser.

The files are in the directory:

```
opt/lum/lum/os/hpux/doc/en_US
```

```
opt/lum/lum/os/svr4.sgi/doc/en_US
```

```
opt/lum/lum/os/solaris/doc/en_US
```

There are HTML versions of:

- LUM Runtime for HP-UX, IRIX and Solaris Message Reference:
`lummsg.htm`
- This book (*Using LUM Runtime for HP-UX, IRIX and Solaris*):
`lumusg.htm`

A PDF version of this book is available for download from the IBM LUM Web site.

- *Using Application Developer's Toolkit* (if Application Developer's Toolkit is installed in your environment):
`lumtk.htm`

This book describes how to license-enable software products for use with License Use Management.

LUM Web Site

For information and news about IBM License Use Management, and to download LUM Runtime publications and code, visit the IBM LUM Web site at:

```
http://www.software.ibm.com/is/lum
```

Notational Conventions

This book uses the following notation in text:

- | | |
|--------------------|--|
| Bold | Bold print indicates something you click, select, or type, such as a menu option, field, or push button. |
| <i>Italics</i> | Italics are used for variables, for new terms in the text, and for emphasis. |
| Monospacing | Monospacing is used for system messages and examples. |

Summary of Changes

The fourth edition of this book incorporates late changes to Versions 4.5.5 through 4.5.9 of LUM Runtime, which were documented in the README.ARK and README.JCS files for those versions.

This section summarizes the changes made to this book to reflect new and changed function and support.

Additional operating systems supported

LUM Runtime supports the additional operating systems:

- IBM AIX Version 5.0 for IA-64
- Microsoft Windows 2000
- Sun Solaris 2.8

Operating systems no longer supported

OS/2 and Windows NT for Alpha are no longer supported.

Java GUI

You can now choose to configure LUM Runtime and run daily management tasks using a Java GUI. A new section of this book describes how to install the Java GUI. See “Chapter 3. Installing License Use Management Runtime” on page 55.

New application programming interface for Java applications

A new application programming interface enables Java clients to interact directly with the license server without using the Java Client Support. This interaction is possible only for Java clients running on HP-UX and Solaris.

Administering groups of licenses

You can group license-enabled products and administer the group as a unique entity. Such a group is called a “bundle.”

Pricing products by system capacity

Product pricing can be based on the number of users or on the characteristics of the system on which the products run, such as the number of processors or disks.

Displaying licenses and license user databases

You can run the basic license tool to display lists (`i4blt -l`) and product license status (`i4blt -s`), and can generate reports (`i4blt -r`) without having administrator privileges. These options are also available through the equivalent GUI actions.

Detecting a nonresponding server

You can modify the amount of time that a license-enabled application is to wait before a connection is lost.

Automatically cleaning up stale licenses

Stale licenses on configured servers are automatically cleaned up at start-up and during each refresh. The automatic clean-up is triggered by a configurable tag in the `i4ls.ini` file.

Testing high-availability licensing clusters

You can test a high-availability licensing (HAL) cluster that has been configured and activated by means of the `i4tv` command. This command tries to contact all servers that are in serving state, to request all 10 000 licenses of the HAL Test Product.

Improved cluster reliability

When a network fails and is then resumed, any cluster it contains is automatically restarted after a brief interval.

Improved reliability of license server databases

To improve the reliability of license server operations, the structure of the server databases has been modified, so that license information is separated from user information.

Annotation extension for simple nodelocked licenses

The length of the annotation field for simple nodelocked licenses enrolled in the nodelock file is extended to 255 characters.

Defining multiuse rules for the same accessor ID

Vendors can define their own multiuse rule based on a generic string that identifies the requestor of the license.

Enrolling multiple license certificates simultaneously

Using the basic license tool, you can now enroll more than one license certificate at a time.

Product-specific program

Vendors can specify in the license password the name of a program that is to run automatically when a license is enrolled.

Languages supported

LUM Runtime 4.6.0 supports only U.S. English. LUM Runtime 4.5.5 information files are not compatible with LUM Runtime 4.6.0.

Chapter 1. Introduction

License Use Management Runtime (referred to here as *LUM Runtime*) is part of IBM License Use Management, a combination of tools for software asset protection. The License Use Management tools enable software vendors and their customers to ensure that customers comply with the terms and conditions of license agreements. They check compliance through runtime monitoring of the usage of software assets.

License Use Management at a Glance

License Use Management consists of two products:

License Use Management Application Developer's Toolkit (LUM ADK)

Enables vendors to implement license management in an application. To implement license management, vendors embed API calls and API code in their products. The product is then described as *license-enabled*. Vendors can license-enable C-language programs, Java applications, and Java applets.

The LUM ADK offers the vendor great flexibility in:

- Level of control exercised by the license-enabled application
- Type of customer licensing environment for which the application is intended
- Implementation of policies

The LUM ADK is a priced product of IBM. The vendor who acquires the kit receives a copy of the License Use Management software, and gets royalty-free rights to redistribute License Use Management Runtime within the license-enabled application.

LUM Runtime

Enables users of license-enabled software to manage the licensing environment. The LUM Runtime software is free of charge and is available for download from the IBM License Use Management Web site:

<http://www.software.ibm.com/is/lum>

License Use Management Vendor Perspective

License Use Management benefits software vendors by enabling them to:

- Ensure that customers use software licenses within entitled limits
- Base product prices on actual usage
- Protect intellectual property from unauthorized use
- Increase overall revenue as customers acquire all the licenses they need

- Distribute software for a trial period with trial licenses that can be replaced by production licenses, thus minimizing distribution cost

License Use Management Customer Perspective

License Use Management benefits the customers of software vendors by enabling them to:

- Ensure that they have enough licenses to satisfy their business requirements and, at the same time, that they are not paying for more licenses than they need
- Base software charges within the enterprise on actual usage
- Demonstrate license use compliance to internal and external auditors
- Protect organizations from inadvertent violations of license agreements
- Change software assets to alternative pricing policies that the vendor offers

Basic Concepts of License Use Management

A *license*, in the context of License Use Management, is permission to use an instance of a licensed software product or service, according to the basis on which the vendor charges for the product or service. The term *license* in this context does not refer to the license agreement that governs use of and rights to a product.

License-Enabling a Product

Vendors deliver licenses to customers in the form of a *license password*. The password contains encrypted terms of the usage of the software product, such as:

- The number of licenses or concurrent copies of the product the customer can use
- The expiration date of the licenses
- The license type (see “License Types” on page 7)

In the license-enabling process, the vendor can:

- Select among the various license types
- Decide to distribute licenses one-by-one or in packages of multiple licenses from which individual licenses can be extracted (see “License Passwords” on page 5)
- Implement direct controls over the use of licenses, or make it possible for the customer to control use of licenses (see “Use-Control Levels” on page 5)
- Impose, or allow the user to impose, various types of control over administration of licenses (see “License Policies” on page 12)

When the product is installed, LUM Runtime checks that a license is available each time the product is run.

Nodelocked and Network Licenses

Vendors can supply licenses in two forms: *nodelocked* licenses or *network* licenses.

A *nodelocked* license is a license for a specified workstation (node). It is stored on the specified workstation, and the license-enabled product will run on only that workstation.

A *network* license is a license, stored on a server, that can be used by any client workstation. Many LUM Runtime clients can share the licenses for enabled products.

The licenses are stored on one or more network license servers. Each client workstation must be connected to a server. When the user at a client starts a licensed program, LUM Runtime at the license server determines whether a license is available.

License-enabled Java products can have network licenses or nodelocked licenses. For network licenses that use Java Client Support, a Web server computer, rather than the end-user workstation on which the application or applet runs, can also serve as a client. See “Planning for Java Products Using Java Client Support” on page 47.

Managing Licenses

LUM Runtime includes the *basic license tool*, which manages both nodelocked and network licenses. The basic license tool enables you to:

- Add licenses to or delete licenses from the server database
- Display information about the licenses installed
- Distribute the licenses among the license servers available on the network
- Reserve licenses for the exclusive use of certain users
- Generate reports on license usage and server events

The basic license tool has a graphical user interface (GUI) and a command-line interface (CLI). For more information about what the basic license tool does, see “Chapter 5. Daily Tasks” on page 97.

LUM Runtime Platforms

Table 1 shows which platforms LUM Runtime supports, and where to get the LUM Runtime code.

Table 1. LUM Runtime Platforms

AIX 5 for IA-64

LUM Runtime 4.6 base code is part of the base operating system, and is installed on every workstation when the operating system is installed.

You can install Version 4.6 from the License Use Management CD-ROM or from the product package downloaded from the IBM LUM Web site:

<http://www.software.ibm.com/is/lum>

AIX 4.3.3

AIX 4.3.2

AIX 4.3.1

AIX 4.3.0

The following levels of LUM Runtime are part of their associated level of the AIX operating system. They are installed on each workstation when AIX is installed.

| AIX Level | LUM Runtime Level |
|-----------|-------------------|
| 4.3.3 | 4.5.5 |
| 4.3.2 | 4.5.0 |
| 4.3.1 | 4.0.1 |
| 4.3.0 | 4.0.0 |

Optional packages and filesets can be installed from the AIX installation media.

To upgrade to LUM Runtime Version 4.6, download the code from the IBM LUM Web site:

<http://www.software.ibm.com/is/lum>

LUM Runtime Version 4.6 can either be redistributed with the license-enabled product or be downloaded from the IBM LUM Web site:

<http://www.software.ibm.com/is/lum>

Windows® 2000

Windows NT® 4.0

Windows NT Server 4.0,
Terminal Server Edition

Windows NT Server 4.0

Windows 98

Windows 95

Sun Solaris 2.6, 2.7, and 2.8

HP-UX 10.20 and 11.0

Silicon Graphics IRIX 6.3, 6.4,
and 6.5

License Passwords

Vendors provide license passwords (also known as *license keys*) with their products.

A license password is an encrypted character string. It contains information about the license, such as:

- The type of license (see “License Types” on page 7)
- The date when the licenses become active
- The date when the licenses expire

There are two types of password: simple and compound. A *simple password* represents one or more licenses. A *compound password* contains multiple simple passwords, each of which represents one or more licenses.

Note: The expiration date of simple licenses that are contained in a compound password must fall on or before the expiration date of their compound password.

Compound passwords can be used as follows:

- Vendors use compound passwords to distribute multiple licenses to their customers.
- The customer installs the compound password on the assigned license server. The customer extracts the licenses and distributes them, as required, to different license servers. (These servers are not specified in the compound password.)
- A sales representative extracts the licenses from the compound password and distributes them to customers.

The vendor includes the password, along with other information about the application, in the *enrollment certificate file* (ECF). You then make licenses available to users of the product by *enrolling* the product using the license password. See “Enrolling the Product” on page 99.

Use-Control Levels

Products can have one of the following predefined use control levels:

- Vendor-managed use control
- Customer-managed use control

Vendor-Managed Use Products

With vendor-managed use (VMU) products, the vendor manages compliance with the terms of the acquisition of the software product.

When you request licenses for a vendor-managed use product, the product vendor asks you to supply the unique identifier (target ID) of each

workstation where you intend to install the product licenses. For nodelocked licenses, this is the identification of the workstation where the enabled product is to be installed; for network licenses, this is the network license server. You must also supply the number of licenses that you want to acquire. The vendor uses this information to create the password that you use to install and activate the licenses.

Vendors ship a vendor-managed use product typically with a simple password. They can also use compound passwords for this purpose.

If you want to change the terms and conditions of the contract (for example, to increase the number of licenses), you provide the vendor with similar information for each of the workstations on which you intend to install the licenses and get a new password.

A vendor can produce a vendor-managed use license password with target ID set to ANY, so that you can install it on any workstation. The vendor can deliver such a password with the product package without your specifying how many licenses you want to acquire. Instead, the vendor sets an upper limit, possibly very large, on the number of licenses you can install on each license server. By generating and delivering such a password, the vendor has decided not to perform the checks that are normally associated with vendor-managed use.

Customer-Managed Use Products

To provide vendors with greater flexibility in the way they deliver licensed software, LUM Runtime supports customer-managed use (CMU) control. With products that are enabled in this way, the vendor does not directly associate licenses with a particular license server (or group of license servers). The vendor does not set an upper limit on the number of licenses that you are entitled to use. Instead, it is your responsibility to set that upper limit, depending on the terms of the software product acquisition.

LUM Runtime provides you with the information on the usage of the enabled products, thereby helping you stay within the boundaries of the acquisition agreement. Transactions, such as enrollment, distribution of licenses, updates, and deletions, are logged in a tamper-proof LUM Runtime database.

Vendors typically ship a customer-managed use product with a compound password that you can use to extract and distribute the number of licenses you have acquired. They can also use simple passwords for certain types of licenses.

License Types

This section describes the types of license the vendor can select. When you receive a license-enabled product, check the product documentation to determine the license type.

Nodelocked Licenses

A nodelocked license restricts the use of a product to the workstation specified in the license. Vendors typically use nodelocked licenses for standalone applications, rather than for client/server applications.

For nodelocked licenses there are two license-enabling models: *non-runtime-based* and *runtime-based*. If a vendor chooses non-runtime-based enabling, the license-enabled product itself, rather than LUM Runtime manages use of the nodelocked license. The password for such a product is stored in a *nodelock file*. When you start the application, it checks the nodelock file to ensure you have a valid license. If the vendor chooses runtime-based enabling, management of the nodelocked license is performed by the nodelocked license server on the local workstation. You then use the basic license tool to view and update information about the nodelocked licenses. See “License-Enabling Models” on page 16 for more information about license-enabling models.

Vendors can enable their products to use the following kinds of nodelocked licenses:

- Simple nodelocked licenses
- Concurrent nodelocked licenses
- Use-once nodelocked licenses
- Per-server licenses

Simple Nodelocked Licenses



A simple nodelocked license allows an unlimited number of simultaneous uses of the licensed application on the local workstation. Simple nodelocked licenses are valid only for vendor-managed use products. A word processor is a typical example of a product that uses nodelocked licenses.

Concurrent Nodelocked Licenses



The concurrent nodelocked license is local to the node where the application has been installed. It allows a limited number of simultaneous uses of the licensed application. A typical example of a concurrent nodelocked license is a client/server application. The application server is able to recognize the number of clients connected to it and ask for a license for each of them.

Vendors can use concurrent nodelocked licenses for both vendor-managed and customer-managed products.

When you enroll a customer-managed product, you must specify how many concurrent nodelocked licenses you have acquired for the product. The administrator can modify this number at any time.

Use-Once Nodelocked Licenses



A use-once nodelocked license permits a single use of a licensed product on a particular workstation. Every time the product is started, one license is consumed.

A typical use of use-once nodelocked licenses is to distribute promotional or demonstration versions of software.

Vendors also provide use-once nodelocked licenses to supplement concurrent nodelocked licenses during times when user demand for those products exceeds the number of available concurrent nodelocked licenses.

Vendors can use use-once nodelocked licenses for both vendor-managed and customer-managed products.

When you enroll the licenses for a customer-managed product, you must specify how many use-once nodelocked licenses you have acquired for the product. The administrator can modify this number at any time.

Per-Server Licenses



Per-server licenses are similar to concurrent nodelocked licenses, except that at any time, you can change them into per-seat licenses (see “Scenario 8: Switching from Per-Server to Per-Seat Licenses” on page 111).

Vendors use per-server/per-seat licenses to enable client/server applications constructed for multiple-server solutions. With both per-server and per-seat licenses, the server of a licensed client/server application can request licenses for its clients. The application clients need not be license-enabled.

With per-server licensing, each application server license is associated with a specific number of application clients. This represents the maximum number of application clients that may concurrently request services from that application server. The application client licenses are stored locally on the application server workstation and are granted temporarily to requesting application clients. Multiple application servers grant licenses independently

of one another; if the same application client connects to more than one application server, the application client is granted more than one license. You should therefore probably use per-server licenses only in an environment where:

- Each application client connects to only a single application server, or
- Each application client uses the application infrequently for brief periods

When your environment grows in such a way that application clients are connecting to multiple application servers, you can convert your per-server licenses to per-seat. With per-seat licensing, unused application client licenses are kept in a central repository, which all the application servers share. They also share a central list of application clients to which a license has been assigned. When a license is assigned to an application client, the license remains assigned to the application client even when it is not using the product. If an application client connects to multiple application servers, it is assigned only one license.

Per-server licenses are valid only for customer-managed use products.

Network Licenses

Network licenses, rather than being restricted to a single workstation, are stored on a network license server and shared among multiple network license clients.

Vendors can enable their products to use the following kinds of network licenses:

- Concurrent licenses
- Reservable licenses
- Use-once licenses
- Per-seat licenses

Concurrent Licenses



A concurrent license is a network license that can be temporarily granted to run the licensed application on a client.

When the product is running, that license remains unavailable to other users of the product. When the product stops running, the license is returned to the server, where it becomes available to other users.

Concurrent licenses allow as many users to run a licensed application simultaneously as there are valid licenses for the product available from the network license servers in your licensing environment.

A typical use of concurrent licenses is for products with relatively expensive licenses that each user will use only some of the time. The customer orders fewer licenses than there are users to optimize use of the licenses. Such applications may be either client/server applications, for which the client is enabled, or non-client/server applications.

Vendors can use concurrent licenses for both vendor-managed and customer-managed products.

Reservable Licenses



A reservable license is a network license that you can reserve for the exclusive use of a user, a group, or a node. The reservation is for a specified time period. A reservable license that has been reserved is called a reserved license. A reservable license that has not been reserved is called an unreserved license.

When a reserved license is granted from the network, the license is stored on the workstation where the licensed application is running. Thereafter, the license can be used on the workstation, even if the workstation is disconnected from the network, until the reservation expires.

A typical use of reservable licenses is for the client part of a client/server application that is likely to run on a portable computer that is often disconnected from the network. Another typical use is for a compiler being

used in software development. During a build process involving many compilations, it is more efficient to reserve a compiler license for a day or two than to make a separate request for a compiler license for every compilation

You can reserve some of the reservable licenses for an application and leave others unreserved. Unreserved licenses are treated like concurrent licenses.

Vendors can use reservable licenses for both vendor-managed and customer-managed products.

Use-Once Licenses



A use-once license is a network license that permits a single use of a licensed product during the time the license is valid. Every time the product is started, one license is consumed.

A typical use of use-once licenses is to distribute promotional or demonstration versions of software.

Vendors also provide use-once licenses to supplement concurrent licenses when user demand for those products exceeds the number of available concurrent licenses.

Vendors can use use-once licenses for both vendor-managed and customer-managed products.

Per-Seat Licenses



Vendors use per-server/per-seat licenses to enable client/server applications constructed for multiple-server solutions. With both per-server and per-seat licenses, the server of a licensed client/server application can request licenses for its clients. The application clients need not be license-enabled.

For per-seat licensing, unused application client licenses are kept in a central repository, which all the application servers share. They also share a central list of application clients to which a license has been assigned. When a license for a C or C++ application or for a Java application that uses the Java native interface is assigned to an application client, that assignment is permanent. If an application client connects to multiple application servers, it is assigned only one license.

You will probably want to use per-seat, rather than per-server, licenses in an environment where application clients connect to multiple application servers. (See also “Per-Server Licenses” on page 8.)

Per-seat licenses are valid only for customer-managed use products.

License Policies

Vendors can enable their products to implement various policy decisions regarding how licenses are managed.

Vendor Controlled Policies

The vendor can implement the license policies: capacity, try-and-buy, multiuse rules, product wait queues, license annotation, custom configuration, bundle, and product-specific program.

Capacity

With this policy vendors can comply with the terms and conditions of products that are priced based on certain characteristics of the system on which the product is running, not only on the number of users who are using the product. This includes, for example, the number of processors on which the application can run or the maximum size of the physical memory.

In such cases the vendor can specify a “capacity type” that defines the unit of measure for the internal counter (“capacity units”) associated to the license password. The capacity type is an integer value between 1 and 255; some of these values have a predefined value, others may have any vendor specific meaning.

The current predefined capacity types are:

- Online processors
- Configured processors
- Physical disks
- Physical memory (in MB)

When you use one of the predefined capacity types, the LUM library embedded in the license application can calculate the number of capacity units that are consumed by the application itself. In the other cases the vendor must calculate them before passing the results to the LUM library. In either case, the license is granted only if the capacity type of the password matches the capacity type specified in the request, and the capacity units are not exceeded. This applies to simple nodelock, concurrent nodelock, and concurrent network license types, under either vendor-managed or customer-managed use control.

Note: Not all the above capacity types are supported on all the platforms (see *Using License Use Management Application Developer's Toolkit*).

Try-and-Buy

The vendor can enable a product with a special simple nodelocked license for customers to use during an evaluation period. The evaluation period (with duration set by the vendor) starts either when the product is enrolled or when the product is run for the first time.

Multiuse Rules

Multiuse rules define the conditions under which multiple invocations of a product require only a single license. These rules are applicable only to concurrent network, concurrent nodelocked, and per-server licenses.

The vendor can enable a product so that after a license has been granted to a particular user, group, node, job ID, or accessor ID, a second invocation of the product does not require a second license. An accessor ID is a generic string that can be used by the vendor to further identify the caller of the license request.

For example, if a user invokes a compiler repeatedly, a multiuse rule might specify that the second and subsequent invocations do not require additional licenses. Multiuse rules may be based on any combination of the following tests that the server performs when a concurrent license is requested:

- The request for a license is associated with the same user as a previous request.
- The request for a license is associated with the same group as a previous request. The vendor can also change the meaning of the “same group” rule to implement a vendor rule. For example, the vendor might implement a multiuse rule that applies when a request is associated with the same display as a previous request. Vendors can also modify the meaning of “same group” in other ways, to implement whatever multiuse rules they design. Any vendor-specific rule overrides the “same group” rule.
- The request for a license is associated with the same node as a previous request (applicable to concurrent licenses only).
- The request for a license is associated with the same job ID as a previous request.
- The request for a license is associated with the same accessor ID as a previous request.

Product Wait Queues

Some products with concurrent licenses may use wait queues.

When a user invokes such a product, and there are no licenses available, the product can be enabled to ask if the user wants to wait for a license. If the user responds affirmatively, the user is added to the wait queue on each LUM Runtime network license server that provides concurrent licenses for the

product. User names are added to the wait queue in chronological sequence. When a license becomes available, it is granted to the first user in the queue.

License Annotation

License annotation is data that is defined and included as part of the license information when a license is created. When the license is granted, the data is passed to the enabled application for its own use. Licenses of any type can be annotated.

A typical use of license annotation is to create licenses that correspond to different configurations of the same product. Consider an application that has several optional priced features, all delivered as part of the product package. The vendor can create license annotations to define which options the customer has bought and, therefore, which features are accessible to the end user.

Custom Configuration

Vendors who want to offer selected combinations of products, tailored more precisely to the needs of users, can define custom configurations by adding functions and products to a base configuration.

You specify the required content of a custom configuration when you order the configuration. You can order a custom configuration for one *seat* or for a block of any number of identical seats. If you order a configuration for a block of seats, the quantity of each add-on function or product must equal the number of seats in the block.

Each custom configuration, whether for a single seat or for a block of two or more seats, is assigned a separate custom configuration license. A custom configuration license is a special case of a concurrent network license or a concurrent or simple nodelocked license that contains a unique serial number identifying that custom configuration. The single serial number and license for a block configuration helps you to manage your installed licenses more easily.

After initial installation of a custom configuration, you can better manage the evolution and growth of your configurations, by ordering additional “add-on” functions and products, as necessary. To retain a single serial number and license, however, any changes made to the custom configuration must be applied to all seats under that serial number.

Bundle

Sometimes it may be useful to treat a set of products as a unique entity. By defining *bundles*, licensing system administrators can manage the licenses referring to products as a unit.

The licensing system administrator can view all the bundles in a licensing system and see the licenses that are in bundles. You cannot delete individual licenses in a bundle, but you can delete the bundle.

Also, it is possible to verify the consistency of a bundle if all the licenses in the bundle have been enrolled.

Products in the bundle are linked by a common serial number, but each product is still represented by its own license password. The custom configuration policy, however, provides a way of bundling in which all the products are represented by a single license.

Product-Specific Program

Vendors who need to perform some product-specific actions at the moment of the license enrollment can define in the license password the name and path of a program that LUM Runtime will run as part of the enrollment process. The product is responsible for the existence of such a program on the workstation where the enrollment takes place. If LUM does not find the program the enrollment fails. This policy is only available for simple nodelock licenses under a non-runtime-based enabling (see “License-Enabling Models” on page 16).

Customer Controlled Policies

The customer can exercise the license policies: hard stop/soft stop, user access restriction, and per-server/per-seat switch.

Hard Stop/Soft Stop

The vendor can enable a product so that you can choose the behavior of the product when the end user starts it and no licenses are available.

If no license is available, one of two things can happen:

- The product does not start, and there is no way for the end user to go on (hard stop policy).
- The product starts (soft stop policy).

When you enroll a product enabled for hard stop/soft stop, the default is hard stop. To use soft-stop, you must enable a network license server with the correct option. You can use the basic license tool to change the policy to soft stop and back again. For details, see “Scenario 9: Using the Hard Stop/Soft Stop Policy” on page 112.

When the soft stop policy is set, LUM Runtime keeps track of the high-water mark. The high-water mark is the maximum number of licenses ever granted for a given product beyond the number of licenses that are enrolled for that product. You can see this number through the basic license tool, and you can reset it to 0. Use this number to help you decide the number of additional

license keys you need. When the hard stop policy is selected, the number of in-use licenses cannot exceed the number of enrolled licenses, so the high-water mark is not maintained.

While for CMU policies the user can exploit the LUM Runtime hard stop/soft stop policy, VMU application vendors can decide to have a soft stop policy that is under the full control of the enabled application itself.

User Access Restriction

You can use the user file to control which users have access to licenses for specific products. The user file is a flat ASCII file that you create using a text editor. For each product in the file, there is a list of users. It lists either those who are allowed to use the product (in which case no one else can use it) or those who are not allowed to use it (in which case anyone else can use it).

For details, see “Scenario 10: Restricting User Access” on page 115.

Switching from Per-Server to Per-Seat Licenses

Vendors of client/server applications who choose per-server/per-seat licensing provide you with two enrollment certificates:

- The per-server certificate, containing a per-server password
- The per-seat certificate, containing a per-seat password

You have the option to start in per-server mode, and switch at any time to per-seat mode, or start directly in per-seat mode. Once the per-seat mode has been activated, it is not possible to go back to per-server mode.

For information to help you decide between per-server and per-seat, see “Per-Server Licenses” on page 8 and “Per-Seat Licenses” on page 11. For information about how to perform the switch, see “Scenario 8: Switching from Per-Server to Per-Seat Licenses” on page 111.

License-Enabling Models

The product vendor can create license-enabled products that use nodelocked or network licenses. The enablement of nodelocked licenses can be either non-runtime-based or runtime-based.

If the vendor chose non-runtime-based enabling (nodelocked licenses only), the product does not make use of LUM Runtime on the workstation where the product runs. Following the vendor’s installation instructions, you may be required to store the password for such a product in a vendor-selected nodelock file. When you start the application, it checks the nodelock file to ensure you have a valid license. It is not necessary for the nodelocked license server to be running for the license to be granted. Information about use of

the product is not logged. You cannot use the basic license tool to view information or get reports about the product and its usage.

If the vendor chose runtime-based enabling for a product with nodelocked licenses, the product makes use of LUM Runtime on the workstation where the product runs. It does not require configuration unless the end user has special requirements. The password for such a product is stored in the nodelocked license database. When you start the application, it contacts the nodelocked license server, which checks its database to ensure you have a valid license. Information about use of the product is logged. You can use the basic license tool to view information or get reports about the product and its usage.

A network license-enabled product makes use of LUM Runtime on the workstation where the product runs and requires some limited configuration on that workstation. The licenses are stored on one or more network license servers. When the user at a client starts a licensed program, LUM Runtime at the license server determines whether or not a license is available.

Table 2 on page 18 summarizes the license-enabling models, license types, and license policies.

Table 2. License Types and Policies Available for LUM Products

| License-Enabling Model | License Types Available | License Policies Available |
|--|--|--|
| Nodelocked* License-Enabled Products (Non-Runtime-Based Enabling) | Simple Nodelocked | Try-and-Buy License Annotation Custom Configuration Capacity Product-Specific Program |
| | Nodelocked License-Enabled Products (Runtime-Based Enabling) | Try-and-Buy License Annotation Capacity Bundles Custom Configuration |
| | Use-Once Nodelocked | User Access Restriction License Annotation |
| | Concurrent Nodelocked, Per server | Hard Stop/Soft Stop† Multiuse Rules User Access Restriction License Annotation Capacity† Bundles |
| | Network License-Enabled Products | Hard Stop/Soft Stop† Multiuse Rules User Access Restriction Product Wait Queues License Annotation Capacity† Bundles Custom Configuration |
| | Reservable | Hard Stop/Soft Stop (when unreserved) User Access Restriction License Annotation |
| | Use-Once | User Access Restriction License Annotation |
| | Per-Seat | Hard Stop/Soft Stop User Access Restriction Per-Server/Per-Seat switch License Annotation |

* This applies only to C-language applications.

† Soft-stop does not work with capacity for customer-managed use licenses.

Scalable Installation

LUM Runtime consists of separate installable features, so that you can install exactly what you need on each workstation.

For example, in AIX 5.0 for IA-64, all required LUM Runtime features are automatically installed on every AIX workstation as part of AIX 5.0 for IA-64 installation. You can install optional features, such as the graphical user interface, either when you install AIX or later.

On Windows, you can select the appropriate features depending on the role the workstation is to play in your licensing environment. There are features for runtime, communications and online documentation. Vendors can, optionally, incorporate the communications feature into the installation images of their license-enabled products at the minimum level of installation and configuration the products require. Alternatively, they can specify that you download and install LUM Runtime.

When you configure LUM Runtime, the configuration tool recognizes which features are installed and presents only the options consistent with the installed feature.

The tool for configuring LUM Runtime license servers and clients (i4cfg) has a command-line interface and a graphical user interface on all platforms, and an alternative, interactive script interface on all UNIX platforms.

Creating Licenses

LUM Runtime includes a tool that creates product licenses for the use of vendors who create license-enabled products. Two uses of the license creation tool are:

- The tool enables vendors to create these kinds of passwords:
 - Test passwords, for use in testing while enabling a product
 - Production passwords, to deliver to customers

Distribution of production passwords to customers depends on the use control level of the license-enabled products:

For customer-managed use control products, the customer receives the license password together with the product package.

For vendor-managed use control products, for IBM license-enabled products, the customer requests the license password from the IBM country software password distribution center. For non-IBM license-enabled products, the customer requests the license password from the vendor software password distribution center.

To create production passwords, vendors must acquire the license for this tool from IBM or from Isogon Corp. The address of Isogon Corp. is:

Isogon Corporation
330 Seventh Avenue
New York, New York 10001
U.S.A.
Tel: (+1) 212-376-3200
Fax: (+1) 212-376-3280

- The tool is also useful for vendor sales representatives, who can be provided by the vendor with a production compound password for a vendor-managed use product. The compound password contains many licenses, from which the sales representative extracts licenses for individual customers.

For details about how to use this tool, see “i4lct - License Creation Tool” on page 191.

Administering Licenses

The *basic license tool* is used to administer licenses.

The basic license tool has a command-line interface and a graphical user interface on all platforms.

It enables you to:

- Manage all types of licenses.
The administrator can use the basic license tool to manage nodelocked and network licenses.
- Add, update, or delete licenses.
Add licenses to or delete licenses from the network license server or nodelocked licensed server database; update information about existing customer-managed use licenses.
- Display information about licenses.
Display a notebook of information about the licenses installed for each product.
- Distribute licenses.
Extract licenses from a compound password and distribute them among the network license servers available on the network.
- Reserve licenses.
Manage the reservation of reservable licenses for the exclusive use of certain users.
- Manage multiple network and nodelocked license servers.

From any properly configured workstation, you can view and manage licenses that are installed on any network license server and on any nodelocked license server in the network. Working at a single administration site, you can manage all kinds of licenses on all workstations. The capability to manage licenses on nodelocked license servers is particularly useful for per-server and concurrent nodelocked licenses.

- Generate reports.

Standard Event Report. Displays detailed information about significant events that occur on the license servers that you specify.

License Request by Product Report. Displays statistical information about the use of the licenses of a product in the time interval that you specify. For each product, it reports the licenses that were requested, the licenses that were granted, and the percentage of rejections.

License Request by User Report. Displays statistical information about the use of products by users in the time interval that you specify. For each user, it reports the licenses that were requested, the licenses that were granted, and the percentage of rejections.

License Use by Product Report. Displays statistical information about the use of the licenses of a product in a specified time interval. For each product, it reports:

- The maximum number of nodes that used licenses for the product at the same time
- The maximum number of users that used licenses for the product at the same time
- The average time the licenses were in use

License Use by User Report. Displays statistical information about the use of the licenses by each user in a specified time interval. For each user, it reports the times the user requested licenses and the length of time the user kept the licenses in use.

Customer-Managed Use Audit. Reports the following information for customer-managed use product transactions:

- Vendor name
- Product name
- Product version
- Administrator information
- Time stamp
- Number of licenses
- Transaction type (for example, product enrolled, license distributed, license deleted, license updated, per-server/per-seat license migrated)

- Signature stamp (user, group, and node)
- Signature information
- Use the high-water mark.

When the soft-stop policy is in effect, the high-water mark is recorded in the licensing database. The high-water mark is the maximum number of licenses ever granted for a given product beyond the number of licenses that are enrolled for that product. You can see this number through the basic license tool and can reset it to 0. This number assists you in deciding how many additional licenses (when customer-managed) or license keys (when vendor-managed) you need. When the hard stop policy is selected, the number of in-use licenses cannot exceed the number of enrolled licenses, so the high-water mark is not maintained.
- Set the threshold.

You can set a threshold percentage of licenses. If more than the threshold percentage of licenses for a product are in use, messages about the level of usage are logged. There is a single threshold that applies to all vendor-managed products. You can change that threshold, and you can also set a separate threshold for each product.
- Exercise customer-controlled policies.

You can switch between hard stop and soft stop, switch from per-server to per-seat, and manage the identifiers of application clients using per-seat licenses.
- Administer high-availability licensing (see “High-Availability Licensing”).

Create clusters, activate and deactivate members of clusters, and show cluster status.
- Administer bundles.

Display a list of bundles, display a list of bundle features, and delete bundles.

For help on using the basic license tool, see “Performing Basic Administration” on page 99.

High-Availability Licensing

High-availability licensing enables you to set up an environment in which there is a very high degree of certainty that concurrent licenses will be available, even if a network license server goes down.

When you use this option, you create a cluster of network license servers. A cluster is a group of from 3 to 12 network license servers that jointly serve vendor-managed concurrent licenses that are enrolled on the cluster rather than on an individual server.

You can create and administer a cluster, and administer high-availability licenses, from any workstation. However, no Windows 95 or Windows 98 network license server can be a member of a cluster.

While some servers in the cluster are serving licenses, one or more servers remain in reserve, ready to take over should an active server fail.

Each active server serves an equal share of the licenses enrolled on the cluster. When a server becomes unavailable and another server takes its place, responsibility for the licenses is automatically redistributed among active servers.

For high-availability licensing to work for a particular product, the product vendor must supply a password tied to a cluster rather than to an individual target server.

High-availability licensing works only with the IP protocol and does not support the product wait queue policy. Before you decide to use high-availability licensing for a product, make sure such a password is available from the product's vendor.

High-availability licensing is recommended only for users who are already experienced with managing individual license servers and who already have a stable licensing environment working.

For planning information, see “Planning Clusters for High-Availability Licensing” on page 47. For an example, see “Scenario 11: Creating and Managing a Cluster” on page 116.

Backing Up Databases and Files

On license servers, there is an automatic backup procedure for LUM Runtime databases and files. See “Using the Built-In Backup and Recovery Procedure” on page 205.

Working with Licensed Products

This section explains what happens when a user starts a licensed product, depending on how the product is enabled.

Only C, C++, and Java programs can be license-enabled.

In the figures and text in this section, references to the *enabled application* or *enabled applet* refer to the application or applet itself (which contains API calls) plus the embedded code that services the API calls (which carries out the described steps).

This section assumes that, if required:

- LUM Runtime is installed properly.
- LUM Runtime is configured properly.
- A Web server computer is set up properly for Java applications and applets that use Java Client Support (JCS).
- The network is running properly.

If not, what happens depends on how the vendor enabled the product. See the product documentation for details.

Central Registry License Server

Some of the scenarios in this section show the use of a *central registry license server*. The central registry is a repository of information that all the other network license servers can use. If you plan to install customer-managed use products with network licenses, or products with reservable licenses, you must identify one (and only one) central registry. Otherwise, the central registry license server is not required.

The central registry can contain:

- A record of all per-seat licenses
- The list of application clients to which per-seat licenses have been granted
- A record of soft stop license use
- The high-water mark
- Reserved licenses that have not yet been granted

Working with Nodelocked Licenses (Non-Runtime-Based Enabling)

Figure 1 shows what happens when an end user invokes a C or C++ application with nodelocked licenses for which the vendor chose non-runtime-based enabling. The licenses must be simple nodelocked licenses.

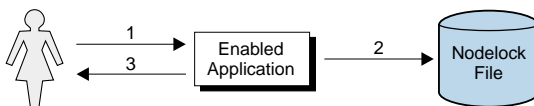


Figure 1. Using a Nodelocked License (Non-Runtime-Based Enabling)

1. The end user invokes the application.
2. The application checks the nodelock file to ensure a license is stored on the local system.
3. If there is a valid license in the nodelock file, the application runs. If not, depending on how the vendor enabled the application, it may return information to the end user, or it may run even with no license available.

For information about how to edit a nodelock file, see “Appendix B. Using the Nodelock File” on page 245.

Working with Nodelocked Licenses (Runtime-Based Enabling)

Figure 2 shows what happens when an end user invokes an application with nodelocked licenses for which the vendor chose runtime-based enabling. The licenses can be simple nodelocked, use-once nodelocked, or concurrent nodelocked licenses.

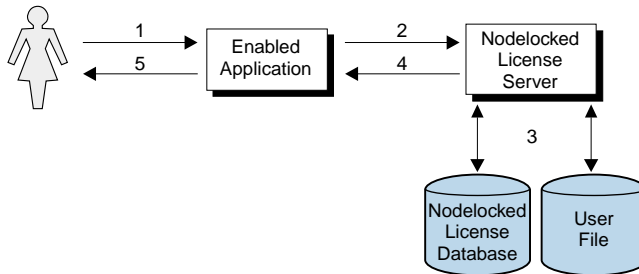


Figure 2. Using a Nodelocked License (Runtime-Based Enabling)

1. The end user invokes the application.
2. The application requests a license from the nodelocked license server on the local system.
3. The nodelocked license server checks that there is a valid license on the workstation and that this user is authorized to use it.
If there is no nodelocked license but the application uses concurrent nodelocked licenses and implements the soft stop policy, the nodelocked license server checks for a soft stop license and checks the user file for authorization.
4. The nodelocked license server returns the status of the license request to the application.
5. If a license was found and granted, or if a soft stop license was granted, the application runs. If no license can be granted, depending on how the vendor enabled the product, the application may return information to the end user, or it may run even with no license available.

Working with Use-Once Licenses

Figure 3 shows what happens when an end user invokes an application with use-once licenses.

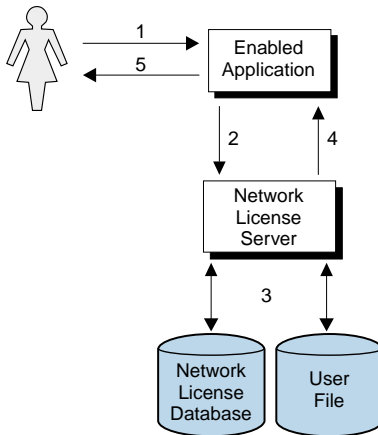


Figure 3. Using a Use-Once License

1. The user invokes the application.
2. The application requests a license from the network license server.
3. The network license server checks its license database for an available license and the user file for authorization.
4. The network license server returns the status of the request to the application. If a license was found and granted, the application runs, and one license is subtracted from the number of available use-once licenses.
5. If no license can be granted, depending on how the vendor enabled the product, the application may return information to the end user, or it may run even with no license available.

Figure 4 shows what happens when an end user invokes a Java application or applet with use-once licenses, using Java Client Support. In this case, the Web server computer, rather than the end user's workstation, serves as the network license client.

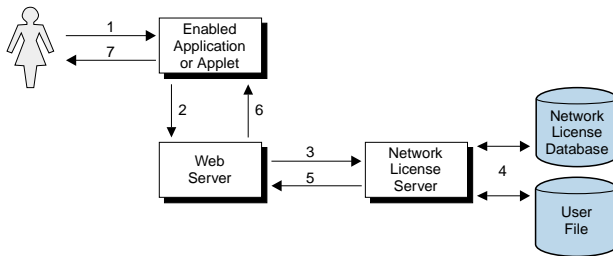


Figure 4. Using a Use-Once License with Java Client Support

1. The user invokes the application or downloads the applet through a Web browser.
2. The application or applet sends a license request to the Web server using the http protocol.
3. The Web server requests a license for the application or applet from the network license server.
4. The network license server checks its license database for an available license and the user file for authorization.
5. The network license server returns the status of the request to the Web server. If a license was found and granted, one license is subtracted from the number of available use-once licenses.
6. The Web server returns the status of the request to the application or applet, using the http protocol. If the status is OK, the application or applet runs.
7. If no license can be granted, depending on how the vendor enabled the application or applet, it may return information to the end user, or it may run even with no license available.

Working with Concurrent Licenses

Figure 5 shows what happens when an end user invokes an application with concurrent licenses.

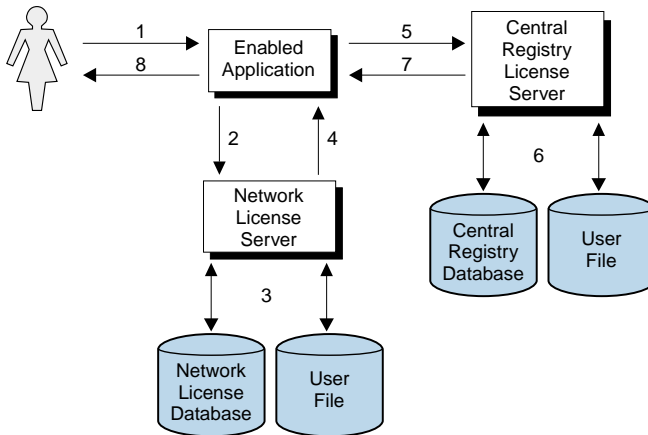


Figure 5. Using a Concurrent License

1. The user invokes the application.
2. The application requests a license from the network license server.
3. The network license server checks its license database for an available license and the user file for authorization.
4. The network license server returns the status of the request to the application. If a license was found and granted, the application runs.
5. If a network license was not found, and the application implements the soft stop policy, the application requests a soft stop license from the central registry license server.
6. The central registry license server checks its database for a soft stop license and the user file for authorization.
7. The central registry license server returns the status of the request to the application. If a soft stop license was granted, the application runs.
8. If no license can be granted, depending on how the vendor enabled the product, the application may return information to the end user, or it may run even with no license available.

Figure 6 shows what happens when an end user invokes a Java application or applet that has concurrent licenses using Java Client Support. In this case, the Web server computer, rather than the end user's workstation, serves as the network license client.

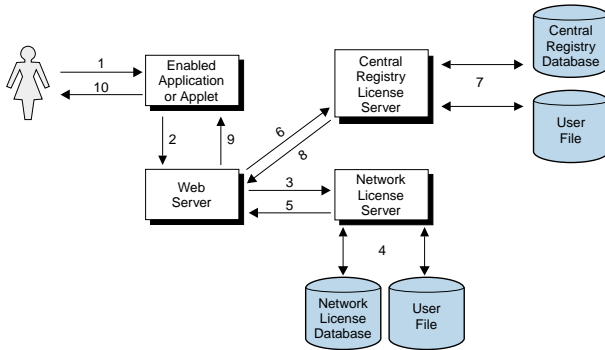


Figure 6. Using a Concurrent License with Java Client Support

1. The user invokes the application or downloads the applet through a Web browser.
2. The application or applet sends a license request to the Web server using the http protocol.
3. The Web server requests a license for the application or applet from the network license server.
4. The network license server checks its license database for an available license and the user file for authorization.
5. The network license server returns the status of the request to the Web server. If a license was found and granted, the Web server returns a positive status to the application or applet, and it runs.
6. If no concurrent license was found, the Web server requests a soft-stop license from the central registry license server.
7. The central registry license server checks its database for a soft-stop license and the user file for authorization.
8. The central registry license server returns the status of the request to the Web server.
9. The Web server returns the status of the request to the application or applet, using the http protocol. If the status is OK, the application or applet runs.
10. If no license can be granted, depending on how the vendor enabled the application or applet, it may return information to the end user, or it may run even with no license available.

Working with Reservable Licenses

Figure 7 shows what happens when an end user invokes an application with reservable licenses.

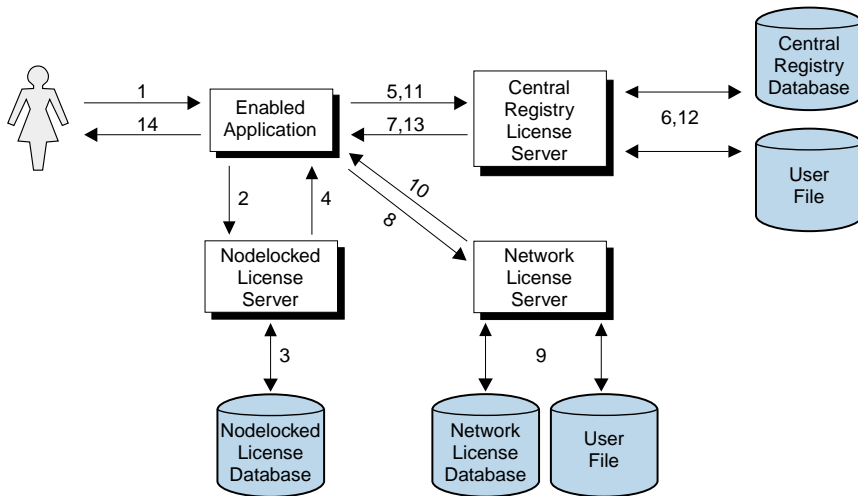


Figure 7. Using a Reservable License

1. The user invokes the application.
2. The application requests a reserved license from the nodelocked license server.
3. The nodelocked license server checks its database for a reserved license. This is a license that you reserved for the user. It was granted to the user and stored on the local workstation, in response to a previous request.
4. The nodelocked license server returns the status of the request to the application. If a license was found, the application runs.
5. If the nodelocked license server does not find a license, the application requests a reserved license from the central registry license server. This is a license that you have reserved for this user, group, or workstation.
6. The central registry license server checks its database for a reserved license and the user file for authorization.
7. The central registry license server returns the status of the request to the application. If a reserved license was found and granted, it is stored in the nodelocked license server's database, and the application runs.
8. If a reserved license was not found, the application requests a reservable license from the network license server. This is a reservable license that you have not reserved for anyone.
9. The network license server checks its license database for a reservable license and the user file for authorization.

10. The network license server returns the status of the request to the application. If a reservable license was found and granted, the application runs.
11. If a reservable license was not found, and the application implements the soft stop policy, it requests a soft stop reservable license from the central registry license server.
12. The central registry license server checks its database for a soft stop reservable license and the user file for authorization.
13. The central registry license server returns the status of the request to the application. If a soft stop license was granted, the application runs.
14. If no license can be granted, depending on how the vendor enabled the product, the application may return information to the end user, or it may run even with no license available.

Figure 8 shows what happens when an end user invokes a Java application or applet with reservable licenses using Java Client Support. In this case:

- The Web server computer, rather than the end user's workstation, serves as the network license client.
- Reserved licenses, when granted, are not moved to the nodelocked license server.

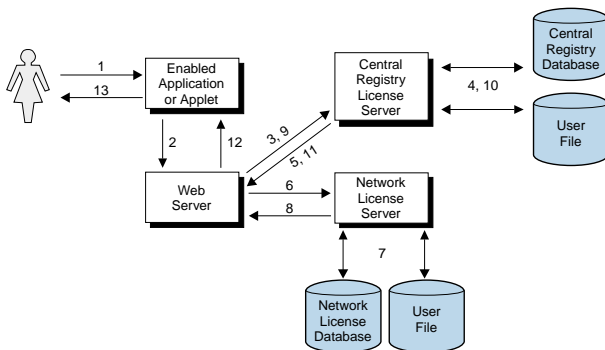


Figure 8. Using a Reservable License with Java Client Support

1. The user invokes the application or downloads the applet through a Web browser.
2. The application or applet requests a reserved license from the Web server using the http protocol.
3. The Web server requests a reserved license for the application or applet from the central registry license server. This is a license that you have reserved for this user, group, or workstation.

4. The central registry license server checks its database for a reserved license and the user file for authorization.
5. The central registry license server returns the status of the request to the Web server. If a reserved license was found and granted, the Web server returns a positive status to the application or applet, and it runs.
6. If a reserved license was not found, the Web server requests a reservable license from the network license server. This is a reservable license that has not been reserved.
7. The network license server checks its database for a reservable license and the user file for authorization.
8. The network license server returns the status of the request to the Web server.
9. If no reservable license was found, the Web server requests a soft-stop license from the central registry license server.
10. The central registry license server checks its database for a soft-stop license and the user file for authorization.
11. The central registry license server returns the status of the request to the Web server.
12. The Web server returns the status of the request to the application or applet, using the http protocol. If the status is OK, the application or applet runs.
13. If no license can be granted, depending on how the vendor enabled the application or applet, it may return information to the end user, or it may run even with no license available.

Working with Per-Server Licenses

Figure 9 shows what happens when an end user invokes an application with per-server licenses when per-seat has not been enabled. In the figure, the application server is license-enabled.

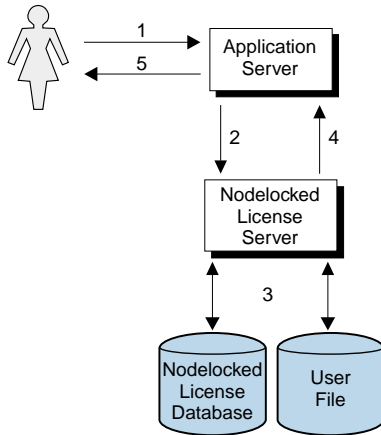


Figure 9. Using a Per-Server License

1. The application client user invokes the application.
2. The application server requests a per-server license from the nodelocked license server. This is a license that you have stored on the nodelocked license server.
3. The nodelocked license server checks the nodelocked license database for such a license and the user file for authorization. If no license is found, but the application implements the soft stop policy, the nodelocked license server checks for a soft stop license.
4. The nodelocked license server returns the status of the request to the application server. If a license was found, or if a soft stop license was granted, the application runs.
5. If no license can be granted, depending on how the vendor enabled the product, the application may return information to the end user, or it may run even with no license available.

Working with Per-Seat Licenses

Figure 10 shows what happens when an end user invokes an application with per-server/per-seat licenses when per-seat has been enabled. In the figure, the application server is license-enabled.

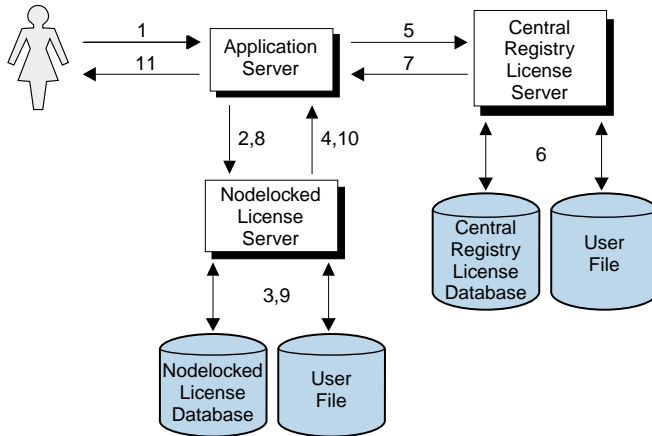


Figure 10. Using a Per-Seat License

1. The application client user invokes the application.
2. The application server requests a per-seat license from the nodelocked license server. This is a license that has already been granted to the user on a previous request and stored on the local workstation.
3. The nodelocked license server checks the nodelocked license database for such a license.
4. The nodelocked license server returns the status of the request to the application server. If a per-seat license was found, the application runs.
5. If no per-seat license was found on the nodelocked license server, the application server requests a per-seat license from the central registry license server.
6. The central registry license server checks whether a license is already being used by the requesting application client, possibly granted through another application server. In such a case the application can start without having a new license granted. Otherwise, the central registry license server checks whether a per-seat license is available. If so, it grants the license and records the application client identifier. If no per-seat license is found, but the application implements the soft stop policy, the central registry license server checks for a soft stop license.
7. The central registry license server returns the status of the request to the application server.

8. If a per-seat or soft stop license was granted, the application sends a shadow copy of the granted per-seat license to the nodelocked license server.
9. The nodelocked license server adds the shadow copy to the nodelocked license database.
10. The nodelocked license server returns the status of the request to the application server, and the application runs.
11. If no license can be granted, depending on how the vendor enabled the product, the application may return information to the end user, or it may run even with no license available.

Figure 11 shows what happens when an end user invokes a Java application or applet with per-server/per-seat licenses using Java Client Support, when per-seat has been enabled. In this case:

- The Web server computer, rather than the end user's workstation, serves as the network license client.
- When a per-seat license is granted no shadow copy is stored on the nodelocked license server.

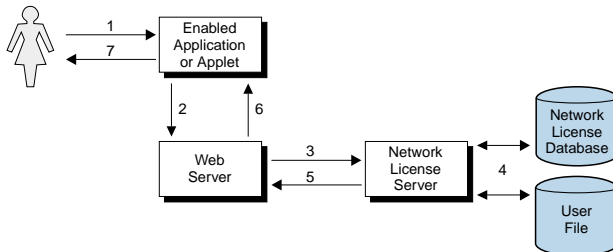


Figure 11. Using a Per-Seat License with Java Client Support

1. The user invokes the application or downloads the applet through a Web browser.
2. The application or applet sends a license request to the Web server. It requests a per-seat license from the Web server, using the http protocol.
3. The Web server requests a license for the application or applet from the central registry license server.
4. The central registry license server checks whether a license is already being used by the requesting application client, possibly granted through another application server. In such a case the application can start without having a new license granted. Otherwise, the central registry license server checks whether a per-seat license is available. If so, it grants the license and records the application client identifier. If no per-seat license is found,

but the application implements the soft-stop policy, the central registry license server checks for a soft-stop license. If a soft-stop license is available, it is granted.

5. The central registry license server returns the status of the request to the Web server.
6. The Web server returns the status of the request to the application or applet, using the http protocol. If the status is OK, the application or applet runs.
7. If no license can be granted, depending on how the vendor enabled the application or applet, it may return information to the end user, or it may run even with no license available.

Chapter 2. Planning Network Licensing

This chapter is for the administrator who is setting up an environment to allow multiple client machines to share licenses stored on one or more network license servers. Skip this chapter if:

- You are using only applications with nodelocked licenses, *and*
- You do not intend to use the Basic License Tool from one machine to administer licenses on other machines

Designing the network licensing environment that provides the best solution for your business requires careful and thoughtful planning. This chapter will assist you, as the system administrator, to plan the environment for network licensed products and to decide on the configuration options you need.

It is important that you allow enough time for planning, especially when using LUM Runtime in large networks or across subnetworks.

The decisions you need to make include:

- How many network license servers you will set up
- Which machines, if any, will be the network license servers
- How you will distribute product licenses among the network license servers
- Which clients will have access to which servers
- How clients will locate the servers
- Whether all servers will serve all clients, or whether you will set up independent groups of servers and clients
- Which machine will be the central registry (if required)
- Whether you will make use of LUM Runtime high-availability licensing; and, if so, which network license servers will be part of a cluster
- Whether and how you will make use of remote administration to administer from one machine the network and nodelocked licenses on other machines
- Which machines will be used as Web servers for Java applications and applets

Selecting Your Servers

The license server system depends on a stable network. If name resolution and routing in a network are not running properly, then the network license servers, network license clients, and central registry license server may be unable to communicate properly.

In designating machines to be network license servers or the central registry license server, keep the following criteria in mind:

- A license server should be a computer that stays on at all times. Machines that are frequently unavailable or unreliable, such as those that are brought down often for testing or maintenance, are not good candidates.
- It is important to keep license servers for production environments separate from those for test environments.
- If you have multiple subnetworks, then ideally, the servers should be on the same subnetwork as the majority of clients that will run the licensed products. Accessing in another subnetwork, across a bridge or router, may not be quite as fast.

If the network spans subnetworks, you need to spread the licenses out among network license servers. Also, inside the same network, each client request for a license generates network traffic. Therefore, it can be useful to spread the application licenses across more than one network license server, and across multiple platforms. When a computer is down, the licenses assigned to the network license server on that system are unavailable, but licenses assigned to other network license servers remain available. Having several license servers on the network will help to prevent bottlenecks that result when many clients communicate with a single network license server.

The number of network license servers in the network should be proportional to the frequency of license requests rather than to the number of users. For example, suppose that a compiler and a word processor are both license-enabled. A single user running many short compilations will place a heavier load on the license server than many users each starting the word processor once.

Computers that function as network license servers or as the central registry can also run the license-enabled products. The license server software does not have a noticeable effect on the performance of products.

When you have identified the network license servers, and before you configure them, you must organize the servers into one or more groups. The servers in a group form an independent licensing environment and serve a common set of clients. You must also identify a central registry license server for the group, if it requires one. “Planning Direct Binding” on page 43 will help you to group your servers.

Network Computing System (NCS)

The network computing system (NCS) is a set of tools for distributed computing. Some of its tools are included in the LUM Runtime components.

NCS includes:

- Remote Procedure Call (RPC) Runtime Library.

The backbone of the network computing system. It provides the calls that enable local programs to execute procedures on remote hosts. These calls transfer requests and responses between clients (the programs that call the procedures), and servers (the programs that execute the procedures). The RPC that is embedded in all license servers and in enabled products provides a common mechanism to support the request and acquisition of licenses.

- Location Broker.

The location broker processes, as discussed under “Namespace Binding” on page 41, and tools to administer them.

After configuration, these mechanisms are transparent to the end user of the software product.

Installing on a Machine where NCS is Already Installed

When you install License Use Runtime, the NCS shipped as part of License Use Runtime does not replace any other NCS that is already installed on the machine. Instead, it is installed in parallel directories

At any given time, you can have one set of NCS processes active. It is strongly recommended that you select as License Use Runtime servers machines that are not servers for any license management product. If you configure a machine as a License Use Runtime server, whenever an NCS process is started, any corresponding process that is already running is stopped.

A License Use Runtime Server can provide licenses only for products that are enabled using the License Use Management Application Developer’s Toolkit. It cannot provide licenses that require any other license management product, such as iFOR/LS or NetLS, that may be installed on the system.

On client machines you can install products that were enabled using License Use Management, iFOR/LS, or NetLS. The client part of iFOR/LS or NetLS can coexist with the client part of License Use Management on the same system. You should configure License Use Runtime clients to work with License Use Runtime servers only.

Selecting a Type of Network Binding

LUM Runtime provides two types of network configuration to enable clients to locate (or *bind to*) the network license servers and the central registry. They are direct binding and namespace binding.

Direct Binding

Direct binding is the simpler binding mechanism, suitable for small networks and for networks that do not change frequently. For environments, with one or two network license servers, direct binding provides a simple, effective licensing environment.

With direct binding, you make a list of your network license servers and the central registry. The list is called the *direct binding servers list* in this chapter and in the configuration scenarios in “Setting Up Your Servers and Clients” on page 67.

During configuration of servers and clients, you specify the network addresses of all the servers on the list. The network addresses are stored on every server and every client in a configuration file.

All network license servers, and the central registry license server, listen for incoming communications on well-known ports.

All network license servers, and the central registry license server, listen for incoming communications on well-known ports (1515 and 10999). The network license client uses these port numbers, together with the network addresses of the server systems that are specified in the configuration file, to locate and connect to the servers.

In addition to enabling clients to locate license servers, the direct binding mechanism makes it possible, from any license server, to use the Basic License Tool remotely to administer licenses on all the servers in the direct binding list. By adding nodelocked license servers to the direct binding servers list, you can administer licenses that are on remote nodelocked license servers.

Nodelocked license servers that are configured for remote administration listen on port 12999. The Basic License Tool uses this port number, together with the network addresses of the nodelocked license servers, to locate and connect to the servers for remote administration.

In the same way, you can enable remote administration from a machine configured only as a nodelocked license server. When you configure a nodelocked license server, you can create a direct binding servers list that contains all the license servers (both network and nodelocked) whose licenses you want to administer remotely.

Namespace Binding

As the licensing environment increases, keeping the direct binding environment up-to-date becomes more complex, and namespace binding becomes the better way to manage the license use management environment. Namespace binding is a powerful method of administering large client/server networks and networks that change frequently.

With namespace binding, one or more network license servers must run a subsystem called the *global location broker*. All the network license servers register themselves with the global location broker. The global location broker maintains a database of all the network license servers and the license-enabled products for which they have licenses. When a client requests a license, the global location broker locates a server for the client.

The client machine does not need to have a list of all the network license servers. It needs only the address of a server on which the global location broker runs.

The global location broker dynamically updates network location information for each license server. If you configure new license servers, or move existing license servers to new locations on the network, licensed applications will always be able to find them.

You may want to set up your namespace binding environment so that some of the servers serve only some of the clients. Such a grouping of clients and servers is called an NCS cell, or just a cell.

When a network license client requests a license, only a license server in the same cell as the client can satisfy the request.

If multiple servers in the cell have licenses for the product, the servers are checked for an available license in random sequence. This automatically balancing the workload of the servers.

The cell is analogous to the direct binding servers list (see “Direct Binding” on page 40). You should configure each server as part of a direct binding servers list or a namespace binding cell, but not both.

Network license servers configured using namespace binding cells can support clients that locate the server through either namespace binding or direct binding.

In addition to enabling clients to locate license servers, the namespace binding mechanism makes it possible to use the Basic License Tool to do remote administration of licenses on all the servers in the cell.

Performance Considerations in Choosing a Binding

Assuming that licenses are equally spread over all the license servers and that all servers belong to the same licensing environment, then:

- If namespace binding is used the license workload is automatically balanced between the different servers.
- If direct binding is used then the workload balance is not automatic. The license system administrator must simulate it arranging the clients' Direct Binding list so that each license server occupies different positions on the same number of clients.

The same concept applies to the list of servers running a global location broker listed in the `glb_site.txt` file when using namespace binding and clients or servers are located in more than two subnetworks.

In all cases in which there is a certain level of discretion in deciding the order of the servers, some further points must be considered:

- What has to be balanced is not the number of client machines but the number of application clients: if more than one enabled application runs on a certain machine this must be taken into account.
- The frequency of license requests and license checks is relevant i.e. applications that frequently request and check licenses impact server performance more than applications that request and check licenses in longer time intervals. To this category belong also fast applications that are frequently run.
- In a normal environment, clients reach more quickly servers on the same subnetwork.

On the client side it is possible to distinguish 2 scenarios:

- Some clients are configured in namespace binding only and some other clients are configured in direct binding only.

For the clients configured in namespace binding, workload balancing is automatic. For the clients configured in direct binding, workload balancing over multiple servers is not automatic but must be simulated by the licensing system administrator varying the order of the servers in the clients' direct binding list so that the servers occupy different positions on the same number of clients. This scenario makes sense if some clients need to contact only a subset of the license servers in the licensing system: these clients may be configured in direct binding to see only the servers they actually need to reach.

- Namespace binding and direct binding coexist in the same client.

In this case the same client is configured both in namespace binding and in direct binding. If all license servers listed in the direct binding list are located in the same NCS cell, it makes no difference to configure the client

in direct binding mode. The only difference is that the servers in the direct binding list are contacted before contacting the global location broker, and this may impact the workload balancing.

Planning Direct Binding

Before you begin configuring machines to use direct binding, be sure you have identified all the servers in your direct binding servers list. Then go to the configuration scenarios in “Setting Up Your Servers and Clients” on page 67. As you configure direct binding at each server and at each client, be sure you enter exactly the same list of servers.

Performance Notes:

- It is important that the direct binding servers list include all the servers, and that it exclude machines that will not function as servers. If there are any extra machines in the list, there will be a noticeable effect on performance.
- When a network license client configured for direct binding requests a license, and multiple servers have licenses for the product, the servers are checked for an available license in the sequence they were entered into the direct binding servers list during configuration of the client. Therefore, if you know how frequently specific network license clients will request licenses for specific products, you may be able to balance the workload of the servers by varying the sequence in which servers are defined at different clients.
- If you are certain that all the licenses requested by a particular network license client will be supplied by a subset of the servers, when you configure the client you may configure direct binding with just those servers, rather than all servers in the direct binding servers list, to improve performance. If you configure the client in this way, make sure that it is configured to communicate with the necessary servers; otherwise, it will not be able to get licenses.

Planning Namespace Binding

In setting up namespace binding, you need to decide:

- How you will group the servers and clients
- Within each group, which servers will run the location brokers and other NCS tools

Planning Cells

In namespace binding, all nodes belonging to a cell are identified by a single universal unique identifier (UUID). The UUID is a 36-byte string that identifies the host on which it was created and the time at which it was created.

A node cannot be in more than one cell.

You can, optionally, place servers in the default cell, which has a default UUID. If a network license client is configured for namespace binding and is not configured as part of another cell, it joins the default cell.

You can create alternate cells to isolate individual departments or other groups of users. Be careful that different NCS users at your location do not inadvertently create two or more default cells. Because the cells would have the same UUID, they would not be isolated from one another, and results would be unpredictable.

Because cells cannot overlap, it is important to understand who should have access to which licenses before you configure your servers. In a production environment, you may want to configure all your license servers to run in the default cell. This simplifies the task of managing servers and allows a central administrator to control all the license servers. However, if some licenses are to be restricted to a certain group of users, you may choose to install those licenses on servers running in an alternate cell, and make the clients that use the licenses part of that cell.

You should establish alternate cells for test environments, because the unstable nature of the test environment could negatively affect regular production users.

When you have decided which servers and clients will belong to each cell, go to the configuration scenarios in “Setting Up Your Servers and Clients” on page 67. As you configure namespace binding at each server and at each client, place it in the selected cell.

If you are setting up LUM Runtime on a machine that is not on a network, but you plan to use license-enabled products with network licenses, you need to have a network license server running on this machine. In this case, it is best to configure NCS to be in its own alternate cell.

Selecting the Global Location Brokers

If the network is small to medium in size with high-speed connections throughout, one global location broker is probably sufficient. Choose one of the network license servers to run the global location broker. If the network is large, it may be best to set up one server that runs the global location broker on each LAN.

When you are deciding which machines should run the global location broker, keep in mind that the process runs continuously in the background, waiting

for a request for the function it provides. The function it provides is called infrequently. It is usually in wait state and has little effect on system performance.

In a namespace binding environment, each network license server and the central registry license server, including systems that run the global location broker, runs a process called the *local location broker*. The local location broker handles communication with the global location broker. When you configure a network license server, you specify whether it is to run just the local location broker or also the global location broker.

Running the Location Brokers

To configure your network and start the location broker processes, see “Setting Up Your Servers and Clients” on page 67. LUM Runtime provides tools to administer the location brokers. To use them, see “Using NCS Tools”, and “Chapter 6. LUM Runtime CLI” on page 129.

Running the Global Location Broker Database Cleaner

The global location broker database cleaner is a process that should always be active; it automatically and periodically cleans up the global location broker databases.

When a license server starts up, it registers itself to the global location broker. When the server stops, it deletes itself from the global location broker database. Should the server accidentally go down without being able to deregister itself, invalid entries remain in the global location broker database. The global location broker database cleaner deletes them.

Using NCS Tools

NCS provides tools that you can optionally use to administer your namespace binding environment.

Table 3. NCS Tools

| Tool | Description |
|--|---|
| Local Broker Administration (lb_admin) | Administers the registration of the servers in global location broker or local location broker databases. It can be used to look up information, add new entries, and delete existing entries in a specified database. |
| GLBD Replicas Administration (drm_admin) | Monitors and modifies the list of the replicated versions of the global location broker databases. It can be used to modify, or merge databases to force convergence among replicas, to stop servers, and to delete replicas. |
| GLBDs List (lb_find) | Lists the servers running the global location broker in the network. |

Table 3. NCS Tools (continued)

| Tool | Description |
|--|-------------------------------------|
| Universal Unique Identifier generator (uuid_gen) | Generates the UUID for an NCS cell. |

For a detailed explanation of how to use these tools, see “Chapter 6. LUM Runtime CLI” on page 129.

Reaching a Global Location Broker in a Different Subnetwork

Normally, products on network license clients contact a global location broker by broadcasting on the local network. If your system does not support broadcasting, or if the global location broker is running on a license server in a separate subnetwork, you need to set up an alternate mechanism to enable the machine to locate a global location broker. The mechanism is the file `glb_site.txt`, which you create on the machine that needs to reach a global location broker.

The `glb_site.txt` file lists the network addresses of servers where a global location broker may be running. A machine that has a `glb_site.txt` file tries these addresses in order. Once it locates a server that is running the global location broker, it can locate network license servers. If it does not locate a server that is running the global location broker, the machine does not broadcast.

For information about how to create the `glb_site.txt` file, see “Configuring to Reach a Global Location Broker in a Different Subnetwork” on page 92.

Planning the Central Registry

The central registry license server subsystem provides a mechanism for storing licensing information in a database common to all the servers. It is used for the administration of customer-managed use products and products with reservable licenses. For namespace binding, only one central registry subsystem must be running in a cell. For direct binding, only one central registry subsystem must be running in a direct binding servers list. This ensures that the data is accurate and complete.

Notes:

1. You use the configuration tool to specify where to start the central registry.
2. Select the node where you will run the central registry carefully. After you place the central registry on a node, it cannot be moved.
3. The machine running the central registry must be up and running in order to perform administration tasks on network customer-managed products or on products using reservable licenses.

Planning for Java Products Using Java Client Support

Java Client Support (JCS) provides an alternative environment to the native Java APIs for running Java applications. Java Client Support is the only way to run Java applets.

If you plan to use license-enabled Java products using Java Client Support, you will need to set up one or more Web server machines. License-enabled Java applications and applets request licenses from the Web server. The Web server machine, in turn, serves as the network license client.

Planning Clusters for High-Availability Licensing

High-availability licensing is recommended only for users who are already experienced with managing individual license servers and who already have a stable licensing environment working.

For high-availability licensing, you set up clusters of network license servers connected through TCP/IP. For concurrent licenses with vendor-managed use control only, the software vendor generates passwords that are bound to the cluster rather than to a single server. Some of the servers in a cluster serve licenses, while others wait in reserve to take over in case a serving server goes down. The servers that are serving at any time share equally the responsibility for the licenses that are bound to the cluster, and keep one another informed about the status of the licenses.

You can create and administer a cluster, and administer high-availability licenses, from any machine. However, an OS/2, Windows 95, or Windows 98 network license server can **not** be a member of a cluster.

A network license server that is a member of a cluster can serve licenses that are bound to the server and participate as a member of a cluster at the same time.

Restrictions on Cluster Size and Composition

For security reasons, it is necessary to impose strict rules on the size and composition of clusters. Be very careful when you decide how many and which servers to put in a cluster. You will not be able to change your decisions after the fact and they will affect the size and composition of the cluster as long as it exists.

When you create a cluster, you specify the initial number of servers in the cluster, and which servers they are. The initial number must be in the range 3 through 10. The first server assigned to the cluster is automatically activated; that is, it is available to participate in serving licenses as part of the cluster. You must explicitly activate the other members.

The initial number of servers dictates two important attributes of the cluster:

- The minimum number of servers that must be activated in the cluster for the cluster to work
- The maximum number of servers that can be added to the cluster in addition to the initial number

If you want to replace a server machine that is one of the initial minimum number, to upgrade the hardware or to replace failing hardware, add a new server to the cluster. The number of new servers you can add, even to replace other servers, is limited.

Attention: The initial minimum number of servers must always be in the cluster; they must not be deactivated. If any is deactivated, the cluster ceases to serve licenses.

Passwords that are bound to a cluster are usable on only that cluster. If you find it necessary to delete a cluster and create a new one, or to create additional clusters, you will not be able to use existing passwords on the new cluster.

Note:

To delete a cluster, deactivate all its members. When you deactivate a server, it must be up and running.

After a cluster has been created and its members have been activated, the number of activated members determines how many servers must be up and running for the cluster to function.

The relationships between these cluster attributes is shown in Table 4.

The minimum number of servers up and running, as shown in the table, is the number of servers that serve licenses. All servers beyond that number are in reserve, waiting to take over if a serving server goes down.

Table 4. Number of Servers in a Cluster

| Initial Number | Min. no. Activated for Cluster to Work | Max no. Added after Cluster Creation | Actual no. Activated | Min no. Up and Running for Cluster to Work |
|-----------------------|---|---|-----------------------------|---|
| 3 | 2 | 1 | 2 3 4 | 2 2 3 |
| 4 | 4 | 2 | 4 5 6 | 3 3 4 |
| 5 | 4 | 1 | 4 5 6 | 3 3 4 |
| 6 | 6 | 2 | 6 7 8 | 4 4 5 |
| 7 | 6 | 1 | 6 7 8 | 4 4 5 |

Table 4. Number of Servers in a Cluster (continued)

| Initial Number | Min. no. Activated for Cluster to Work | Max no. Added after Cluster Creation | Actual no. Activated | Min no. Up and Running for Cluster to Work |
|----------------|--|--------------------------------------|----------------------|--|
| 8 | 8 | 2 | 8 9 10 | 5 5 6 |
| 9 | 8 | 1 | 8 9 10 | 5 5 6 |
| 10 | 10 | 2 | 10 11 12 | 6 6 7 |

Examples of Cluster Size Rules

Example 1: Initial number of servers is 3

The following rules apply:

- During the life of the cluster, you can add only one server to the cluster. This means you can add a new server with upgraded hardware, and deactivate one of the original three servers, only once during the life of the cluster. This scenario has the effect of replacing a server with an upgraded machine. Alternatively, you can add a fourth server to the cluster without deactivating any of the original three, thus increasing the cluster size to four servers. Again, you can add a server only once.
- No matter whether the cluster has three or four members, at least two members must be activated for the cluster to work.
- More than half of the activated servers must be up and running for the cluster to work.

Table 5 shows how the servers are deployed, depending on how many are activated, and how many are up and running.

Table 5. Example - Cluster with Three Initial Members

| Number of Activated Members | Number of Members Up and Running | Number of Members Serving Licenses | Number of Servers In Reserve |
|-----------------------------|----------------------------------|------------------------------------|------------------------------|
| 2 | 2 | 2 | 0* |
| 3 | 2 3 | 2 2 | 0* 1 |
| 4 | 3 4 | 3 3 | 0* 1 |

* When the number of servers in reserve is 0, there is no high-availability advantage

Example 2: Initial number of servers is 6

The following rules apply:

- During the life of the cluster, you can add two servers to the cluster. This means you can add two new servers with upgraded hardware, in effect replacing two servers with upgraded machines. Alternatively, you can add one or two servers to the cluster without deactivating any of the original six, thus increasing the cluster size to seven or eight servers.
- Whether the cluster has six, seven, or eight members, at least six members must be activated for the cluster to work.
- More than half of the activated servers must be up and running for the cluster to work.

Table 6 shows how the servers are deployed, depending on how many are activated and how many are up and running.

Table 6. Example - Cluster with Six Initial Members

| Number of Activated Members | Number of Members Up and Running | Number of Members Serving Licenses | Number of Servers In Reserve |
|-----------------------------|----------------------------------|------------------------------------|------------------------------|
| 6 | 4 5 6 | 4 4 4 | 0* 1 2 |
| 7 | 4 5 6 7 | 4 4 4 4 | 0* 1 2 3 |
| 8 | 5 6 7 8 | 5 5 5 5 | 0* 1 2 3 |

* When the number of servers in reserve is 0, there is no high-availability advantage

Cluster Membership Considerations

If you use direct binding, be sure all network license clients that will use licenses bound to the cluster, and all servers that are members of the cluster, have all the servers of the cluster in their direct binding server list in order to exploit fully the high availability of licenses.

If you use namespace binding, all the servers in a cluster and all their network clients must be in the same cell in order to exploit fully the high availability of licenses.

A server can be activated in only one cluster at any time. If you assign a server to a cluster and never activate it, or explicitly deactivate it, it can join a second cluster and be activated there. But in this case, the server cannot be activated in its original cluster, and no other server can be substituted in the original cluster. To reactivate the server in its original cluster, you must first deactivate it in the second cluster.

Note:

Either disable or enable remote administration on all servers. If you enable or disable it only on some servers, you may have problems enrolling and removing licenses bound to the cluster.

Verifying Network Connections

LUM Runtime provides the `i4tv` tool to verify that license servers are running properly. For a detailed explanation of how to start the tool and how to use it, see “`i4tv - Test Verification Tool`” on page 178.

Network Examples

This section shows some of the possible network configurations you can have in your environment. For simplicity, the examples show an environment with at most five network license clients, three network license servers, and two nodelocked license servers.

Figure 12 shows a configuration where all the required NCS subsystems run on the same server.

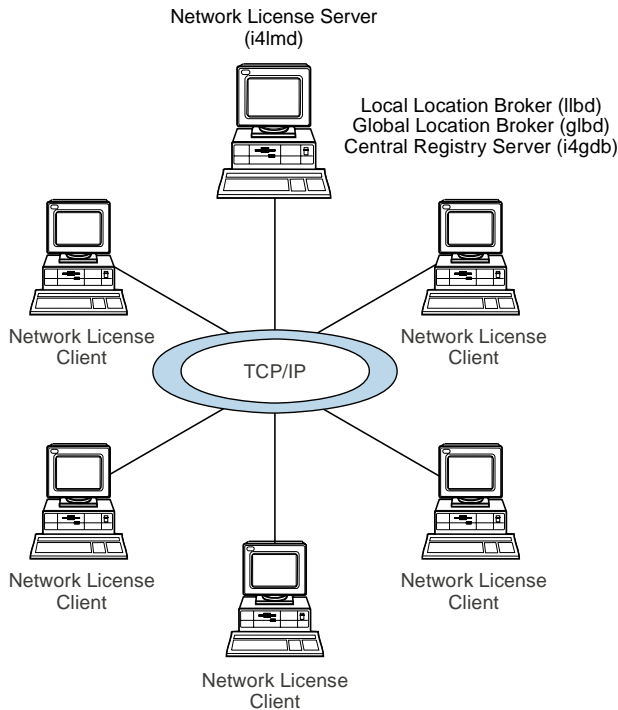


Figure 12. NCS Cell with All the Subsystems on the Same Server

Figure 13 on page 52 shows a network with two network license servers (A and D) and two nodelocked license servers (B and C). One network license server, and both nodelocked license servers, run only the local location broker, which is mandatory on all servers. One network license server also runs the

central registry and the global location broker. From any of the license servers, it is possible to administer licenses on all the license servers.

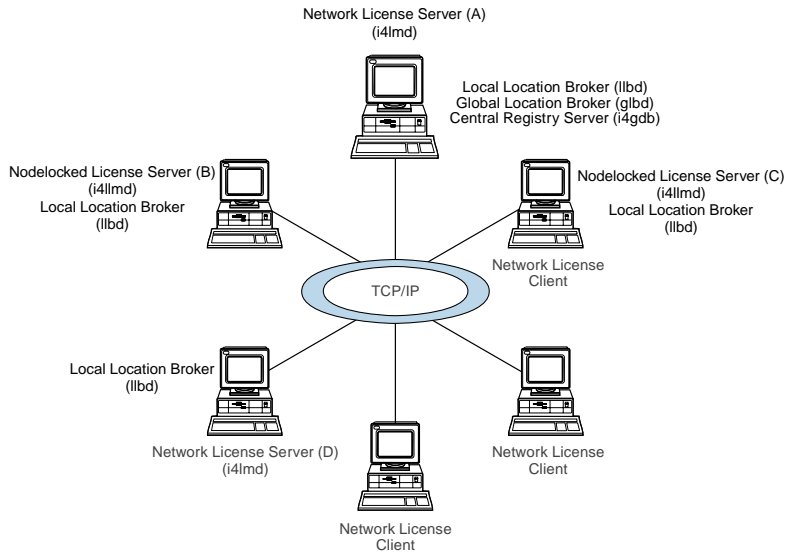


Figure 13. NCS Cell with Network License Servers and Nodelocked License Servers

Figure 14 on page 53 shows a network with three network license servers. This example shows that more than one license server in the network can run the global location broker, but with only one central registry. Server C runs a global location broker that is a replica of the first one that was started on server B.

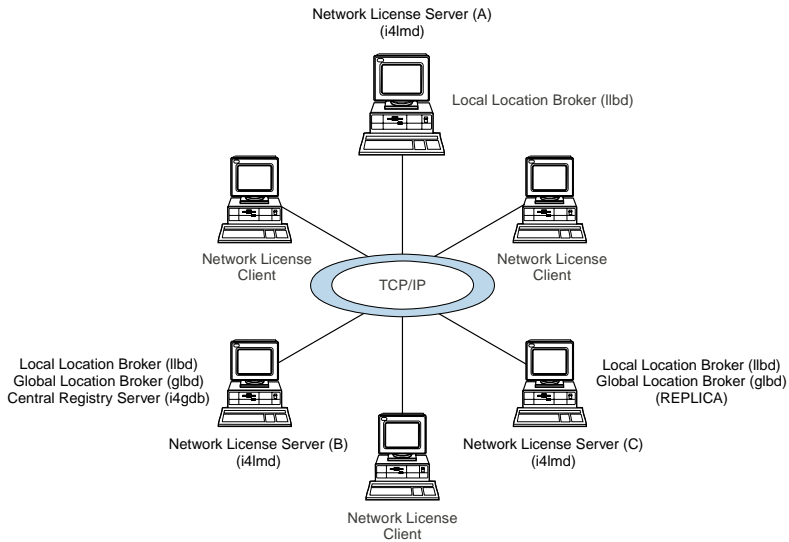


Figure 14. NCS Cell with Three Network License Servers and Three Clients

Figure 15 shows an example of a network configuration that uses direct binding. The example shows a network license server and two nodelocked license servers in a network. From any of the license servers, it is possible to administer licenses on all the license servers.

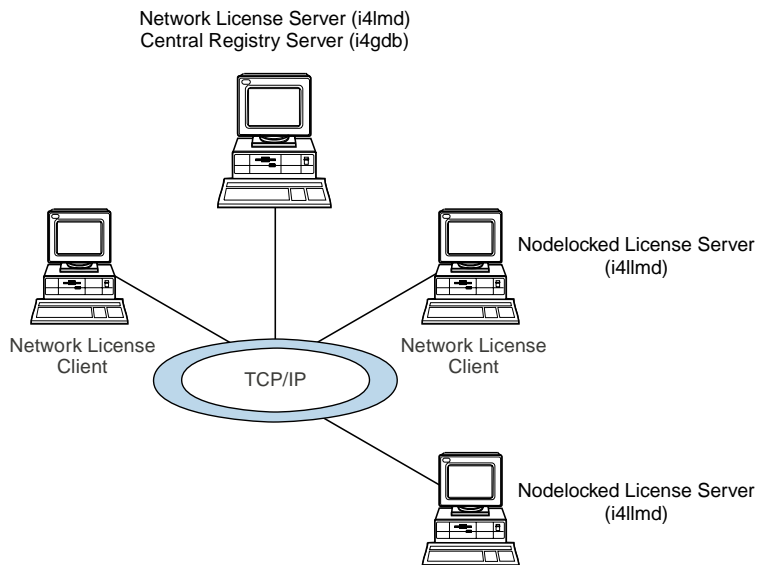


Figure 15. Direct Binding with Network License Servers and Nodelocked License Servers

Figure 16 shows an example of a Java configuration. The example shows two network license servers, a network license client, and a network application client in a Java-enabled network. Server A communicates with the Java-enabled applet or application using the http protocol, if necessary being protected by a firewall.

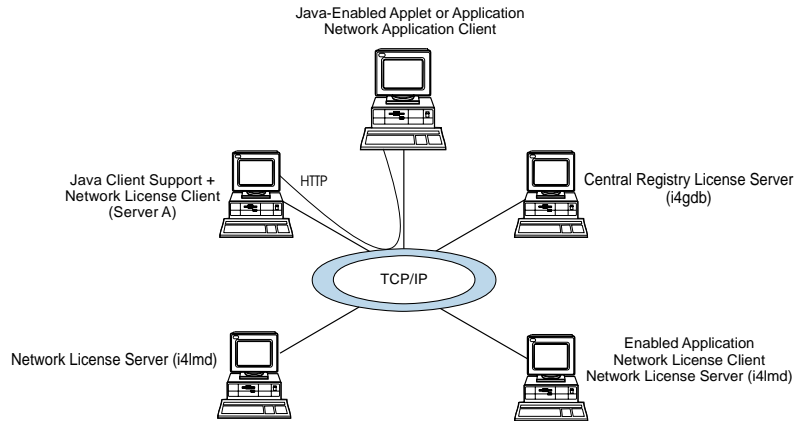


Figure 16. Direct Binding with Java Client Support

Chapter 3. Installing License Use Management Runtime

This chapter is intended for administrators using license-enabled products and software developers who are license-enabling products.

This chapter includes information about:

- What to do before installing
- Installing
- What to do after installing
- Uninstalling
- Installing the Java graphical user interface

Important

If any other license management product is installed on the machines in your environment, you must be aware of certain requirements before you install. Be sure you read “Chapter 2. Planning Network Licensing” on page 37 carefully. Considerations for coexistence with other license management products are in the sections “Selecting Your Servers” on page 37, “Installing on a Machine where NCS is Already Installed” on page 39, , and .

Installing License Use Runtime on HP-UX

License Use Runtime Version 4.6 contains one package, named LUM - License Use Runtime Base Code.

Before installing License Use Runtime

To determine whether License Use Runtime Version 4.6 is already installed on your machine, refer to the file:

```
/var/lum/VERSION
```

Before you install :

- Allocate at least 20 MB of disk space in the /opt file system.
- Delete any directory (not a symbolic link to a directory) named /var/lum/.

Hardware and Software Requirements

License Use Runtime requires no hardware other than a system that can run HP-UX 10.20 or 11.0.

TCP/IP must be installed.

A Web browser is required to view the .HTM documentation.

Obtaining the License Use Runtime Code

You can get the License Use Runtime code:

- By downloading License Use Runtime from the Web. Download the TAR file from <http://www.software.ibm.com/is/lum>. Type the command `tar -xvf` to decompress the file so that you have the package ready for installation.
- With an enabled application, if the vendor chose to redistribute the code.

Installing the License Use Runtime Code

Follow these steps:

1. Login with root authority.
Use SAM to install License Use Runtime as follows:
2. Click on the **Software Management** icon.
3. Select **Install Software to Local Host** icon.
4. In the **Specify Source** window, set **Source Depot Type** to **Local Directory**. Set **Source Depot Path** to the directory where you have downloaded the code. Click on **OK**.
5. Select **License Use Management Runtime Base Code** from the list of programs.
6. From **Actions**, select **Mark for Install**.
7. From **Actions**, select **Install (Analysis)**.
8. When the analysis is complete, click on **OK**, then **Yes** to confirm installation, and then **Done**.

If you do not have a graphical terminal, use the `swinstall` command.

For more information about installation in general, refer to the `swinstall` MAN pages.

After Installing License Use Runtime

After installation, before starting License Use Runtime login with root authority and add the following path to the `.profile` in the `PATH` environmental variable:

```
/opt/lum/ls/os/hpux/bin
```

Then exit and login again to allow changes to take effect.

Uninstalling License Use Runtime

To remove License Use Runtime from your machine:

1. Login with root authority.
Use SAM to uninstall, as follows:
2. Click on the **Software Management** icon.
3. Select **Remove Software** and then **Remove Local Host Software**.
4. Select **License Use Management Runtime Base Code** from the list of programs.
5. From **Actions**, select **Mark for Remove**.
6. From **Actions**, select **Remove (Analysis)**.
7. When the analysis is complete, click on **OK**, then **Yes** to confirm uninstallation, and then **Done**.

If you do not have a graphical terminal, use the `swremove` command.

Installing the Java GUI on HP-UX

The Java GUI contains one package, named License Use Management Runtime Java GUI.

Before installing the Java GUI

Before you install the Java GUI, allocate at least 7 MB of disk space in the `/opt` file system.

Java Runtime Environment 1.3 or later is required.

HP-UX 11.0

Install License Use Runtime *before* installing the Java GUI.

Obtaining the Java GUI Code

- You can get the Java GUI code: By downloading it from the Web. Download the TAR file from <http://www.software.ibm.com/is/lum>. Use the `tar -xvf` command to decompress the file so that the Java GUI package is ready for installation.
- With an enabled application, if the vendor chose to redistribute the Java GUI code.

Installing the Java GUI Package

Follow these steps:

1. Login with root authority.
Use SAM to install the Java GUI, as follows:
2. Click on the **Software Management** icon.
3. Select **Install Software to Local Host** icon.

4. In the **Specify Source** window, set **Source Depot Type** to **Local Directory**. Set **Source Depot Path** to the directory where you have downloaded the code. Click on **OK**.
5. Select **License Use Management Runtime Java GUI** from the list of programs.
6. From **Actions**, select **Mark for Install**.
7. From **Actions**, select **Install (Analysis)**.
8. When the analysis is complete, click on **OK**, then **Yes** to confirm installation, and then **Done**.

If you do not have a graphical terminal, use the `swinstall` command.

For more information about installation in general, refer to the `swinstall` MAN pages.

After Installing the Java Gui

After installation, before starting the Java GUI, login with root authority and add the following path to the `.profile` in the `SHLIB_PATH` environmental variable:

```
/opt/lum/ls/os/hpux/dll
```

Then exit and login again to allow changes to take effect.

Uninstalling the Java GUI

To remove the Java GUI from your machine:

1. Login with root authority.
- Use SAM to uninstall the Java GUI, as follows:
2. Click on the **Software Management** icon.
 3. Select **Remove Software** and then **Remove Local Host Software**.
 4. Select **License Use Management Runtime Java GUI** from the list of programs.
 5. From **Actions**, select **Mark for Remove**.
 6. From **Actions**, select **Remove (Analysis)**.
 7. When the analysis is complete, click on **OK**, then **Yes** to confirm uninstallation, and then **Done**.

If you do not have a graphical terminal, use the `swremove` command.

Installing License Use Runtime on IRIX

License Use Runtime Version 4.6 contains one package, named License Use Runtime Base Code.

Before installing License Use Runtime

To determine whether License Use Runtime Version 4.6 is already installed on your machine, refer to the file:

```
/var/lum/VERSION
```

Before you install License Use Runtime allocate at least 20MB of disk space in the /opt file system.

Hardware and Software Requirements

License Use Runtime requires no hardware other than a system that can run IRIX 6.3, 6.4, or 6.5.

IRIX 6.3, 6.4, or 6.5 with the POSIX Patch Set or its successor must be installed.

TCP/IP must be installed.

A Web browser is required to view the .HTM documentation.

Obtaining the License Use Runtime Code

You can get the License Use Runtime code:

- By downloading License Use Runtime from the Web. Download the License Use Runtime package from <http://www.software.ibm.com/is/lum>.
- With an enabled application, if the vendor chose to redistribute the code.

Installing the License Use Runtime Package

Follow these steps:

1. Login with root authority.
2. Do either of the following:
 - Use the `swmgr` command to install License Use Runtime.
 - From the desktop, select **System, Software Manager**.
3. Select **Default Installation**.
4. In the **Available Software** field, enter the directory in which you have downloaded the code.
5. Select **Start** to begin installation
6. When installation ends, select **OK**.

If you do not have a graphical terminal, use the `inst` utility.

For more information about installation in general, refer to the `inst` MAN pages.

After installing License Use Runtime

After installation, before starting License Use Runtime login with root authority and add the following path to the .profile in the PATH environmental variable:

```
/opt/lum/ls/os/svr4.sgi/bin
```

Then exit and login again to allow changes to take effect.

Uninstalling License Use Runtime

To remove License Use Runtime from your machine,

1. Login with root authority.
2. Use the `swmgr` command to uninstall License Use Runtime
3. From the desktop, select **System**, then **Software Manager**, and **Manage Installed Software** to display the list of installed products
4. From the list, select **License Use Management Runtime 4.6** and check **Remove**.
5. Select **Start** to begin uninstallation, and **OK** when it ends.

If you do not have a graphical terminal, use the `inst` utility.

Installing the Java GUI on IRIX

The Java GUI contains one package, named License Use Management Runtime Java GUI.

Before Installing the Java GUI

Before you install the Java GUI, allocate at least 7 MB of disk space in the `/opt` file system.

IRIX 6.5

Java Runtime Environment 1.2.2 or later is required.

Install License Use Management Runtime *before* installing the Java GUI.

Obtaining the Java GUI Code

You can get the Java GUI code:

- By downloading from the Web. Download the TAR file from <http://www.software.ibm.com/is/lum>. Use the `tar -xvf` command to decompress the file so that the Java GUI package is ready for installation.
- With an enabled application, if the vendor chose to redistribute the Java GUI code.

Installing the Java GUI Package

Follow these steps:

1. Login with root authority.
Use `swmgr` to install as follows:
2. From the desktop, select **System, Software Manager, and Default Installation**.
3. In the **Available Software** field, enter the directory where you have downloaded the Java GUI code.
4. Select **Start** to begin installation, and **OK** when it ends.

☐ If you do not have a graphical terminal, use the `inst` utility.

For more information about installation in general, refer to the `inst` MAN pages.

After Installing the Java GUI

After installation, before starting the Java GUI, login with root authority and add the following path to the `.profile` in the `LD_LIBRARY_PATH` environmental variable:

```
/opt/1um/1s/os/svr4.sgi/dll
```

Then exit and login again to allow changes to take effect.

Uninstalling the Java GUI

To remove the Java GUI from your machine,

1. Login with root authority.
Use `swmgr` to uninstall as follows:
2. From the desktop, select **System, Software Manager, and Manage Installed Software**.
3. From the list of products, select **License Use Management Runtime Java GUI** and check **Remove**.
4. Select **Start** to begin uninstallation, and **OK** when it ends.

If you do not have a graphical terminal, use the `inst` utility.

Installing License Use Runtime on Solaris

License Use Runtime Version 4.6 contains one package, named LUM - License Use Runtime Base Code.

Before Installing License Use Runtime

To determine whether License Use Runtime is already installed on your machine, refer to the file:

```
/var/1um/VERSION
```

Before installing, allocate at least 23MB of disk space in the `/opt` file system.

Hardware and Software Requirements

License Use Runtime requires no hardware other than a system that can run Solaris 2.6, 2.7 or 2.8.

TCP/IP must be installed.

A Web browser is required to view the .HTM documentation.

Obtaining the License Use Runtime Code

You can get the License Use Runtime code:

- By downloading License Use Runtime from the Web. Download the License Use Runtime package from <http://www.software.ibm.com/is/lum>.
- With an enabled application, if the vendor chose to redistribute the code.

Installing the License Use Runtime Package

Follow these steps:

1. Login with root authority.

Use `admintool` to install as follows:

2. From **Browse**, select **Software**.

Perform the following step only if you have already installed License Use Management Runtime version 4.0 and you are now installing a later release:

3. **Select Properties --> Package Administration**, and then change the value of **Existing Packages** to **Overwrite**.

4. From **Edit**, select **Add**.

5. In **Software Location**, select **Hard Disk**, and fill in the directory where you have downloaded the code.

6. Select **License Use Management Runtime Base Code**, and click on **Add**.

If you do not have a graphical terminal, use the `pkgadd` command:

```
pkgadd -d
```

If you have already installed Version 4.0 and you are now installing a later release, the `pkgadd` command must also contain the parameter:

```
-a lumadmin
```

For more information about installation in general, refer to the *Solaris System Administration Answer Book*.

After Installing License Use Runtime

After installation, before starting , login with root authority and add the following path to the `.profile` in the `PATH` environmental variable:

```
/opt/lum/ls/os/solaris/bin
```

Then exit and login again to allow changes to take effect.

Uninstalling License Use Runtime

To remove License Use Runtime from your machine:

1. Login with root authority.
Use `admintool` to uninstall as follows:
2. From **Browse**, select **Software**.
3. Select **License Use Management Runtime Base Code**.
4. From **Edit**, select **Delete**.
5. Select **Delete** to confirm, and **Y** when asked if you want to remove this package.

If you do not have a graphical terminal, use the `pkgrm` command.

Installing the Java GUI on Solaris

The Java Gui contains one package, named License Use Runtime Java GUI.

Before Installing the Java GUI

Before installing the Java GUI, allocate at least 30MB of disk space in the `/opt` file system.

Java Runtime Environment 1.3 or later is required.

Note: If you decide to run License Use Management Java Client Support on the same machine on which you install the License Use Management, refer to the README.ARK document for installation requirements.

Install License Use Runtime *before* installing the Java GUI.

Obtaining the Java GUI Code

You can get the Java GUI code:

- By downloading from the Web. Download the TAR file from <http://www.software.ibm.com/is/lum>. Use the `tar -xvf` command to decompress the file so that the Java GUI package is ready for installation.
- With an enabled application, if the vendor chose to redistribute the Java GUI code.

Installing the Java Gui Package

Follow these steps:

1. Login with root authority.
Use `admintool` to install as follows:
2. From **Browse**, select **Software**.
3. From **Edit**, select **Add**.
4. In **Software Location**, select **Hard Disk**, and fill in the directory where you have downloaded the code.

5. Select **License Use Management Runtime Java GUI**, and click on **Add**.

If you do not have a graphical terminal, use the `pkgadd` command:

```
pkgadd -d
```

For more information about installation in general, refer to the *Solaris System Administration Answer Book*.

After Installing the Java GUI

After installation, before starting , login with root authority and add the following path to the `.profile` in the `LD_LIBRARY_PATH` environmental variable:

```
/opt/lum/ls/os/solaris/dll
```

Then exit and login again to allow changes to take effect.

Uninstalling the Java GUI

To remove the Java GUI from your machine:

1. Login with root authority.
Use `admintool` to uninstall as follows:
2. From **Browse**, select **Software**.
3. Select **License Use Management Runtime Java GUI**.
4. From **Edit**, select **Delete**.
5. Select **Delete** to confirm, and **Y** when asked if you want to remove this package.

If you do not have a graphical terminal, use the `pkgrm` command.

Installing LUM Java Client Support on Solaris

LUM Java Client Support contains one package named LUM Java Client Support .

Before Installing LUM Java Client Support

LUM Java Client Support requires approximately 200KB of disk space.

Software Requirements

The following software is required:

- Solaris 2.6 with the Native Threads Package, or 2.7.
If you are using Lotus Domino Go Webserver 4.6.2.5 or Netscape Enterprise Server Version 3, the SunOS kernel update patch 104283-04 is required.
- One of the following Web servers:
 - Lotus Domino Go Webserver 4.6.x
 - Netscape Enterprise Server 3.0.1 or 3.5.1; 3.5.1 is recommended

- Netscape FastTrack Server 2.0.1 or 3.0.1
- Either Java Development Kit (JDK) 1.1.4 or 1.1.6 with the Native Threads Package, or Java Runtime Environment (JRE) 1.1.4 or 1.1.6 with the Native Threads Package. JDK 1.1.6 is shipped with the IBM WebSphere Application Server.
- IBM WebSphere Application Server 2.0.2
- The License Use Runtime code

Obtaining LUM Java Client Support Code

You can get the LUM Java Client Support code:

- By downloading the package from the Web. Download the TAR file from <http://www.software.ibm.com/is/lum>. Use the command `tar -xvf` to decompress the file so that the LUM Java Client Support package is ready for installation.
- With an enabled application, if the vendor chose to redistribute the LUM Java Client Support code.

Installing the LUM Java Client Support Package

Follow these steps:

1. Login with root authority.
Use `admintool` to install LUM Java Client Support as follows:
2. From **Browse**, select **Software**.
3. From **Edit**, select **Add**.
4. In **Software Location**, select **Hard Disk** and fill in the directory where you have downloaded the code.
5. Select **LUM Java Client Support**, and click on **Add**.
6. LUM Java Client Support is installed in the `/usr/lpp/IBMWebAS/classes/com/ibm/licUseMgmt` directory.

If you do not have a graphical terminal, use the `pkgadd` command:

```
pkgadd -d
```

For more information about installation in general, refer to the *Solaris System Administration Answer Book*

Uninstalling LUM Java Client Support

To remove LUM Java Client Support from your machine,

1. Login with root authority.
Use `admintool` to uninstall LUM Java Client Support as follows:
2. From **Browse**, select **Software**.
3. Select **LUM Java Client Support**.
4. From **Edit**, select **Delete**.

5. Select **Delete** to confirm, and **Y** when asked if you want to remove this package.

If you do not have a graphical terminal, use the `pkgrm` command.

Chapter 4. Configuring LUM Runtime

The scenarios in this chapter describe how to set up your LUM Runtime environment.

LUM Runtime is not required for non-runtime nodelocked workstations (see “License Use Management at a Glance” on page 1).

Setting Up Your Servers and Clients

After you install LUM Runtime, you must configure the program on each machine.

The configuration tool has a GUI, a script interface, and a command line interface. The information you provide is saved in a configuration file. When you start LUM Runtime, it uses the information in this file to direct the behavior of the local system in the licensing environment. See “Appendix A. LUM Runtime Configuration File” on page 235 for reference information on the configuration file.

Configuring to Handle Nodelocked Licenses

To handle only products with nodelocked licenses, you need only configure the machine as a nodelocked license server (“Scenario 1: Configuring a Standalone Nodelocked License Server” on page 74) and have the nodelocked license server up and running. Every machine is automatically configured as a nodelocked license server when LUM Runtime is installed. You do not have to do any configuration unless you want to change the default configuration.

If a machine configured as a nodelocked license server is in a network, instances of the Basic License Tool on other machines can administer licenses on the nodelocked license server. With a little additional configuration (“Scenario 2: Configuring a Nodelocked License Server in a Network” on page 76), you can run the Basic License Tool on the nodelocked license server machine and administer licenses stored on remote network license servers, nodelocked license servers, and the central registry.

Configuring to Handle Network Licenses

To handle products with network licenses, you must configure at least one network license server (“Scenario 3: Configuring a Network License Server” on page 80) and configure each client as a network license client (“Scenario 5: Configuring a Network License Client” on page 89). If you use products with

customer-managed or reservable licenses, you must also configure one server as the central registry (“Scenario 4: Configuring the Central Registry License Server” on page 85).

Determining the Configuration Required

You can configure a machine to play more than one role in your licensing environment. For example, if you configure the same machine as a nodelocked license server, a network license server, and the central registry license server, that machine can handle all types of licensed products.

If you know the types of licenses used by the license-enabled products in your environment, Table 7 will help you to determine how to configure:

- The license servers for the application
- The machines that will request licenses for the application

See the application documentation for information that might affect your configuration. The *enrollment certificate file* that you receive from the vendor shows the type of license.

Table 7. Configuration Required to Support All Types of Licenses

| License Type | License Requester | License Server |
|---|---|---|
| Simple Nodelocked (Non-Runtime-Based Enabling) (note 1) | License-Enabled Application | None |
| Simple Nodelocked (Runtime-Based Enabling) (note 1) | License-Enabled Application | Nodelocked License Server on the Same Machine as the Application |
| Use-Once Nodelocked | License-Enabled Application | Nodelocked License Server on the Same Machine as the Application |
| Concurrent Nodelocked | License-Enabled Application | Nodelocked License Server on the Same Machine as the Application |
| Per-Server | License-Enabled Application | Nodelocked License Server on the Same Machine as the Application |
| Use-Once | Network License Client | Network License Server (note 2), and Central Registry License Server (note 3) |
| Concurrent | Network License Client | Network License Server (note 2) and Central Registry License Server (note 3) |
| Per-Seat | Network License Client and Nodelocked License Server | Central Registry License Server (note 3) |
| Reservable | Network License Client and Nodelocked License Server (note 4) | Network License Server (note 2) and Central Registry License Server (note 3) |

Table 7. Configuration Required to Support All Types of Licenses (continued)

| License Type | License Requester | License Server |
|---|-------------------|----------------|
| Notes | | |
| <ol style="list-style-type: none"> If the vendor enabled the product with simple nodelocked licenses and delivered the licenses to you in a compound network password, you must also: <ul style="list-style-type: none"> Configure a network license server, where you will install the compound password, and Configure the local machine (where the nodelocked license is to be installed) as a network license client of that server You can configure one or more network license servers. You can configure only one central registry license server. For customer-managed use products, the central registry is required. It enables you to update the count of product licences, implement the hard stop or soft stop policy, or track the high-water mark. Note that because per-seat licenses are always customer-managed, they require the central registry. For reservable licenses, the central registry is required if you want to be able to reserve licenses for specific users. For reservable licenses, the nodelocked license server is required for the end user to get a reserved license. | | |

Before You Configure

Before you begin the configuration process, for every machine you are going to configure, you need to decide which roles it will play and how you plan to set up direct binding or namespace binding. You might also decide to override some of the configuration defaults. The actions you can take during configuration are summarized in Table 8. Check the table for all the roles your machine will play, and make all the indicated decisions before you start configuration.

Table 8. Configuration Options

| Configuration Options | Nodelocked License Server | Network License Client | Network License Server | Central Registry License Server |
|--|---------------------------|------------------------|------------------------|---------------------------------|
| Customize selection of information logged or accept default? (“Customizing Log Information” on page 70) | Yes | | Yes | Yes |
| Customize selection of information logged or accept default? (“Customizing Log Information” on page 70) | Yes | | Yes | Yes |
| Start license servers at system startup (default is no)? (“Automatically Starting License Servers” on page 71) | Yes | | Yes | Yes |
| Disable remote administration of network license servers (default is no)? (“Disabling Remote Administration” on page 71) | | | Yes | |

Table 8. Configuration Options (continued)

| Configuration Options | Nodelocked License Server | Network License Client | Network License Server | Central Registry License Server |
|---|---------------------------|------------------------|------------------------|---------------------------------|
| Disable remote administration of nodelocked license servers (default is no)? (“Disabling Remote Administration” on page 71) | Yes | | | |
| Set up direct binding (“Configuring Direct Binding” on page 72) | | | | |
| Prepare a list of nodelocked license servers for remote administration | Yes (note 1) | Yes | Yes | Yes |
| Have your direct binding servers list ready | Yes (note 1) | Yes | Yes | Yes |
| Know which machine is the central registry | Yes (note 1) | Yes | Yes | Yes |
| Change default direct binding ports? | Yes (note 1) | Yes | Yes | Yes |
| Set up namespace binding (“Configuring Namespace Binding” on page 72) | | | | |
| Join an existing alternate cell? | Yes (note 1,2) | Yes | Yes | Yes |
| Know the name of a server already there | Yes (note 1,2) | Yes | Yes | Yes |
| Run a replica GLB? | Yes (note 1,2) | | Yes | Yes |
| Join the default cell? | Yes (note 1,2) | Yes | Yes | Yes |
| Run a replica GLB? | Yes (note 1,2) | | Yes | Yes |
| Start a new cell? | Yes (note 1,2) | | Yes | Yes |

Notes

1. Applicable if you plan to run the Basic License Tool and administer licenses on other machines from this nodelocked license server
2. Applicable if you plan to run the Basic License Tool and administer licenses on other machines from this nodelocked license server, or if you want instances of the Basic License Tool on other machines to be able to administer licenses on his machine.

Customizing Log Information

For any license server, you can customize the selection of events that are logged, and the location of the log file. Note that if you want to change the location of the log from the default to a path you choose, the directory you specify must already exist. Otherwise, you will lose the logging function.

The following events can be logged:

- All events** Includes all the events in the list.
- Errors** Describes server errors that do not stop the server, but return a status code and a message. This is logged by default.
- License timeout** Tells you that the server has canceled the request for a license because the check period expired. This is not logged by default.
- License wait** Tells you when a license request cannot be satisfied because no licenses are available, and the user is added to a queue. This is not logged by default.
- License checkin** Tells you when a licensed product has sent a check-in call to the server to notify that the product is running. This is not logged by default.
- License grant/release** Tells you when a license was granted or released. This is not logged by default.
- Vendor added/deleted** Tells you when a product of a new vendor was registered or deleted. This is logged by default.
- Vendor messages** Provides the log messages the vendor inserted in the enabled product. This is logged by default.
- Product added/deleted** Tells you when a new product was registered or deleted. This is logged by default.
- Server start/stop** Logs the successful start or stop of the license server. This is not logged by default.

Automatically Starting License Servers

During configuration of any license server, you can specify that license servers should start automatically when you start the machine. Otherwise, you must remember to start the services manually after configuration and before using the Basic License Tool or any enabled applications.

Disabling Remote Administration

When you configure a network or nodelocked license server, you can specify that licenses stored on that server cannot be administered from any other license server.

Configuring Direct Binding

When you configure a network license server, network license client, or central registry license server that is to be part of a direct binding environment, you must have your direct binding servers list ready. If you configure in this way, clients will be able to locate the server only through direct binding.

When you configure a nodelocked license server, network license server, or central registry license server that is to be part of a direct binding environment, you must also have ready a list of nodelocked license servers whose licenses you want to administer remotely from this machine.

You will enter the hostnames or network addresses of all the servers in the list, except for the nodelocked license server on the local machine, which is added to the list automatically. You will also designate which server, if any, is the central registry.

When you configure the servers in the direct binding servers list, and the clients that will use them, be sure you define exactly the same set of servers on each.

You can change the default port numbers for nodelocked license servers, network license servers, and the central registry license server. Do not change the defaults unless they are already in use by other applications.

If you are running Java Client Support on the same machine and want to change the direct binding list:

1. Stop LUM Runtime and the Web server.
2. Change the direct binding list.
3. Restart LUM Runtime and the Web server.

Configuring Namespace Binding

When you configure a nodelocked license server, network license server, network license client, or central registry license server to be part of a namespace binding environment, clients will be able to locate the server, and the Basic License Tool will be able to locate remote servers, through either namespace binding or direct binding.

You must know which cell this machine is to be part of (see “Planning Cells” on page 43 and “Selecting the Global Location Brokers” on page 44). If the machine is to join an existing cell, other than the default cell, you must be able to identify a server that is already in the cell.

If there are other users of NCS at your location who might create a default cell, it is safer to configure only alternate cells. Since the default cell always has the same UUID, results would be unpredictable.

In the case of a server joining an existing cell, you must decide whether the server is to run a replica of the global location broker.

If your machine is on a subnetwork different from that of the server that starts the global location broker, or if your system does not support broadcasting, further configuration steps are needed after you do the basic configuration (see “Configuring to Reach a Global Location Broker in a Different Subnetwork” on page 92).

Using the Configuration Tools

To configure LUM Runtime, you can use one of the following tools:

- Configuration Tool script
- Configuration Tool graphical user interface
- Configuration Tool command line interface

Using the Configuration Tool Script

LUM Runtime provides a configuration script you can use if you want to perform a guided configuration of your machine without using the graphical user interface.

Login with root authority and issue the following command:

```
i4cfg -script
```

You are then offered the choice of four configuration scenarios:

- If the machine you are configuring is the central registry license server, select **4**. During the question-and-answer session that follows, the machine will automatically be configured as a network license client, and you can optionally configure as a nodelocked license server or a network license server, or both.
- If the machine you are configuring is not the central registry license server, but is a network license server, select **3**. During the question-and-answer session that follows, the machine will automatically be configured as a network license client, and you can optionally configure as a nodelocked license server.
- If the machine you are configuring is a nodelocked license server and is neither the central registry license server nor a network license server, select **2**. During the question-and-answer session that follows, you can optionally configure as a network license client.
- If the machine is a network license client only, select **1**.

If you run the script more than once, the latest information entered takes effect.

Using the Configuration Tool GUI

If the LUM Runtime graphical user interface is installed on your machine, you can use it to configure your machine.

Login with root authority and issue the command:

```
i4cfg
```

A configuration tool notebook appears. Follow the steps of one or more of the configuration scenarios in this section, depending on the role of your machine in your licensing environment.

Each of the configuration scenarios in this chapter shows how to configure a machine to play only one role in the licensing environment. If the machine is to play two or more roles, check all the applicable roles on the **Configure As** page of the configuration tool notebook.

If you configure a specific page of the notebook more than once, the most recent configuration takes effect.

Using the Configuration Tool Command-Line Interface

You can use the `i4cfg` command to accomplish the same configuration tasks explained in the scenarios in this chapter. At the end of each scenario, a section named "Command-Line Equivalent" shows the `i4cfg` commands that correspond to the GUI scenario.

For details of the `i4cfg` command, see "i4cfg - Configuration Tool" on page 159.

Scenario 1: Configuring a Standalone Nodelocked License Server

Use this scenario to configure a nodelocked license server without setting up any network connections to other LUM Runtime servers. Use "Scenario 2: Configuring a Nodelocked License Server in a Network" on page 76 if you want to:

- Run the Basic License Tool and administer licenses on other license servers from this machine
- Administer nodelocked licenses on this machine from instances of the Basic License Tool on other machines, using namespace binding to connect

A nodelocked license server can use licenses of the types shown in Table 7 on page 68 . By default, every machine is configured as a nodelocked license server. You need to perform this configuration only if you want to change the default configuration.

To configure a machine as a standalone nodelocked license server after installation, perform the following steps:

1. Login with root authority and issue the `i4cfg` command. The Configuration Tool notebook is displayed.
2. On the **Configure As** page, select **Nodelocked License Server** and **Advanced Configuration**. The notebook is shown in Figure 17.



Figure 17. Configuration Tool Notebook - Standalone Nodelocked License Server

- For the type of configuration you are doing, ignore the **Direct binding** and **Direct binding ports** pages and the **Disable Remote Administration** check box, and do not check **Namespace Binding Support**.
3. On the **Start up** page, select **Start services at system startup** to start the nodelocked license server when you power on the machine.
 4. On the **Log** page, select the events you want to be logged and specify where you want the log to be kept, as shown in Figure 18 on page 76.



Figure 18. Configuration Tool Notebook - Log Page

If you change the location of the log from the default directory to a directory of your own choice, that directory must already exist. Otherwise, the logging function will be lost. The logged events are stored in the files `l1m1gnn_`, where `nn` assumes values from 00 to 99. When a file is full, according to a maximum number of lines fixed in the configuration file, a new log file is started.

5. Select **Close** from the system menu at the upper left corner of the notebook. A message is displayed to confirm that you are ready to save your choices.

Configuration Script Equivalent

To configure the standalone nodelocked license server using the configuration script, enter the command:

```
i4cfg -script
```

In response to the first question, select **2**; then respond to the questions as they are asked.

Command-Line Equivalent

To configure the standalone nodelocked license server:

```
i4cfg -a n -S a -e a -l /home/baratti
```

Scenario 2: Configuring a Nodelocked License Server in a Network

Use this scenario to configure a nodelocked license server, making it part of a direct binding server list or a namespace binding cell. Configuring in this way, you can:

- Run the Basic License Tool and administer licenses on other license servers from this machine

- Allow instances of the Basic License Tool on other machines to administer nodelocked licenses on this machine

A nodelocked license server can use licenses of the types shown in Table 7 on page 68.

To configure a machine as a nodelocked license server with remote administration, after installation, perform the following steps:

1. Login with root authority and issue the `i4cfg` command. The Configuration Tool notebook is displayed.
2. On the **Configure As** page, select **Nodelocked License Server** and **Advanced Configuration**.
3. Leave the **Disable remote administration** box unchecked, to enable instances of the Basic License Tool on other machines to administer nodelocked licenses on this machine. The completed **Configure As** page is the same as the one shown in Figure 17 on page 75.
4. If you want to change the defaults, complete the **Start up** and **Log** pages, as explained in “Scenario 1: Configuring a Standalone Nodelocked License Server” on page 74.

Use the remaining pages of the notebook to establish remote connections between this server and other LUM Runtime license servers. From this machine, you will be able to use the Basic License Tool to administer licenses on those servers.

5. If you have decided that this server is to use direct binding to connect to other servers, select the **Direct binding** tab. In this case, skip the next step (**Namespace binding** page).

The Direct binding section is displayed, as shown in Figure 19 on page 78.

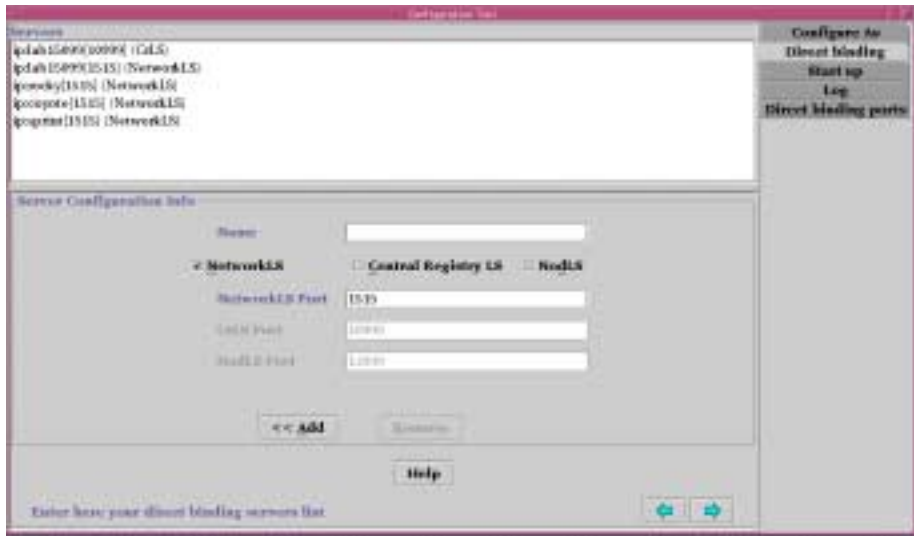


Figure 19. Configuration Tool Notebook - Direct Binding Section

On this page you specify all the network license servers and nodelocked license servers whose licenses you will administer remotely from this machine. Do not include this nodelocked license server itself. If the central registry license server, a network license server, and a nodelocked license server run on the same machine, include all the servers whose licenses you want to administer. In this example, the administrator performs the following steps for each server:

- a. In the **Name** field, enter the TCP/IP host name of the machine you are adding to the Servers list. Note that the server name is case-sensitive.
 - b. Check **NodLS**, **NetworkLS**, or **Central Registry LS**, or any combination, depending on the roles the machine plays in the network.
 - c. Leave the default values in the **NetworkLS Port**, **CrLS Port**, and **NodLS Port** fields.
 - d. Select the **<<Add** push button to add the server to the Servers list.
6. If you have decided that this server is to communicate with other servers through namespace binding rather than direct binding, check the **Namespace binding support** check box on the **Configure As** page. This adds the **Namespace binding** page to the notebook. Select the **Namespace binding** tab. The Namespace binding page is displayed, as shown in Figure 20 on page 79.

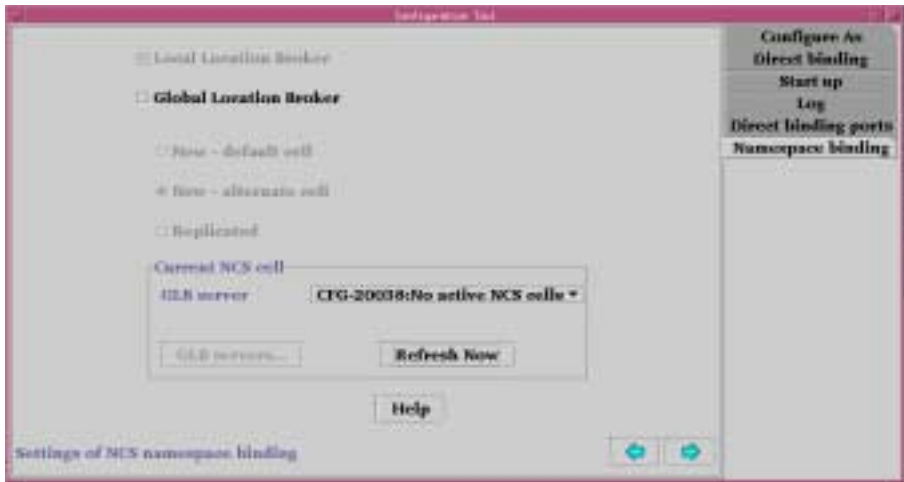


Figure 20. Configuration Tool Notebook - Namespace Binding Section

If this is the first server (including nodelocked license servers, network license servers and the central registry license server) to be configured in the cell, then select the **Global Location Broker** check box to start the global location broker on the server. Select either **New - default cell** or **New - alternate cell** to start the global location broker in a new cell.

If there are other users of NCS at your location who might create a default cell, it is safer to configure only alternate cells. Because there can be only one default cell, results would be unpredictable.

If, alternatively, other servers have already been configured in the cell, follow these steps:

- a. If you want the server being configured to have a copy of the global location broker, select the **Global Location Broker** check box and the **Replicated** radio button. If you do not want to run a copy of the global location broker, do not check **Global Location Broker**.
- b. In the **GLB Server** field, choose the address of a server in the cell that has the global location broker.
- c. Check that there is no `glb_site.txt` file, or, if the file exists, that it includes a server that is in the cell being joined. Otherwise, use the `i4cfg -G null` command to delete the existing site list.
- d. If the selected GLB server is on a machine that has multiple network adapters, make sure the GLB server has been started on the adapter to which the machine being configured is connected.

If your machine is on a subnetwork different from the one of the server that starts the global location broker, or if your system does not support

broadcasting, further configuration steps are needed (see “Configuring to Reach a Global Location Broker in a Different Subnetwork” on page 92).

7. Select **Close** from the system menu in the upper left corner of the notebook. A message is displayed to confirm that you are ready to save your choices.

Now the workstation can be used as a nodelocked license server. The administrator can run the Basic License Tool on the workstation and can administer licenses on remote LUM Runtime servers.

Configuration Script Equivalent

To configure the nodelocked license server in a network using the configuration script, enter the command:

```
i4cfg -script
```

In response to the first question, select 2; then respond to the questions as they are asked.

Command-Line Equivalent

To configure the nodelocked license server in a network:

- With direct binding:

```
i4cfg -a n -S a,n -e a -l /home/baratti -b "'network ip:thelma ip:louise'  
'nodelocked ip:speedy' 'registry ip:thelma'" -n n
```

- With namespace binding, joining an existing cell that has UUID 456b91c50000.0d.00.00.87.84.00.00.00:

```
i4cfg -a n -S a,n -e a -l /home/baratti -b null -n 1  
-c 456b91c50000.0d.00.00.87.84.00.00.00
```

Note that to achieve the same result as the direct binding example, **louise**, **speedy**, and **thelma** must join the same cell.

Scenario 3: Configuring a Network License Server

This scenario shows how the administrator configures LUM Runtime as a network license server (in this example, **louise**), making it part of a direct binding server list or a namespace binding cell.

When you configure a machine as a network license server, you can use licenses of the types shown in Table 7 on page 68. You can also use the Basic License Tool to administer licenses on remote license servers in the network.

To configure the network license server, after installation of LUM Runtime:

1. Login with root authority and issue the `i4cfg` command. The Configuration Tool notebook is displayed.
2. On the **Configure As** page, select **Network License Server**. Note that **Network License Client** is then automatically checked. Leave **Disable**

Remote Administration unchecked. Check **Advanced Configuration**, which adds the **Direct binding ports** and **Log** pages to the notebook. The **Configure As** page is shown in Figure 21.

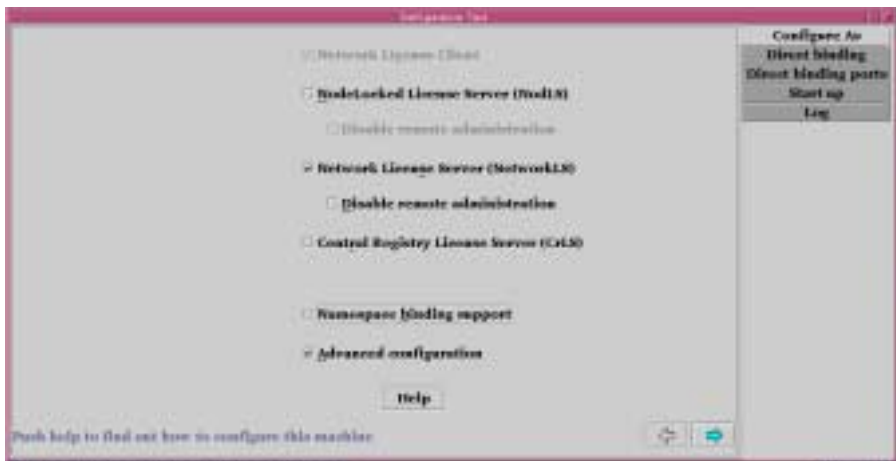


Figure 21. Configuration Tool Notebook - Network License Server

3. On the **Start up** page, select **Start services at system startup** to start the network license server when you power on the machine.
4. On the **Log** page, select the events you want to be logged and specify where you want the log to be kept, as shown in Figure 22.

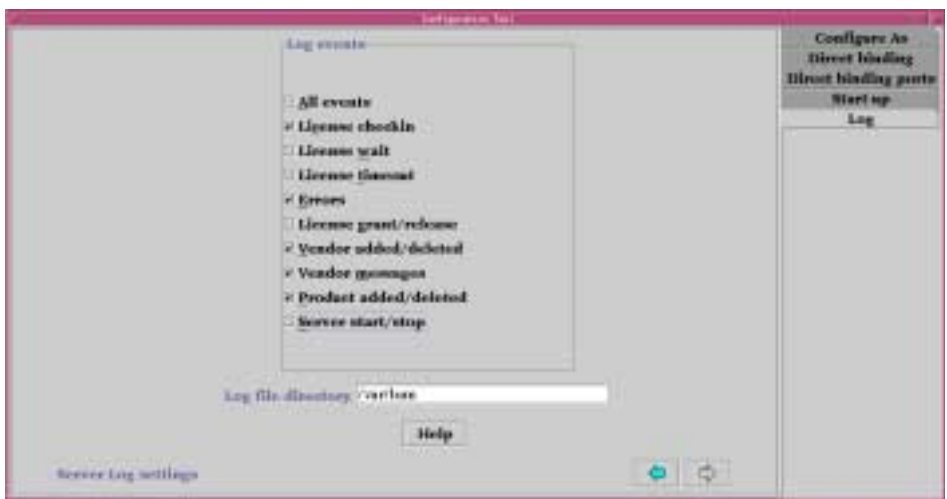


Figure 22. Configuration Tool Notebook - Log Page

The logged events are stored in the files `logdbnn_`, where `nn` assumes values from 00 to 99. When a file is full, according to a maximum number of lines fixed in the configuration file, a new one is started.

5. If you have decided that this server is to be part of a direct binding servers list, select the **Direct binding** tab. If you configure in this way, clients will be able to locate the server only through direct binding. In this case, skip the next step (**Namespace binding** page). The **Direct binding** section is displayed, as shown in Figure 23.

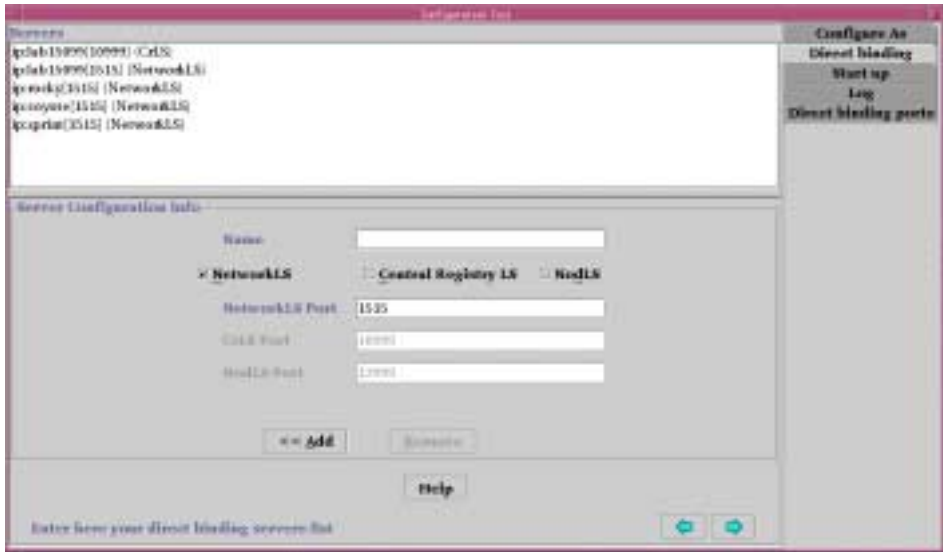


Figure 23. Configuration Tool Notebook - Direct Binding Section

On this page you specify all the network license servers in the direct binding servers list. You must include this network license server that you are configuring, and the central registry license server, if any. If the central registry license server and a network license server run on the same machine, be sure you include both servers in the list.

As you configure the servers in the direct binding servers list, be sure you define exactly the same set of servers on each.

In addition to specifying the direct binding servers list, use this page to specify any remote nodelocked license servers whose licenses you want to administer from this machine. Do not include the nodelocked license server on this machine. You can administer local nodelocked licenses automatically, without specifying direct binding.

In this example, the administrator performs the following steps for each server:

- a. In the **Name** field, enter the TCP/IP host name of the machine you are adding to the Servers list. Note that the server name is case-sensitive.
 - b. If the server being added is a network license server, leave only the **NetworkLS** check box selected.
 - c. Check **NodLS**, **NetworkLS**, or **Central Registry LS**, or any combination, depending on the roles the machine plays in the network.
 - d. Leave the default values in the **NetworkLS Port**, **CrLS Port**, and **NodLS Port** fields.
 - e. Select the **<<Add** push button to add the server to the **Servers** list.
6. If you have decided that this server is to be part of a namespace binding cell rather than a direct binding servers list, check the **Namespace binding support** check box on the **Configure As** page. This adds the Namespace binding page to the notebook. If you configure in this way, clients will be able to locate the server through either namespace binding or direct binding. Select the **Namespace binding** tab. The **Namespace binding** page is displayed, as shown in Figure 24.

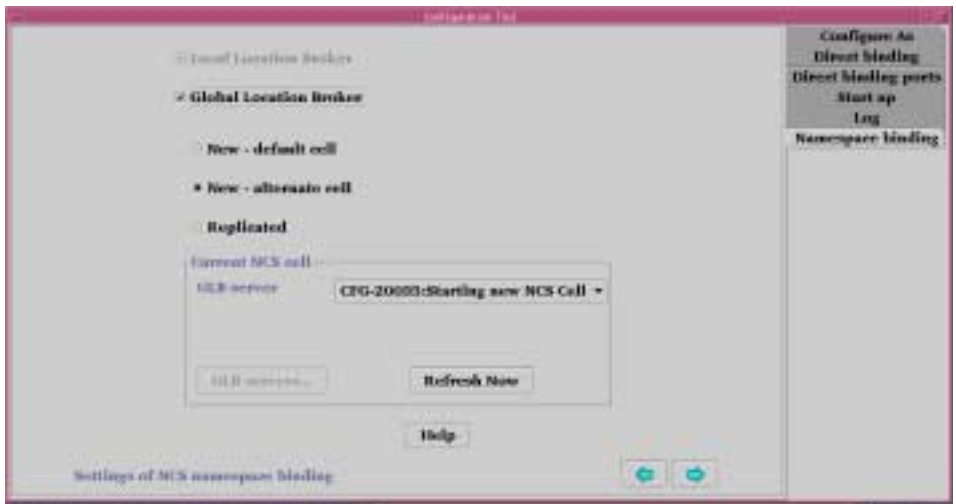


Figure 24. Configuration Tool Notebook - Namespace Binding Section

If this is the first server (including nodelocked license servers, and the central registry license server) to be configured in the cell, then select the **Global Location Broker** check box to start the global location broker on the server. Select either **New - default cell** or **New - alternate cell** to start the global location broker in a new cell.

If there are other users of NCS at your location who might create a default cell, it is safer to configure only alternate cells. Since the two default cells would have the same UUID, results would be unpredictable.

If, alternatively, other network license servers or the central registry license server, or both, have already been configured in the cell, follow these steps:

- a. If you want the server being configured to have a copy of the global location broker, select the **Global Location Broker** check box and the **Replicated** radio button. If you do not want to run a copy of the global location broker, do not check **Global Location Broker**.
- b. In the **GLB Server** field, choose the address of a server in the cell that has the global location broker.
- c. Check that there is no `glb_site.txt` file, or, if the file exists, that it includes a server that is in the cell being joined. Otherwise, use the `i4cfg -G null` command to delete the existing site list.
- d. If the selected GLB server is on a machine that has multiple network adapters, be sure the GLB server has been started on the adapter to which the machine being configured is connected.

If your machine is on a subnetwork different from the one of the server that starts the global location broker, or if your system does not support broadcasting, further configuration steps are needed (see "Configuring to Reach a Global Location Broker in a Different Subnetwork").

7. Select **Close** from the system menu in the upper left corner of the notebook. A message is displayed to confirm that you are ready to save your choices.

Now the workstation can be used as a network license server, to install and grant product licenses and monitor their usage.

Configuration Script Equivalent

To configure the network license server using the configuration script, enter the command:

```
i4cfg -script
```

In response to the first question, select 3; then respond to the questions as they are asked.

Command-Line Equivalent

To configure the network license server:

- With direct binding:

```
i4cfg -a s -S a -e cegvmp -l /home/baratti -b "network ip:thelma  
ip:louise' 'nodelocked ip:speedy' 'registry ip:thelma'" -n n
```


- With namespace binding, starting a new alternate cell:

```
i4cfg -a s -S a -e cegvmp -l /home/baratti -b null -n g -r first
```

To achieve the same result as the direct binding example, **speedy** and **thelma** must join this new cell.

Scenario 4: Configuring the Central Registry License Server

This scenario shows how the administrator configures the central registry license server (in this example, **thelma**), making it part of a direct binding servers list or a namespace binding cell.

Be sure you configure only one central registry license server. Plan carefully where to configure it; once you start it, you cannot move it. (See “Planning the Central Registry” on page 46.)

Configuring a machine as the central registry license server makes it possible to use licenses of the types shown in Table 7 on page 68. It also makes it possible to use the Basic License Tool to administer licenses on remote license servers in the network.

To configure the central registry license server after installation of LUM Runtime:

1. Login with root authority and issue the `i4cfg` command. The Configuration Tool notebook is displayed.
2. On the Configure As page, select **Central Registry License Server**. **Network License Client** is then automatically checked. The **Configure As** page is shown in Figure 25.



Figure 25. Configuration Tool Notebook - Central Registry License Server

3. On the **Start up** page, select **Start services at system startup** to start the central registry license server when you power on the machine.
4. If you have decided that the central registry license server is to be part of a direct binding servers list, select the **Direct binding** tab. If you configure in this way, clients will be able to locate the server only through direct binding. In this case, skip the next step (**Namespace binding** page). The **Direct binding** section is displayed, as shown in Figure 26.

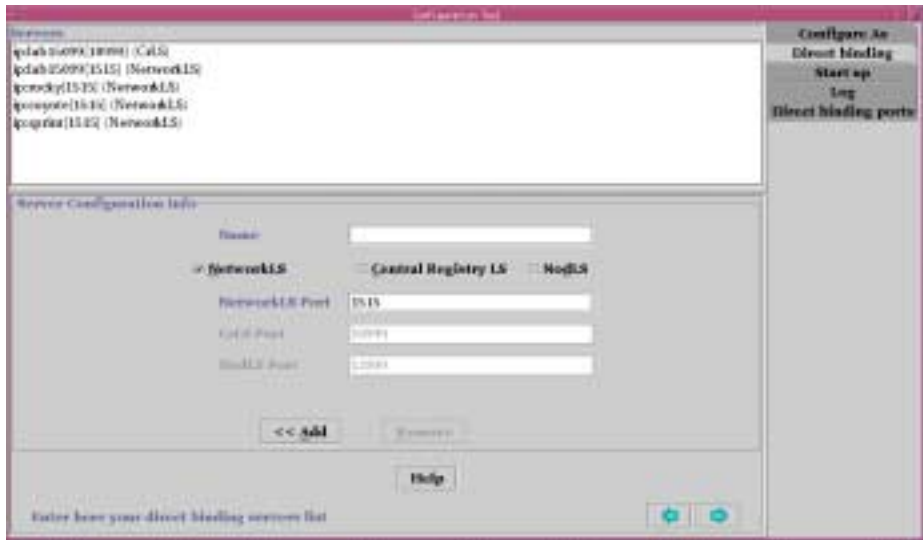


Figure 26. Configuration Tool Notebook - Direct Binding Section

On this page you specify all the license servers in the direct binding servers list. You must include the central registry license server that you are configuring. If the central registry license server and a network license server or nodelocked license server run on the same machine, include all servers in the list.

As you configure the servers in the direct binding servers list, be sure you define exactly the same set of servers on each.

In addition to specifying the direct binding servers list, use this page to specify remote nodelocked license servers whose licenses you want to administer from this machine. Do not include the nodelocked license server on this machine. You can administer local nodelocked licenses automatically, without specifying direct binding.

In this example, the administrator performs the following steps for each server with which this server will communicate:

- a. Check **NodLS**, **NetworkLS**, or **Central Registry LS**, or any combination, depending on the roles the machine plays in the network.
 - b. Leave the default values in the **NetworkLS Port**, **CrLS Port**, and **NodLS Port** fields.
 - c. Select the <<**Add** push button to add the server to the Servers list.
5. If you have decided that the central registry license server is to be part of a namespace binding NCS cell rather than a direct binding servers list, check the **Namespace binding support** check box on the **Configure As** page. This adds the **Namespace binding** page to the notebook. If you configure in this way, clients will be able to locate the server through either namespace binding or direct binding.

Select the **Namespace binding** tab. The **Namespace binding** page is displayed, as shown in Figure 27.

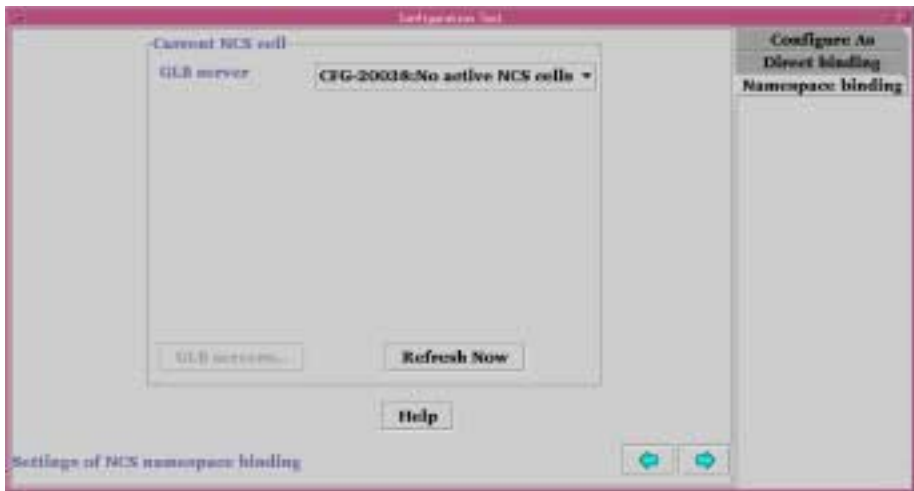


Figure 27. Configuration Tool Notebook - Namespace Binding Section

If this is the first server (including nodelocked license servers, network license servers, and the central registry license server) to be configured in the cell, then select the **Global Location Broker** check box to start the global location broker on the server. Select either **New - default cell** or **New - alternate cell** to start the global location broker in a new cell.

If there are other users of NCS at your location who might create a default cell, it is safer to configure only alternate cells. Since the two default cells would have the same UUID, results would be unpredictable.

If, alternatively, network license servers have already been configured in the cell, follow these steps:

- a. If you want the server being configured to have a copy of the global location broker, select the **Global Location Broker** check box and the **Replicated** radio button. If you do not want to run a copy of the global location broker, do not check **Global Location Broker**.
- b. In the **GLB Server** field, choose the address of a server in the cell that has the global location broker.
- c. Check that there is no `glb_site.txt` file, or, if the file exists, that it includes a server that is in the cell being joined. Otherwise, use the `i4cfg -G null` command to delete the existing site list.
- d. If the selected GLB server is on a machine that has multiple network adapters, be sure the GLB server has been started on the adapter to which the machine being configured is connected.

If your machine is on a subnetwork different from the one of the server that starts the global location broker, or if your system does not support broadcasting, further configuration steps are needed (see “Configuring to Reach a Global Location Broker in a Different Subnetwork” on page 92).

6. Select **Close** from the system menu in the upper left corner of the notebook. A message is displayed to confirm that you are ready to save your choices.

Now the workstation can be used as the central registry license server.

Configuration Script Equivalent

To configure the central registry license server using the command-line script, enter the command:

```
i4cfg -script
```

In response to the first question, select **4**; then respond to the questions as they are asked.

Command-Line Equivalent

To configure the central registry license server:

- With direct binding:

```
i4cfg -a r -S a -e cegvmp -l /home/baratti -b "'network ip:louise'
'nodelocked ip:speedy ip:louise' 'registry ip:thelma'" -n n
```

- With namespace binding, joining an existing alternate cell and replicating the global location broker at the server **lab68086**:

```
i4cfg -a r -S a -e cegvmp -l /home/baratti -b null -n g
-r from:ip:lab68086 -c 789b91c50000.0d.00.00.87.84.00.00.00
```

Note that to achieve the same result as the direct binding example, **louise** and **speedy** must join the same cell.

Scenario 5: Configuring a Network License Client

This scenario shows how the administrator or the end user configures LUM Runtime as a client of the network license servers configured in “Scenario 3: Configuring a Network License Server” on page 80, and of the central registry license server configured in “Scenario 4: Configuring the Central Registry License Server” on page 85. Configuring a machine as a network license client makes it possible to use licenses of the types shown in Table 7 on page 68.

This scenario shows the steps the end user follows to configure the network license client after installation of LUM Runtime.

1. Login with root authority and issue the `i4cfg` command. The Configuration Tool notebook is displayed, as shown in Figure 28.



Figure 28. Configuration Tool Notebook - Network License Client

2. If the network license client is to locate network license servers using direct binding, select the **Direct binding** tab. In this case, skip the next step (**Namespace binding** page). The Direct binding section is displayed, as shown in Figure 29 on page 90.

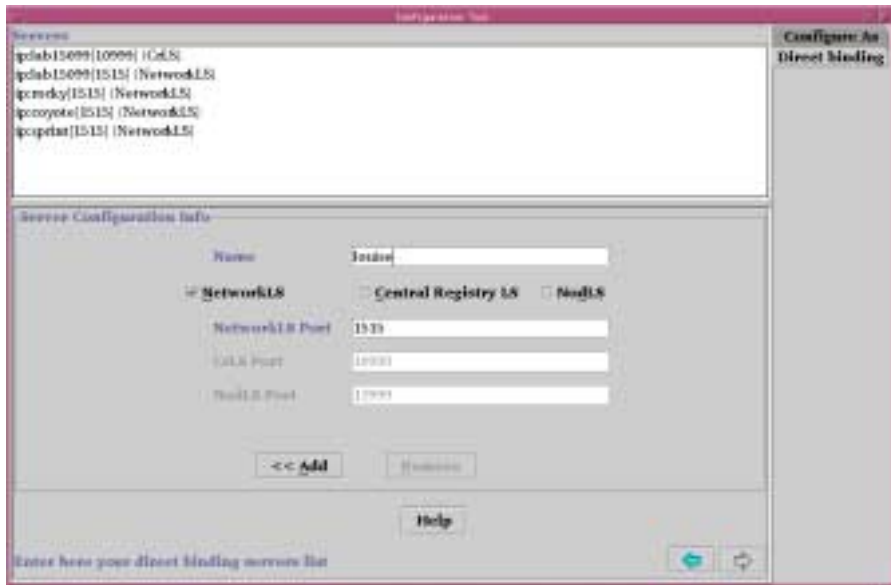


Figure 29. Configuration Tool Notebook - Direct Binding Section

On this page you specify all the license servers with which this client will communicate. Before you begin specifying the servers, be sure you have read the performance notes under “Planning Direct Binding” on page 43.

In this example, for each license server, the administrator does the following:

- a. Enter the TCP/IP host name of the license server in the **Name** field. (Note that the server name is case-sensitive.)
 - b. Check **NodLS**, **NetworkLS**, **Central Registry LS**, or any combination, depending on the roles the server plays in the network.
 - c. Leave the default values in the **NetworkLS Port**, **CrLS Port**, and **NodLS** fields.
 - d. Select the **<<Add** push button to add the server to the Servers list.
3. If the network license client is to locate the server using namespace binding rather than direct binding, select the **Namespace binding support** check box on the **Configure As** page, and then select the **Namespace binding** tab. The **Namespace binding** section is displayed, as shown in Figure 30 on page 91.

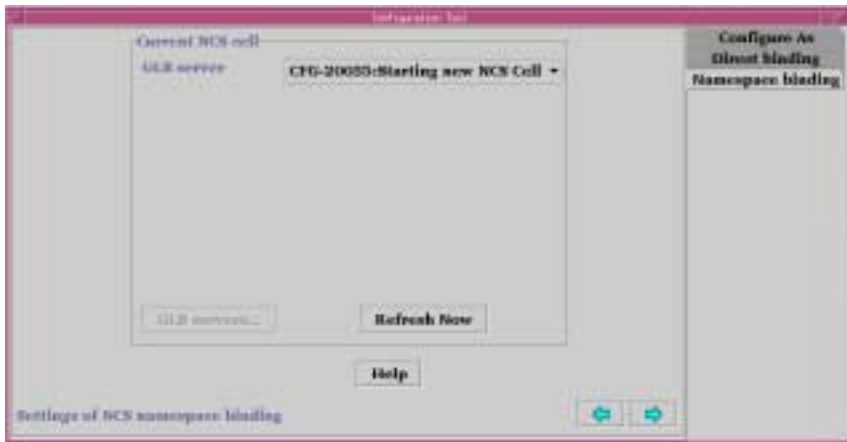


Figure 30. Configuration Tool Notebook - Namespace Binding Section

In the **Namespace binding** section, select the down arrow on the right of the **GLB server** field to see the list of servers where the global location broker runs in each existing cell, and select a server from the list. The client workstation joins the same cell as the selected server. If the selected server is on a machine that has multiple network adapters, be sure the server has been started on the adapter to which your client is connected.

If your machine is on a subnetwork different from the one of the server that starts the global location broker, or if your system does not support broadcasting, further configuration steps are needed (see "Configuring to Reach a Global Location Broker in a Different Subnetwork").

4. Select **Close** from the system menu at the upper left corner of the notebook. A message is displayed to confirm that you are ready to save your choices.

The end user can now use products that have network licenses.

Configuration Script Equivalent

To configure the network license client using the command-line script, enter the command:

```
i4cfg -script
```

In response to the first question, select 1; then respond to the questions as they are asked.

Command-Line Equivalent

To configure the network license client:

- With direct binding:

```
i4cfg -a c -b "'network ip:thelma ip:louise'  
'registry ip:thelma'" -n n
```

- With namespace binding, joining an existing cell that has UUID 456b91c50000.0d.00.00.87.84.00.00.00:

```
i4cfg -a c -b null -n c -c 456b91c50000.0d.00.00.87.84.00.00.00
```

To achieve the same result as the direct binding example, **louise** and **thelma** must join the same cell.

Configuring to Reach a Global Location Broker in a Different Subnetwork

If your system does not support broadcasting or if the global location broker is running on a machine in a different subnetwork, perform the following additional configuration steps on your network license servers, network license clients, and central registry license server to enable them to reach the global location broker:

1. Create a file called `glb_site.txt` in the directory:

```
/etc/ncs
```

In the file, make one line for the address of each server that runs the global location broker that you want to enable this machine to reach. Each address has the following form:

```
ip:host
```

where `host` is the TCP/IP hostname or the ip address. In the latter case, use a leading `#` to indicate that the host is an address and is in the standard numeric form (for example, `#192.9.8.7` or `#515c.111g`).

Blank lines and lines beginning with `#` are ignored.

This is a sample of a `glb_site.txt` file:

```
ip:charlie  
ip:#192.9.8.7
```

2. If the machine belongs to an alternate cell, copy the file: `/etc/ncs/glb_obj.txt` from the server running the global location broker into the `/etc/ncs` directory of the machine being configured. Put the same value in the `NCSCell` tag of the configuration file (see “Appendix A. LUM Runtime Configuration File” on page 235).

Starting and Listing Your Subsystems

When you finish your configuration, issue the command:

```
i4cfg -start
```

to start the subsystems you have configured on your machine.

To verify that they are up and running, issue the command:

```
i4cfg -list
```

Verifying Connections to Servers

To verify that license servers are running properly, use the `i4tv` (test verification) tool, or use the `i4blt -ln` command to get a list of active servers (network license servers, nodelocked license servers, and the central registry license server). For more information about these commands, see “Chapter 6. LUM Runtime CLI” on page 129.

License Servers on a System with Multiple Network Interfaces

This section explains special considerations for a license server on a machine that has more than one network interface (for example, token ring and Ethernet). These considerations apply to:

- Network license servers
- The central registry license server
- Nodelocked license servers whose licenses are administered by instances of the Basic License Tool on remote machines

A license server can listen and offer its services on any network interface.

In a direct binding environment, regardless of the TCP/IP LAN configuration, there are no connection problems in contacting the server. You need only be sure that the machine that is contacting the server uses the hostname of the license server machine on the network interface to which the contacting machine’s LAN is attached.

In a namespace binding environment, special care in configuring the TCP/IP LAN environment is required to prevent connection problems.

When you start the license server, it registers, in the namespace (the `gldb` database), the data that enables clients and other servers to locate the license server itself: family (`tcp/ip`), address, and port. If the license server registers with its token ring address, only token-ring connections will work; if it registers with the Ethernet address, only Ethernet connections will work. The license server retrieves its address by issuing a system call that returns the

first value found, independent of the type of network interface (such as token-ring or Ethernet). This address retrieval is carried out by querying, in order, domain name server, if any; network information services (NIS), if any; and the `/etc/hosts` file.

This section illustrates some potential customer scenarios with network license clients using namespace binding and shows how to make them work.

In these examples, the network license server is on a system called *LSS*. Some computers (called License Clients A) are connected to *LSS* through token ring LAN A, and other computers (called License Clients B) are connected to *LSS* through Ethernet LAN B.

These examples are equally applicable if the machine labeled "License Server System" is a nodelocked license server and the machines labeled "License Management Clients" are other license servers from which licenses on the nodelocked license server are administered.

Example 1: Network License Clients on Two LANs

In this example, the customer wants LAN A computers and LAN B computers to communicate correctly via TCP/IP and wants the network license server to serve both License Clients A and License Clients B. See Figure 31.

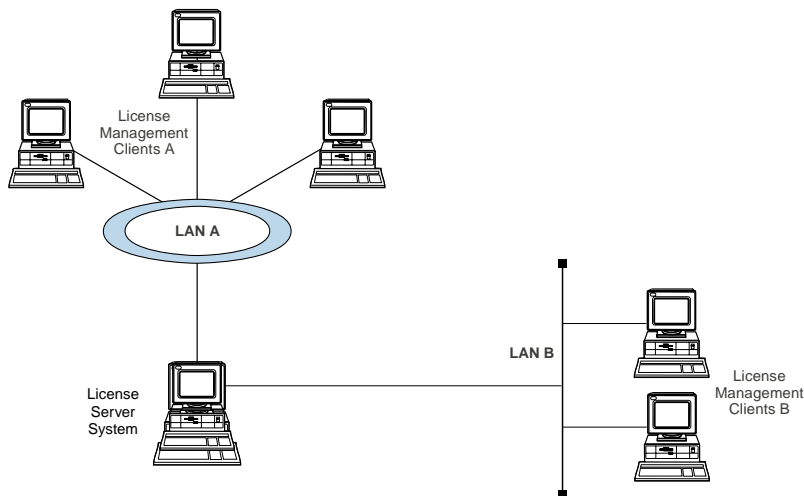


Figure 31. Network License Clients on Two LANs

To set up TCP/IP communication between LAN A and LAN B, the *LSS* machine must be configured as a TCP/IP gateway between the two LANs. To do this, either:

- Set LSS as the default gateway in all the computers on both LANs, or
- Add a new entry in the routing tables of all the computers on both LANs, in particular:
 - In the LAN B computers: IP packets for LAN A go to LSS
 - In the LAN A computers: IP packets for LAN B go to LSS

In either case, LSS must have `ipforwarding=1` to enable the exchange of IP packets between the two LANs.

Example 2: Network License Clients on One LAN

In this example, the hardware configuration is the same as in Example 1, but the customer does not want LAN A computers and LAN B computers to communicate at all. The customer wants the license server to serve only Clients A. There are two possible solutions:

Solution 1

To set up TCP/IP communication between LAN A and LAN B, the LSS machine must be configured as a TCP/IP gateway between the two LANs. (Note that it does not actually function as a gateway.) To do this, either:

- Set LSS as the default gateway in all the computers on LAN A, or
- Add a new entry in the routing tables of all the computers on LAN A; in particular, in the LAN A computers: IP packets for LAN B go to LSS

In either case, LSS must have `ipforwarding=0` to disable the exchange of IP packets between the two LANs but enable LSS to read packets for LAN B.

Solution 2

Without configuring LSS as a TCP/IP gateway or changing the routing tables, it is possible to force the choice of adapter on which the license server must start. In the configuration file (`/var/lum/i4ls.ini`), set the parameter **UseHostTable=yes** to have the license server reverse the search order (first hosts file, then domain name server and NIS). If you put the token-ring entry before the Ethernet entry in the hosts file, the license server will register using the address of the token-ring adapter.

Example 3: Internet Gateway

This scenario is just like Example 1 except that the customer intranet is connected to the Internet by an Internet gateway, **IG**, which is specified as a default gateway for Clients B. As in Example 1, the customer wants LAN A computers and LAN B computers to communicate correctly via TCP/IP and wants the network license server to serve both License Clients A and License Clients B. See Figure 32 on page 96.

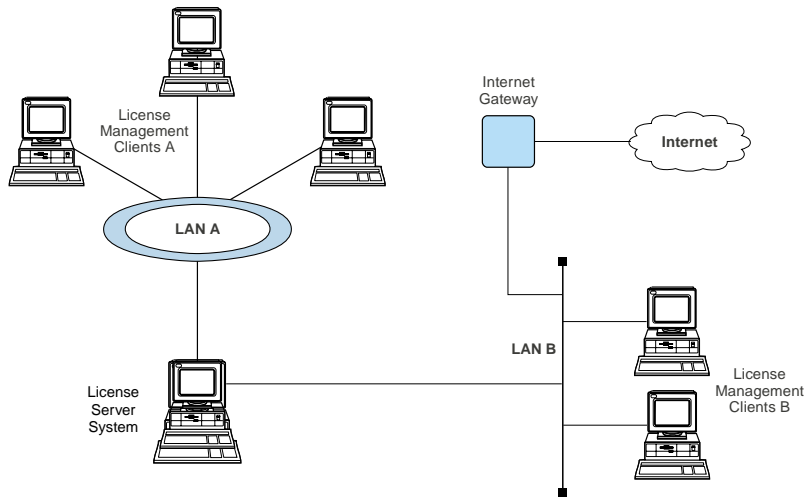


Figure 32. Internet Gateway Connection

In this case, instead of changing the TCP/IP configuration of all computers on both LANs as was required in Example 1, it is enough simply to add a new entry in the IG routing table, so that all packets for LAN B will go to LSS.

Chapter 5. Daily Tasks

This chapter contains scenarios that illustrate the daily tasks needed to manage license-enabled products.

The tasks can be done using either the Basic License Tool GUI (*BLT GUI*) or the command-line interface (*CLI*). The scenarios use the GUI. The equivalent CLI commands are shown at the end of each scenario.

Attention: If you want to run the scenarios, you must substitute your own values for the sample or fictitious names: **server name**, **product name**, **vendor name**, **enrollment certificate name**, **product version**, and **user name**.

The scenarios assume that the server **lab15099** is running the nodelocked license server, a network license server, and the central registry license server. The Basic License Tool is run from **lab15099**.

The scenarios use three sample products from three fictitious IBM vendors:

- SMARTJava Version 2.3, a product of the vendor IBM Software Group. SMARTJava has concurrent licenses, which the vendor delivers via a compound password. It is a customer-managed use product, and the vendor enabled it to allow the customer to exercise the hard stop/soft stop policy. Its enrollment certificate is named `smrtjava.lic`.
- DataMaster Version 2.1a, a product of the vendor IBM Corporation. DataMaster is a vendor-managed use product with reservable licenses. Its enrollment certificate is named `datamst.lic`.
- e-MailVision Version 1.2, a product of the vendor IBM Software Solutions. e-MailVision has per-server/per-seat licenses. The enrollment certificate for the per-server license is `emailvps.lic`, and for per-seat it is `emailvpt.lic`.

The administrator has placed the enrollment certificate files for these three products in the directory `/home/ferretti/certif/`.

Using the Basic License Tool GUI

This section gives some general guidance for using the Basic License Tool GUI (*BLT GUI*).

Starting the Basic License Tool GUI

To start the BLT GUI, login with root authority and issue the command
`i4blt`

The main window appears (Figure 33).



The screenshot shows the 'Basic License Tool' main window. At the top, there is a menu bar with 'Products Selected Edit View Options Help'. Below the menu bar is a toolbar with several icons. The main area contains a table with the following data:

| Product | Version | Vendor | Licenses | In Use Licenses | Bundle Components |
|-------------------------------|---------|------------------------------|----------|-----------------|-------------------|
| DataMaster | 3.3 | IBM Software Solutions | 100 | 0 | No |
| LicensePower/FOE Test Product | 1.0 | LicensePower/FOE Test Vendor | 10000 | 0 | No |
| SMARTflow | 3.5 | IBM Software Solutions | 5 | 0 | No |

Figure 33. Basic License Tool GUI - Main Window

The products shown belong to all the active network license servers, nodelocked license servers, and the central registry.

In the Basic License Tool window the heading **Licenses** indicates licenses that are available to end users (including those that are in use) unless the current date is before the start date of the licenses or the licenses have expired.

Refreshing License Information

Before viewing information about concurrent, reservable, per-server, and concurrent nodelocked licenses in use for a product, it is a good idea to clean up stale licenses. In the main window:

1. Highlight the product.
2. Select **Clean up stale licenses** from the Selected menu.

If you turned the auto cleanup feature on (see “Appendix A. LUM Runtime Configuration File” on page 235) all stale licenses are cleaned up automatically at each BLT refresh.

Selecting Servers, Vendors and Licenses

To reduce the number of servers, vendors or licenses shown in the window:

- Use the **Include...** option of the View menu. You can specify which servers and vendors are shown as of the next refresh.
- Use the **Settings...** option of the Options menu. You can specify the types of licenses (nodelocked, network, or both) to be shown as of the next refresh.

Note:

If a selected server shuts down it is no longer selected, even if it is restarted.

If a selected server shuts down, and you subsequently request a report or a display of information gathered from all selected servers, the

request fails and error messages notify you that it was not possible to communicate with the server. In this case, use the **Refresh Now** option of the View menu, or deselect or restart the failing server, and try again.

Performing Basic Administration

The scenarios in this section demonstrate how to:

- Enroll a licensed product (“Enrolling the Product”).
- Distribute licenses from a compound password (“Distributing the Licenses” on page 103).
- Get a report on the use of licensed products (“Generating Reports” on page 104).
- Check the current users of licensed products (“Checking the Number of Product Users” on page 106).
- Reserve reservable licenses for specific users and monitor the use of reservable licenses (“Scenario 7: Managing Reservable Licenses” on page 107).

Scenario 6: Managing a Licensed Product

In this scenario, the administrator enrolls and manages the SMARTJava product. This scenario shows you how to:

- Enroll the SMARTJava product
- Enroll 20 licenses for SMARTJava
- Distribute five of the SMARTJava licenses to a network license server
- Request a report on usage of SMARTJava licenses during a one-month period
- Check the number of concurrent users of SMARTJava

Enrolling the Product

To enroll the SMARTJava product:

1. In the main window, select **Enroll** from the Products menu, then **Single product...** The Enroll Product window is displayed (Figure 35 on page 101).
2. Select the **Import** button. The Import window is displayed. See Figure 34 on page 100 for an example of the import window.

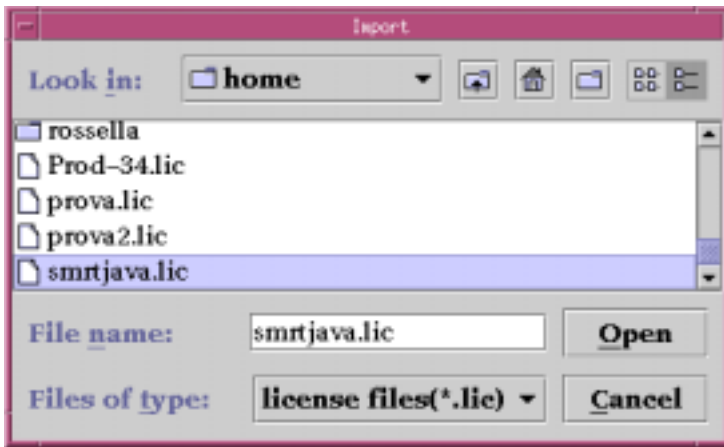


Figure 34. Import window for Custom Configuration

- a. In the **Filter** field, type a path that includes the directory containing the enrollment certificate.
 - b. From the **Directories** list, select the correct directory.
 - c. From the **Files** list, select the the enrollment certificate. For the SMARTJava product, the file is **smrtjava.lic**.
3. Click OK. The Enroll Product window is redisplayed, filled in with the information from the enrollment certificate file. See Figure 35 on page 101.

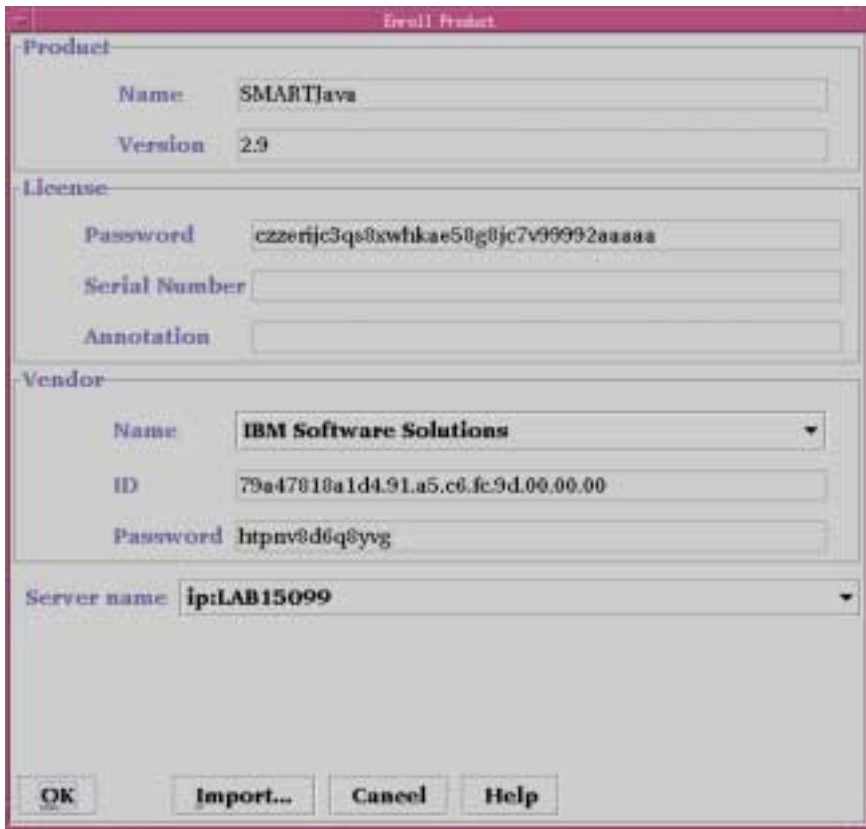


Figure 35. Enroll Product Window (4102)

4. In the **Server name** field, select the server on which the licenses are to be installed. In this example, because the product is customer-managed and has network licenses, the licenses are enrolled on the central registry license server **lab15099**.

Notes:

- a. If the product is vendor-managed, and has a specific target ID set in the enrollment certificate, the licenses must be enrolled on the network license server or nodelocked license server of that target machine.
- b. If the product is vendor-managed and the target ID in the enrollment certificate file is set to **ANY**, select a network license server or a nodelocked license server, depending on license type.
- c. If the product is customer-managed and has nodelocked licenses, select a nodelocked license server.
- d. If the password is bound to a cluster rather than an individual server, select any network license server that is an activated member of the cluster.

5. Click OK.

Because the product is customer-managed, the Enroll Licenses window is displayed.

6. Fill in the Enroll Licenses window with your user information and the number of licenses you want to enroll (in this example, 20) as shown in Figure 36.

Administrator Information:

Name: Michael Princeton

Company: IBM

Address: 73 Fifth Avenue, New York

Additional information:

Product Information:

Enrolled licenses: 20

OK Cancel Help

Figure 36. Enroll Licenses Window

7. Click OK. A message is displayed indicating that the product has been enrolled.

The main window is displayed again, as shown in Figure 37. There is a new line corresponding to SMARTJava, and the icon for the product (a wrapped box) indicates that the product has a compound password.

| Product | Version | Vendor | Licenses | In Use Licenses | Bundle Components |
|-------------------------------|---------|------------------------------|----------|-----------------|-------------------|
| DataMaster | 2.3 | IBM Software Solutions | 100 | 0 | No |
| LicensePower/FOE Test Product | 1.0 | LicensePower/FOE Test Vendor | 10000 | 0 | No |
| SMARTJava | 3.5 | IBM Software Solutions | 5 | 0 | No |

Figure 37. Main Window with SMARTJava Enrolled

Distributing the Licenses

Before the network license clients can be granted licenses to use the product, the administrator must distribute the licenses to a network license server.

Network licenses delivered with a compound password must be distributed. Simple passwords (for example, per-server, per-seat, and concurrent nodelocked licenses) must not be distributed.

To distribute five licenses to the network license server **lab15099**:

1. In the main window, select the line containing the product.
2. Select the **Distribute licenses...** option from the Selected menu. The Distribute Licenses window is displayed, as shown in Figure 38.

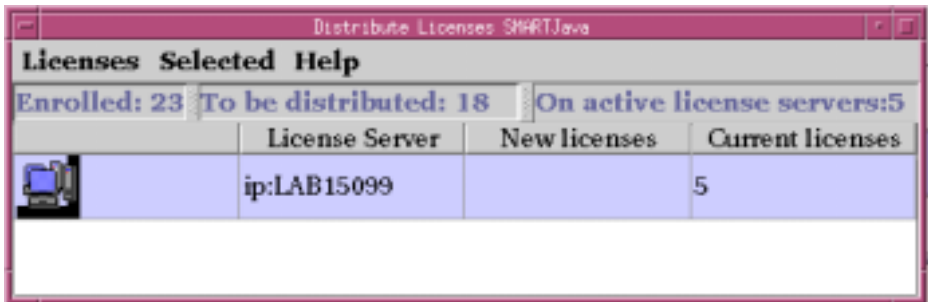


Figure 38. Distribute Licenses Window

3. In the Distribute Licenses window, select the network license server. Right click the selected server, and select the **Set number of licenses....** option from the pop-up menu. The Set number of licenses window is displayed.
4. Enter 5 in the Number of licenses field, as shown in Figure 39 on page 104, and click OK.

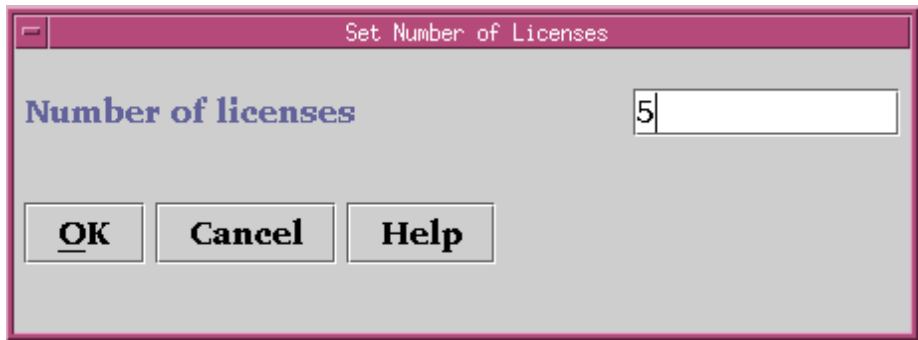


Figure 39. Set Number of Licenses Window

The Distribute Licenses window is redisplayed. The window now shows 15 as the number of licenses available to be distributed. Select the **Distribute** option from the Licenses menu to confirm data and distribute the licenses.

5. In the main window, the number of available licenses changes to 5 and the icon for SMARTJava changes to show a compound password with distributed concurrent licenses.

End users can now use the SMARTJava product.

Generating Reports

This section shows how to get a report of SMARTJava usage for one month: from July 2 to August 2, 2000.

1. Select SMARTJava in the main window (Figure 33 on page 98).
2. Select the **Reports...** option from the Selected menu.
The Reports window is displayed.
3. Fill in the Reports window as shown in Figure 40 on page 105.



Figure 40. Reports Window

- a. Select the report type **License requests by product**.
 - b. Check the **Set date range** checkbox and set the date range for the report in the **From** and **To** fields (in this example, from July 2 to August 2, 2000).
 - c. Click OK.
4. View the Report window, which contains the following report:

```

=====
License Requests By Product
=====

```

| Vendor/Product | Vrsn | Licenses Requested | Licenses Granted | Percent Rejections |
|----------------|------|--------------------|------------------|--------------------|
| ----- | ---- | ----- | ----- | ----- |

```

IBM Software Group      2.3      120      120      0
SMARTJava

```

```

=====
*** End of License Requests By Product ***
=====

```

The report shows that 120 requests were made to use SMARTJava Version 2.3, and all of them were granted.

5. Click **Cancel** in the Reports window.

Checking the Number of Product Users

To check the number of concurrent users of SMARTJava:

1. Select the line corresponding to the SMARTJava product on the main window.
2. Select the option **Open as Details** from the Selected menu. The Details notebook is displayed.
3. Select the Concurrent Users tab. The Concurrent Users page is displayed, as shown in Figure 41.



Figure 41. Concurrent Users Page

It shows the number of licenses in use, with the name of each user. In this example, the user root is using two SMARTJava licenses.

4. Close the notebook.

Command-Line Equivalent

This scenario showed how to enroll SMARTJava and its 20 licenses on the central registry license server, distribute five of the licenses to network license server *lab15099*, get a report on one month's usage, and check the number of concurrent users.

The equivalent CLI commands are as follows.

- To enroll the product on the central registry license server:

```

i4blt -a -n lab15099 -f /home/prince/certif/smrtjava.lic -T 20
-R "'Ian Right' Infotech '73 Fifth Avenue New York'"
-I "'First installed by Ian'"

```

If you use the CLI to enroll a product, check the top of the enrollment certificate file. The vendor may have generated the command to be used. If there are two commands, the `i4blt` command is for use with LUM Runtime Version 4 and the `ls_admin` command is for use with previous releases.

- To distribute five licenses to network license server:

```
i4blt -E -n lab15099 -v "'IBM Software Group'" -p "SMARTJava 2.3" -A 5  
-w lab15099 -I "'Cooper using root'"
```

- To generate a report of requests for SMARTJava from July 2 to August 2, 2000:

```
i4blt -r2 -p "SMARTJava" -b 07/02/2000 -g 08/02/2000
```

- To display information about concurrent users of SMARTJava:

```
i4blt -s -lc -p "SMARTJava"
```

For more information about the CLI, see “Chapter 6. LUM Runtime CLI” on page 129.

Scenario 7: Managing Reservable Licenses

In this scenario, the administrator manages licenses of the DataMaster product. This scenario shows you how to:

- Reserve some reservable licenses for the exclusive use of a specified user
- Monitor usage of reserved licenses by the users for which they were reserved
- Monitor use of unreserved reservable licenses by other users

In this scenario, 100 reservable licenses for DataMaster have already been enrolled. The enrollment process is the same as for concurrent licenses of a customer-managed use product, as shown in “Enrolling the Product” on page 99, except that the Enroll Licenses window is not used. After enrollment, the product appears in the main window. Note that the icon (a hand holding some licenses) indicates that the licenses are reservable.

The enrollment certificate file for DataMaster is shown as an example in “Checking License Details” on page 215.

To reserve some of the licenses for a specific user and monitor use of the reservable licenses:

1. Double-click on the product in the main window and go to the **Reservable tab** of the Details notebook, as shown in Figure 42 on page 108.

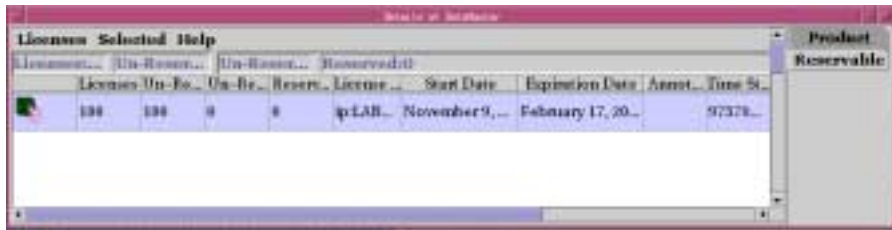


Figure 42. Details Notebook with Reservable Tab. Custom configuration serial number not shown.

Note that there are 100 total licenses, with none in use and none reserved.

2. Right click on the product, and select **Reserve...** from the pop-up menu. The Reserved Licenses - Details window is displayed.
3. Fill in the number of licenses you want to reserve; the user, group, and node ID (alone or in any combination) for which you want to reserve licenses; and the date and time that the reservation is to expire, as shown in Figure 43. The latest allowed expiration date of a reservation is 12/31/2037.

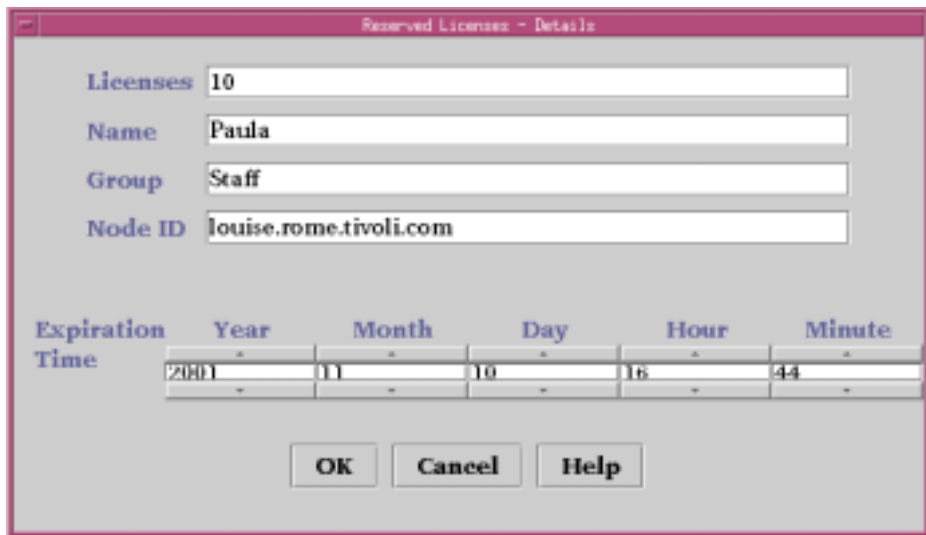


Figure 43. Reserving Reservable Licenses

In the figure, the administrator is reserving ten licenses for user Paula, a member of the group staff, for use on the node lab15099.rome.tivoli.com. The reservation is to expire on November 10, 2000 at 16:44. Note that normally you reserve one license for a specific user and more than one license for a group or node.

4. Click OK.

- The **Reserved** page is added to the Details notebook, as shown in Figure 44.

| License ID | In Use | Name | Group | Node ID | Client | Start | Expir. | Amn. | Tim. | Soft | Soft | Hig. | Time | Pass | Product |
|------------|--------|-------|-------|---------|--------|-------|--------|------|------|------|------|------|------|------|------------|
| 10 | 0 | Paula | Staff | loui | lpLA | Nov | Jan | 973 | No | N/A | 80 | Ver | | | Reservable |

Figure 44. Details Notebook with Reserved Licenses

The example page shows 10 licenses reserved for the user Paula in the group staff.

- Now assume the user Paula requests a license, the **Reserved Users** page is added to the notebook details, as shown in Figure 45. To see the change, you need to refresh the window (using the F5 keyboard key, or the menu option **Refresh now**).

| Name | Group | Node ID | Acid | Product |
|-------|-------|----------|------|------------|
| Paula | staff | LAB15... | 1 | Reservable |

Figure 45. Reserved Users Page with Reservable Licenses in Use

In this example, the **Reserved Users** page shows that the user Paula is using one reserved license.

- Now assume that the user root requests a license to DataMaster. No licenses have been reserved for root, but there are 90 unreserved licenses. Such licenses are available to all users until the administrator reserves them. One of those licenses is granted to root. It is managed exactly like a concurrent license.

The **Un-Reserved Users** page is added to the Details notebook for DataMaster, as shown in Figure 46 on page 110.

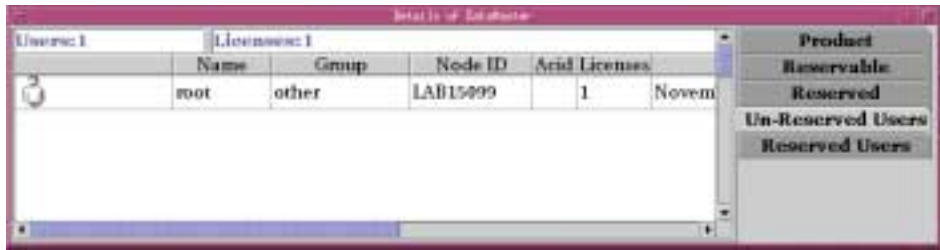


Figure 46. Un-Reserved Users Page

- The Reservable page now shows 1 reserved licenses, 1 unreserved license in use, and 99 unreserved licenses, as shown in Figure 47.

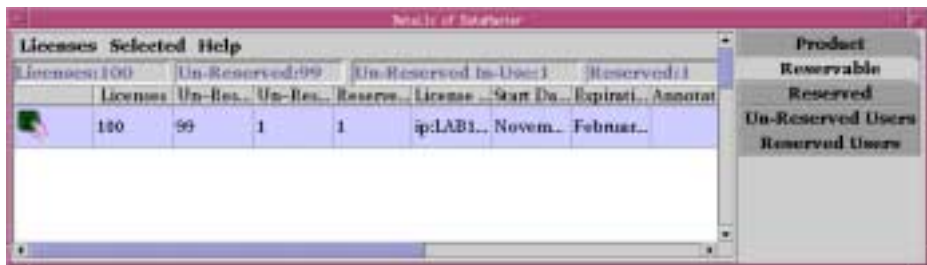


Figure 47. Reservable Page with Unreserved Licenses in Use

Command-Line Equivalent

This scenario showed how to reserve ten DataMaster licenses for the user **Paula**, display information about that user's use of the reserved licenses, display information about the use of the unreserved licenses by other users, and display detailed information about the product.

The equivalent CLI commands are as follows.

- To get the timestamp of the licenses to be reserved:


```
i4blt -lp -i -v "'IBM Corporation'" -p "DataMaster"
```
- To reserve ten DataMaster licenses for the user Paula in group staff on node lab15099.rome.tivoli.com using the license password identified by timestamp 899460562:


```
i4blt -R r -v "'IBM Corporation'" -p "DataMaster 2.1a"
      -t 899460562 -A 10 -g 11/02/1998 -H 18:00 -u "Paula staff lab15099.rome.tivoli.com"
```
- To display information about the users of reserved licenses:


```
i4blt -s -lrr -v "'IBM Corporation'" -p "DataMaster"
```
- To display information about the users of unreserved licenses:


```
i4blt -s -lru -v "'IBM Corporation'" -p "DataMaster"
```

- To display detailed information about the product, including the number of reserved and unreserved licenses:

```
i4blt -lp -i -v "'IBM Corporation'" -p "DataMaster"
```

Exercising Customer-Controlled Policies

The scenarios in this section explain how to exercise the customer-controlled policies outlined in “Customer-Managed Use Products” on page 6. The scenarios show how to:

- Switch from per-server to per-seat licenses (“Scenario 8: Switching from Per-Server to Per-Seat Licenses”)
- Use the hard stop/soft stop policy (“Scenario 9: Using the Hard Stop/Soft Stop Policy” on page 112)
- Update the number of licenses of a customer-managed use product (“Scenario 9: Using the Hard Stop/Soft Stop Policy” on page 112)
- Control the set of users who are permitted to use a specific application (“Scenario 10: Restricting User Access” on page 115)

Scenario 8: Switching from Per-Server to Per-Seat Licenses

In this scenario, the administrator switches the policy for the product e-MailVision from per-server to per-seat. The per-server license has already been enrolled. The enrollment process is the same as for customer-managed concurrent licenses, as described in “Enrolling the Product” on page 99.

The icon for e-MailVision shows per-server licenses.

To do the switch:

1. Install the per-seat license, importing the per-seat enrollment certificate `emailvpt.lic` and enrolling 50 licenses. The enrollment process is the same as for customer-managed concurrent licenses, as described in “Enrolling the Product” on page 99.
2. Select e-MailVision in the main window (Figure 33 on page 98). Select the **Update licenses...** option from the **Selected** menu. The Details notebook is displayed.
3. Click the Per-Seat tab. Now right-click the product, and select **Update licenses...** from the pop-up menu. The Update Licenses window is displayed. Check the box **Enable per-seat licensing**, as shown in Figure 48 on page 112.

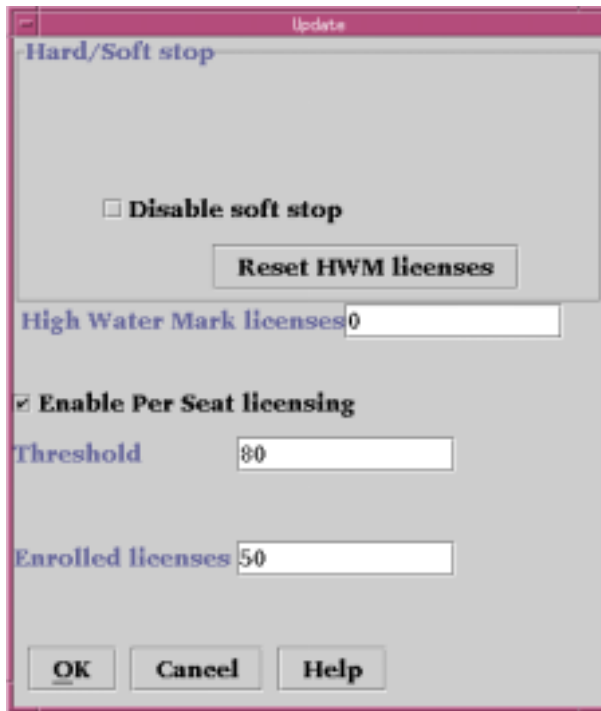


Figure 48. Enabling Per-Seat Licensing

4. Click OK to make the change.
5. In the main window the icon changes to show per-seat licenses. The license server will remove the old per-server licenses.

Command-Line Equivalent

This scenario showed how to switch the e-MailVision product from per-server licensing to per-seat licensing.

The equivalent CLI commands are as follows.

- To enroll the per-seat licenses for e-MailVision: `i4blt -a -f /home/prince/certif/emailvpt.lic -T 2 -R "Keith Hogson"`
- To switch e-MailVision from per-server to per-seat licensing:
`i4blt -U -v "'IBM Software Solutions'" -p "e-MailVision 1.2" -S yes`

Scenario 9: Using the Hard Stop/Soft Stop Policy

In “Scenario 6: Managing a Licensed Product” on page 99, the administrator enrolled the SMARTJava product and distributed five licenses from a network compound password. Now the administrator has distributed the remaining 15 enrolled licenses. Because the vendor enabled this product to use the hard

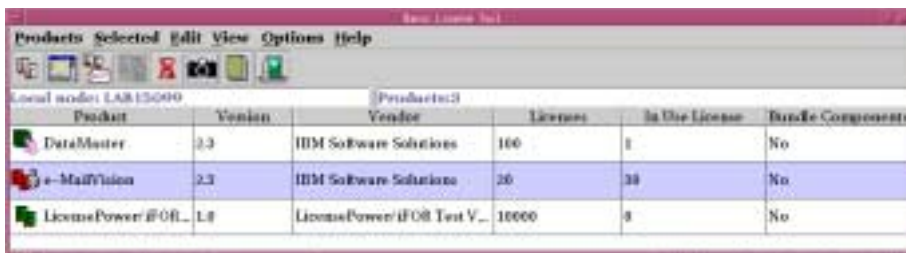
stop/soft stop policy, and the administrator is running it with soft stop set, it is possible that more than 20 licenses are being used at any given time.

In this scenario, the administrator:

- Checks the current number of licenses in use and the maximum number of licenses that have been granted beyond the 20 enrolled (the high-water mark, which in this example is 10)
- Decides to acquire ten more licenses
- Updates the number of enrolled licenses to 30
- Resets the high-water mark to 0
- Distributes ten more licenses from the compound password

Follow these steps:

1. Check the current license usage in the main window (Figure 49).



| Product | Version | Vendor | Licenses | In Use Licenses | Bundle Components |
|----------------------|---------|-----------------------------|----------|-----------------|-------------------|
| DataMaster | 2.3 | IBM Software Solutions | 100 | 1 | No |
| e-MailVision | 2.3 | IBM Software Solutions | 20 | 30 | No |
| LicensePower iFOR... | 1.1 | LicensePower iFOR Test V... | 10000 | 0 | No |

Figure 49. Main window with Soft-Stop Licenses in Use

The window shows that ten licenses beyond the 20 enrolled are in use.

2. Check the longer-term license usage:
Select SMARTJava in the main window. Select **Update licenses...** from the **Selected** menu. The Details notebook is displayed.
3. Go to the Concurrent page, click with the right mouse button on an entry for the product, and select **Update licenses...** from the pop-up menu. The Update Licenses window is displayed (Figure 50 on page 114).

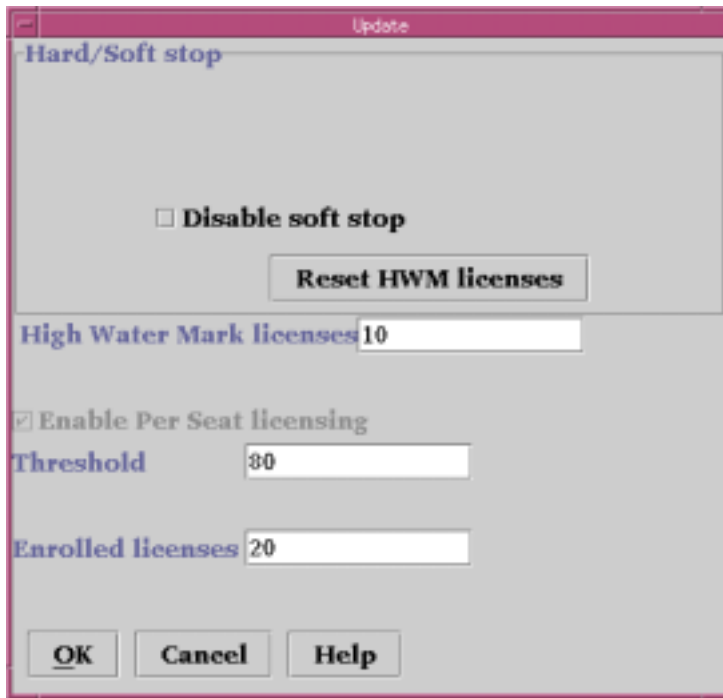


Figure 50. Update Licenses Window with High-Water Mark

The **High Water Mark licenses** field shows that 10 is the maximum number of soft-stop licenses ever in use at one time since the high-water mark was last reset.

4. Decide to acquire ten more licenses, and pay the vendor for them.
5. Returning to the Update Licenses window, enter **30** in the **Enrolled licenses** field. At the same time, reset the high-water mark to **0** by clicking on **Reset HWM Licenses**.
6. Click OK. A confirmation message is displayed.
7. Distribute the ten newly enrolled licenses (see “Distributing the Licenses” on page 103). In the main window (Figure 33 on page 98), the Licenses column for SMARTJava is updated to 30.

Command-Line Equivalent

This scenario showed how to check usage of soft stop licenses for SMARTJava, enrolled and distributed an additional ten licenses, and reset the high-water mark to **0**.

The equivalent CLI commands are as follows.

- To display information about usage of soft stop licenses of SMARTJava:


```
i4b1t -lp -p "SMARTJava" -i
```

- To update the enrollment, enrolling ten more licences on the central registry license server:

```
i4blt -U -v "IBM Software Group" -p "SMARTJava 2.3" -T 30 -I "Luigi using root"
```
- To reset the high-water mark to 0:

```
i4blt -U -v "IBM Software Group" -p "SMARTJava 2.3" -M
```
- To distribute the ten licenses to network license server **lab15099**:

```
i4blt -E -n lab15099 -v "IBM Software Group" -p "SMARTJava 2.3" -A 10  
-w lab15099 -I "Eleanor using root"
```

Scenario 10: Restricting User Access

This scenario explains how to create a user file to designate that certain users may or may not use certain products. You could also use a previously created user file as a base. To create a user file, follow these steps:

1. Using a text editor, open a file named `user_file`.
2. Within the file, to restrict access to a product, use the **vendor** keyword, followed by the name of the vendor, followed by either **all** (meaning all products of this vendor) or the name of a product. Enclose vendor names and product names in quotation marks if they contain embedded blanks. For example:

```
vendor "IBM Software Group" SMARTJava  
vendor Grafix,Inc. all
```

You need one vendor statement for each product of the same vendor, unless `all` is sufficient for your purposes.

3. After each vendor statement, code either an `allow` or a `disallow` statement. `allow` and `disallow` are mutually exclusive.

- `allow`

Specifies that the user names that follow this keyword are allowed to use the product. If no user names follow this keyword, no users can use the product. The user name is the login user name. For example:

```
vendor "IBM Software Group" SMARTJava  
allow fritz harry monique penny
```

This specifies that only four users can use the SMARTJava product: Fritz, Harry, Monique, and Penny. `allow` and `disallow` are mutually exclusive.

- `disallow`

Specifies that the user names that follow this keyword are not allowed to use the product. If no user names follow this keyword, all users can use the product. The user name is the login user name. For example:

```
vendor Grafix,Inc. all  
disallow heather jason
```

This specifies that all users *except* Heather and Jason can use all Grafix, Inc software products.

4. Store the file in the `/var/lum/` directory of the machine where the licenses to be restricted are installed. In this example, the complete user file is:

```
% This line is a comment
% *****
vendor "IBM Software Group" SMARTJava
allow fritz harry monique penny
% *****
vendor Grafix,Inc. all
disallow heather jason
```

5. For a consistent user authorization policy, store the same use file on all network license servers and nodelocked license servers in your environment, including the central registry license server.
6. When adding a new product, remember to update user files at all the license servers accordingly.

Managing High-Availability Licensing (HAL)

The scenario in this section shows how to set up and manage a cluster of network license servers to ensure high availability of concurrent licenses.

When you create a cluster, LUM Runtime generates the cluster ID. For a software vendor to create passwords that are bound to a cluster rather than to a single server, you must provide the cluster ID to the vendor. Therefore, you must create the cluster before you can request licenses bound to the cluster from a software vendor.

Scenario 11: Creating and Managing a Cluster

In this scenario, the administrator:

- Creates a cluster consisting of four network license servers (members)
- Activates all the servers in the cluster
- Adds a fifth server to the cluster
- Deactivates a cluster member

Creating a Cluster

To create a cluster:

1. Before you begin, be sure all the servers you intend to put in the cluster are configured to communicate with each other through direct binding or that they have all joined the same namespace binding cell.
2. In the main window (Figure 33 on page 98), select **View** from the menu bar and the **Clusters...** option from the menu. The Clusters window is displayed, as shown in Figure 53 on page 118.
3. Select **Clusters** from the menu bar and **Create...** from the menu. The Create Cluster window is displayed.

4. Use the **Initial Number** spin box to specify how many servers you intend to put in the cluster. Make sure that this number is what you want, because it determines the maximum number of members the cluster can ever have and the minimum number of activated members necessary to run the cluster. In this example, as shown in Figure 51, the administrator specifies that the initial number of members is 4.



Figure 51. Create Cluster Window

Use the **Name** field to give the cluster a unique name. You will use the name to specify the cluster in GUI and command-line operations. In this example, the administrator names the cluster *Peanut*.

5. Click OK. A pop-up message gives you a chance to change the initial number of members.
6. After you confirm your choices, the Define Cluster Members window is displayed.

Potential members of the cluster are shown in the **Available NetworkLS** box. These are network license servers that are up and running, and are not activated in any other cluster.

Although OS/2, Windows 95, and Windows 98 servers may be listed, do not select them. They can not be members of a cluster.

Select a server from the **Available NetworkLS** list and use the **Add>>** push button to move it to the **Cluster Members** list. Continue until the **Cluster Members** list has exactly the number of servers you specified in **Initial Number**. You can move servers between the **Available NetworkLS** and **Cluster Members** boxes until your selections are final. In the example shown in Figure 52 on page 118, the administrator selects servers **coyote**, **rocky**, **sprint**, and **lab15099**.



Figure 52. Define Cluster Members Window

7. Click OK. A pop-up window is displayed to give you the chance to change your selections. The Clusters window is redisplayed with an entry for the newly-defined cluster, as shown in Figure 53.

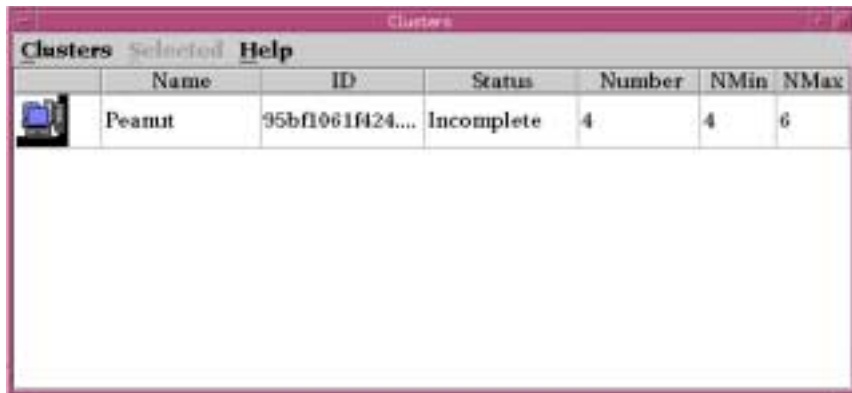


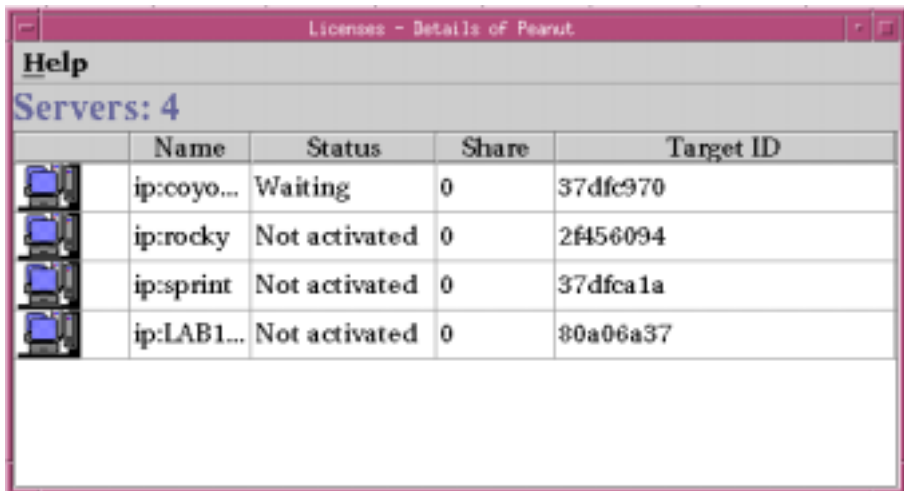
Figure 53. Clusters Window with New Cluster Added

Note that the status of the cluster is **Incomplete**, because not enough servers have been activated yet.

Activating Cluster Members

For a cluster to be able to serve licenses, a minimum number of servers must be activated, and more than half of the activated servers in the cluster must be available. When you create a cluster, only the first server (in this example, **coyote**) is activated. To activate the other servers, follow these steps:

1. In the Clusters window, highlight the cluster *Peanut*. Select **Selected** from the menu bar and **Open As Details...** from the menu. The Details of Peanut window is displayed, as shown in Figure 54.



The screenshot shows a window titled "Licenses - Details of Peanut". Below the title bar is a "Help" button and a header "Servers: 4". A table lists four servers with their names, statuses, shares, and target IDs. Each server name is preceded by a small server icon.





| | Name | Status | Share | Target ID |
|---|------------|---------------|-------|-----------|
|  | ip:coyo... | Waiting | 0 | 37dfc970 |
|  | ip:rocky | Not activated | 0 | 2f456094 |
|  | ip:sprint | Not activated | 0 | 37dfca1a |
|  | ip:LAB1... | Not activated | 0 | 80a06a37 |

Figure 54. Details of New Cluster

The status of server **coyote** is **Waiting**, because it has been activated but the cluster does not yet have enough activated members to start serving licenses. Next to each activated server is displayed the number of the port on which the server performs its high-availability licensing activities.

2. Select server **rocky**. Click on it with the right mouse button and select **Activate** to activate the server. Similarly activate servers **sprint** and **lab15099**.

While each activation is being processed and all the servers in the cluster are being updated, the cluster goes into **Change Pending** status for a time that depends on the number of activated servers in the cluster. While the cluster is in this status, you cannot perform any administration on the cluster. Return to the main window and use F5 to refresh the display, and then view the Clusters window again until the cluster has exited from **Change Pending** status.

3. Return to the Details of Peanut window, where:
 - The status of servers **coyote**, **rocky**, and **sprint** has changed to **Serving**.
 - Each server is serving 33% of the licenses, as shown in Figure 55 on page 120.
 - Server **lab15099** is in **Reserve** status, ready to take over if **coyote**, **rocky**, or **sprint** goes down.

The screenshot shows a window titled "Licenses - Details of Peanut". Below the title bar, there is a "Help" button and the text "Servers: 4". A table lists the details of the servers in the cluster.

| | Name | Status | Sh... | Target ID |
|--|-----------------------------------|---------|-------|-----------|
| | ip:coyote[11999] | Serving | 33 | 37dfc970 |
| | ip:rocky.rome.tivoli.com[11999] | Serving | 33 | 2f456094 |
| | ip:sprint.rome.tivoli.com[11999] | Serving | 33 | 37dfca1a |
| | ip:lab15099.rome.tivoli.com[11... | Reserve | 0 | 80a06a37 |

Figure 55. Details of Cluster after Three Activations

- Return to the Clusters window (Figure 56). The status of the cluster has changed to **Active**. The cluster ID has been generated and is displayed. The administrator can now give the cluster ID to software vendors who will create passwords bound to the cluster.

The screenshot shows a window titled "Clusters". Below the title bar, there are "Clusters", "Selected", and "Help" buttons. A table lists the details of the clusters.

| | Name | ID | Status | Number | NMin | NMax |
|--|--------|----------------|--------|--------|------|------|
| | Peanut | 95bf1061f42... | Active | 4 | 4 | 6 |

Figure 56. Clusters Window with Cluster ID

- Return to the main window, where the HAL test product has been enrolled on the cluster. You can use it to test operation of the cluster.

Adding a Cluster Member

If a cluster has fewer than its maximum number of members, you can add members, one at a time, up to the maximum number. In this example, you can add one additional member to **Peanut**, as follows:

- In the Clusters window, highlight the Peanut cluster. From the **Selected** menu, select **Add cluster member...**. The Add Cluster Members window is displayed. The window is similar to the Define Clusters window shown in Figure 52 on page 118.

Potential members of the cluster are shown in the **Available NetworkLS** box. These are network license servers that are not activated in any other

cluster. Although OS/2, Windows 95, and Windows 98 servers may be listed, do not select them. They can not be members of a cluster.

Select a server (in this example, **thelma**) from the **Available NetworkLS** list and use the **Add>>** push button to move it to the **Cluster Members** list. You can move servers between the **Available NetworkLS** and **Cluster Members** boxes until your selection is final.

2. Click OK. A pop-up window is displayed to give you the chance to change your selection. The Clusters window is redisplayed. The number of servers in *Peanut* is now 5, and the status of the cluster is **Active**. The newly added server is automatically activated.
3. Open the Details of Peanut window (Figure 54 on page 119). The status of servers **coyote**, **rocky**, and **sprint** is **Serving**, and each is serving one-third of the licenses. The status of **lab15099** and **thelma** is **Reserve**.

Deactivating a Server

If you want a server to stop functioning as part of a cluster, you can deactivate it. You can then activate the server in another cluster. You cannot, however, substitute another server for the deactivated server in the cluster where it is deactivated.

To deactivate a server in a cluster:

1. In the Details of Peanut window, select server **thelma**. Click on it with the right mouse button and select **Deactivate** to deactivate the server. While the deactivation is being processed and all the servers in the cluster are being updated, the cluster goes into **Change Pending** status for a time that depends on the number of activated servers in the cluster. While the cluster is in this status, you cannot perform any administration on the cluster. Return to the main window and use F5 to refresh the display, and then view the Clusters window again until the cluster has exited from **Change Pending** status.
2. Return to the Details of Peanut window. The status of server **thelma** has changed to **Not Activated**.

Viewing Licenses Being Served

For a view of a cluster by product, go to a high-availability product (in this case, the HAL Test Product) in the main window. Open the product's Details notebook. On the **Concurrent** page, right-click the product and select the **Show Servers** option. The Details of Cluster window is displayed with additional information about the number of licenses being served by each server, as shown in Figure 57 on page 122.

| Name | Status | Share | Target ID | Shared Licenses | Share in Use |
|-----------------|---------|-------|-----------|-----------------|--------------|
| ip:coyote[119.. | Serving | 33 | 37dfc970 | 3334 | 0 |
| ip:rocky.roma.. | Serving | 33 | 26856094 | 3333 | 0 |
| ip:sprint.rom.. | Serving | 33 | 37dfca1a | 3333 | 0 |
| ip:lab15099.r.. | Reserve | 0 | 40a06a37 | 0 | 0 |

Figure 57. Details of Servers Serving HAL Test Product

Enrolling and Removing Licenses on a Cluster

Checking the Clusters window, you can see the cluster ID of any cluster. Give the cluster ID to the software vendor, who can use it to create passwords that are bound to the cluster, rather than to an individual server. Enroll the licenses on any server of the cluster, as shown in “Enrolling the Product” on page 99.

If you later decide to remove licenses enrolled on a cluster, all activated servers in the cluster must be up and running at the time you do the removal. You must issue the command:

```
i4b1t -d -n server_name
```

where `server_name` identifies one of the servers in the cluster on which the license is enrolled.

Command-Line Equivalent

- To create a cluster named *Peanut* that has members **coyote**, **rocky**, **sprint**, and **lab15099**:

```
i4b1t -H c -N Peanut -T 4 -n "coyote rocky sprint lab15099"
```

- To activate the servers **rocky**, **sprint**, and **lab15099**:

```
i4b1t -H a -N Peanut -n rocky
i4b1t -H a -N Peanut -n sprint
i4b1t -H a -N Peanut -n lab15099
```

The server **coyote**, which is the first in the list, is automatically activated.

- To add the server **thelma** to the cluster:

```
i4b1t -H a -N Peanut -n thelma
```

- To deactivate the server **thelma**:

```
i4b1t -H d -N Peanut -n thelma
```

- To get an overall report of cluster status:
i4b1t -H s -N Peanut
- To get a report of cluster status from the perspective of one of the activated servers in the cluster:
i4b1t -H s -n coyote

Scenario 12: Upgrading a Custom Configuration

The scenario in this section shows you how to upgrade a custom configuration by adding a product to a current custom configuration.

To ensure that the products used are up to date, functionally suitable, and competitive, you will occasionally need to add new product components, increase the number of licenses, or extend the license period. To do this, you request from the vendor a new custom configuration password and supply the serial number of the current license. This serial number identifies your current custom configuration. You then pay for only the difference between the cost of the current license and that of the new license. Next, you install the upgraded license as shown in the following procedure.

Before you start the procedure, look at the current entries on the **Concurrent** page of the Details notebook. Double-click on the product in the Basic License Tool main window, then select the **Concurrent** tab of the Details notebook. The Details page looks similar to that shown in Figure 58.

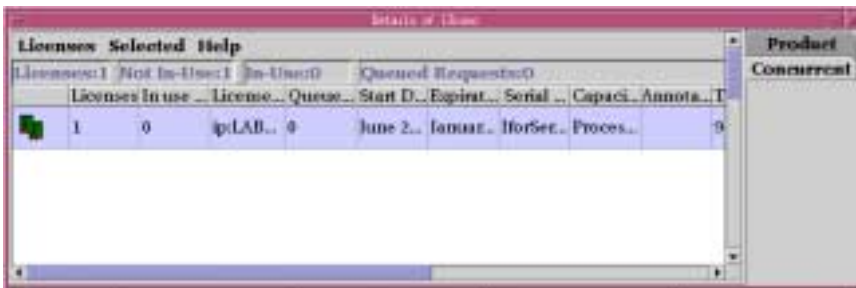


Figure 58. Initial State of the Concurrent Page for a Custom Configuration License

To upgrade your current license:

1. In the main window, select **Enroll** from the Products menu, and then **Single product...**. The Enroll Product window is displayed.
2. Select **Import**.

The Import window is displayed.

In the **Filter** field, enter the path to the directory in which the enrollment certificate is stored (in this example, home/prince/certif). Then, from **Files**, select the custom configuration enrollment certificate (in this example, **m2update.lic**), as shown in Figure 59.

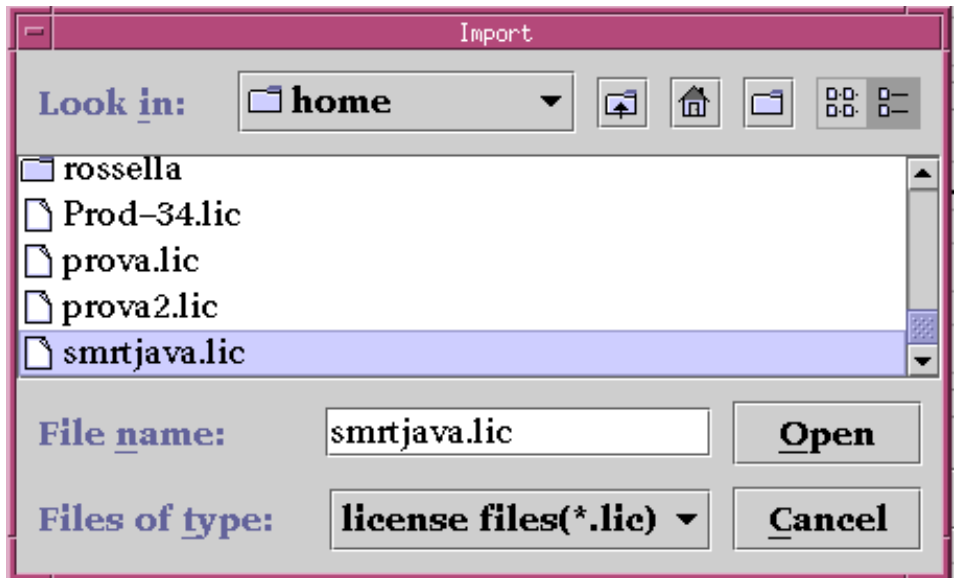


Figure 59. Import Window for Custom Configuration

3. Click OK.

The Enroll Product window is redisplayed, filled in with information from the enrollment certificate file, as shown in Figure 60 on page 125.

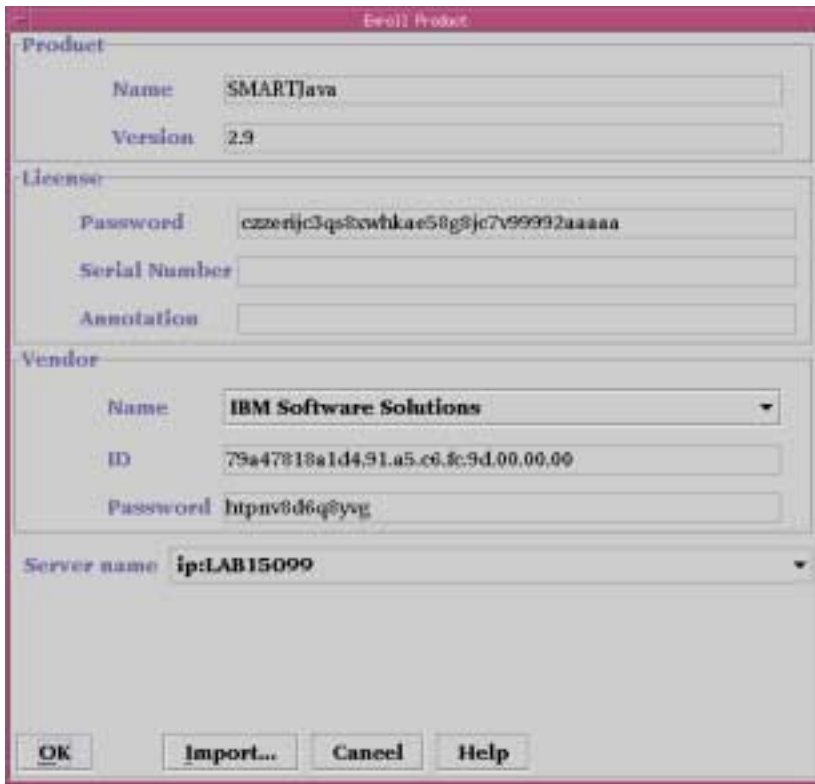


Figure 60. Enroll Product Window for Custom Configuration

4. In the **Server name** field, select the server on which the initial key is installed. In this example, because the product is vendor-managed and has network licenses, the custom configuration license is enrolled on the network license server that has the target ID for which the license was created.

Notes:

- a. If a specific target ID is set in the enrollment certificate, the licenses must be enrolled on the network license server of that target machine.
- b. If the target ID in the enrollment certificate file is set to **ANY**, select a network license server.

The license serial number is the same as it was for the previously enrolled license.

5. Click OK.

The main window is displayed. The **Concurrent** page of the Details notebook now contains the updated license information. To display this

page, double-click on the product name, then select the **Concurrent** tab of the Details notebook. Scroll to the right to see the serial number and the annotation.

Command-Line Equivalent

To upgrade a custom configuration license, using the license certificate file **m2update.lic**, on server **cognigng**:

```
i4blt -a -f m2update.lic -n cognigng
```

Scenario 13: Managing Bundles

In this scenario, the administrator manages licenses belonging to a bundle. This scenario shows you how to:

- Enroll multiple certificates belonging to a bundle
- Monitor bundles and licenses within them
- Manage groups of licenses belonging to a bundle
- Delete a bundle

To enroll multiple certificates, the administrator performs the following steps:

1. Select **Enroll** from the menu, and then **Multiple certificates...** The Import window is displayed. For an example of the Import window, see Figure 59 on page 124.
2. From the **File Name** list, select the enrollment certificates `smrtjava.lic`, `hicomtel.lic`, `mailvps.lic` and `datamst.lic`.
3. Click **OK** . The Enroll Product window is displayed for each certificate, filled in with information from the enrollment certificate file. For an example of the Enroll Product window, see Figure 60 on page 125.
4. For each certificate, the administrator performs the following steps:
 - a. In the **Server name** field, select the server on which licenses are to be installed.
 - b. Click **OK**. The Enroll Product window is redisplayed, filled in with information about the next selected certificate.
5. Repeat step 4 for all certificates.

| Products | | Selected Edit View Options Help | | | |
|----------------------|------------------------|---------------------------------|-------------------|----------|----------|
| Local node: LAB15099 | | Bundle: 1 | | | |
| | Name | Version | Vendor | ID | Status |
| | IBM Software Solutions | | | BNDL005A | Complete |
| | SMARTJava | 2.0 | IBM Software S... | | |
| | DataMaster | 1.0 | IBM Software S... | | |
| | e-MailVision | 1.5 | IBM Software S... | | |

Figure 61. Bundle Enrolled

Once all certificates are enrolled, the administrator shifts the Basic License Tool window to bundles view by selecting **Bundles** from the **View** pull-down menu. The Mechanical Products bundle, whose bundle ID is **BNDL005A**, is displayed.

Licenses inside the bundle can be shown by double-clicking on the bundle, or by selecting **Expand bundle** from the **Selected** pull-down menu. It is possible to view license details by double clicking on the license or by selecting **Open as details** from the **Selected** pull-down menu.

To hide again licenses within a bundle, double click on the expanded bundle, or select **Collapse bundle** from the **Selected** pull-down menu.

To delete the Mechanical Products bundle, the administrator performs the following steps:

1. Select the bundle.
2. Choose **Remove bundle** from the **Selected** pull-down menu.

Command-Line Equivalent

To accomplish the same results (bundle enrollment, managing, and deletion), use the following commands.

To enroll multiple certificates:

```
i4b1t -a -f "smrtjava.lic hicomtel.lic emailvps.lic datamst.lic"
```

To view bundles, with all licenses within them:

```
i4b1t -1b
```

To remove the bundle:

```
i4b1t -d -b BNDL005A
```

Chapter 6. LUM Runtime CLI

This chapter describes how to use the LUM Runtime CLI.

In the descriptions of command syntax, the following conventions are used:

- Bold type** Code this item exactly as shown.
- Italic type* Replace this item with your own value.
- Brackets []** The item or items in brackets are optional.
- Braces {}** Choose one item from the list of alternative items inside the brackets.
- Vertical line |** This OR sign separates the alternative items.
- Three dots** An ellipsis following an item means you can include more than one of the item. For example, *[filename]*... specifies an optional list of files.

The following commands are available:

- i4blt** Basic License Tool (page 130)
- i4cfg** Configuration Tool (page 159)
- lb_admin** Local Broker Administration (page 166)
- drm_admin** GLBD Replicas Administration (page 171)
- lb_find** GLBs List (page 175)
- uuid_gen** ID Generator (page 177)
- i4tv** Test Verification Tool (page 178)
- i4target** Target View Tool (page 180)
- llbd** Local Location Broker Subsystem (page 181)
- glbd** Global Location Broker Subsystem (page 182)
- i4lmd** Network License Server Subsystem (page 184)
- i4llmd** Nodelocked License Server Subsystem (page 186)
- i4gdb** Central Registry Subsystem (page 188)
- i4glbcd** Global Location Broker Data Cleaner Subsystem (page 190)
- i4lct** License Creation Tool (page 191)

i4blt - Basic License Tool

Primary Command Options

The i4blt command has the following primary command options:

- (No option)** Start the Basic License Tool GUI.
- a (Enroll a Product)** Add products to a license database.
- U (Update a Product)** Update the number of licenses you enrolled, update the hard stop/soft stop policy and high-water mark when enabled on the product, switch from per-server to per-seat licenses, and set the threshold value of a customer-managed product.
- E (Extract and Distribute Licenses)** Extract and distribute licenses from a network compound password of a given product to the servers.
- d (Delete a Bundle, Product License or an Application Client Identifier)** Delete bundles, delete products from a license database, or delete Application Client Identifiers from the Central Registry of Application Clients.
- R (Reserve Licenses; Delete or Update Reserved Licenses)** Reserve reservable licenses for use by a specific user, group, or node; deletes reserved licenses; updates reservation status.
- C (Clean Up Stale Licenses)** Update the number of concurrent, reservable, per-server, and concurrent nodelocked licenses in use.
- l (Display a List)** List license database information about servers, vendors, bundles, products, and licenses.
- s (Display Product License Status)** Gather status information about license usage.
- r (Generate a Report)** Report on information recorded in the log file of a license server.
- x (Delete Log Entries)** Delete license server and central registry log file entries.
- m (Monitor and Log Threshold Events)** Monitor and log the threshold messages.

-H (Administer High-Availability Licensing)

Create a cluster of network license servers; add servers to an existing cluster; display cluster status; activate and deactivate servers in a cluster.

-h (Display Help)

Display command syntax and usage information about the Basic License Tool CLI.

General Rules for the i4blt command

1. The root user can run the i4blt command with all its options.
Non-root users can run the **-l** (Display a List), **-s** (Display Product License Status), **-r** (Generate a Report), and **-h** (Display Help) options and the equivalent GUI actions, allowing them to display the content of the license and license users databases.
2. The parameters within any of the following name specifications are positional:
 - vendor_information (*vendor_name vendor_id vendor_password*)
 - product_information (*product_name product_version license_password license_annotation*)
 - administrator_information (*administrator_name company_name address additional_info*)
 - user_information (*user_id user_group user_node*)
3. All the following name specifications must be enclosed within double quotation marks (for example: "*vendor_name vendor_id vendor_password*").
 - vendor_information (*vendor_name vendor_id vendor_password*)
 - product_information (*product_name product_version license_password license_annotation*)
 - administrator_information (*administrator_name company_name address additional_info*)
 - user_information (*user_id user_group user_node*)
 - signature_information
4. When a list of values (such as server names, vendor names, product names, or user names) is entered as a parameter, the list must be enclosed in double quotation marks. For example:
`i4blt -r3 -u "katie dustin emily adam"`
5. A name that contains character spaces must additionally be enclosed within single quotation marks. If multiple blanks within the name must be preserved, each must be preceded by a backslash. For example:
`-v "'IBM Corporation'"`
`-p "'Core\ \ - System' 1.1"`

- The parameters you specify in any of the command options (for example, server names, vendor names, and product names) are case-sensitive.
- The following command parameters have a limited length.

group_name 31 characters

server_name 31 characters

Attention: The first three character positions are reserved for the string ip: Any server name that is longer than 28 characters is truncated on the right.

user_name 31 characters

- You can display help on i4blt command options as follows:

- To get help on just the -a, -U, -E, -d, -m or -H option:

```
i4blt -option
```

- To get help on just the -R, -l, -r, or -x option:

```
i4blt -optionh
```

Examples

- Display the i4blt -E syntax:

```
i4blt -E
```

- Display the i4blt -r syntax:

```
i4blt -rh
```

-a Enroll a Product

This option adds a product to the license database on the license server that you specify. Use the `i4blt -a` command to add a new product and its initial licenses to a license server database. You can also use this command to add licenses for existing vendor-managed products.

You can add product license information to a server in two ways:

- If you got the product license information in the form of an enrollment certificate file, you can install the product importing the enrollment certificate. You can enroll more than one product at the same time.
- If you got the product license information in a format other than an enrollment certificate file, you must enter the product information manually.

Syntax:

If you have the enrollment certificate file:

i4blt -a

```
[ -n server_name ]-f filename [filename]...
```



```
[ -R administrator_name [ company_name address additional_info ] ]  
[ -T enrolled_licenses ]  
[ -I signature_information ]
```

If you do not have the enrollment certificate file:

```
i4blt -a  
[ -n server_name ]  
-v vendor_name vendor_id vendor_password  
-p product_name product_version license_password [ license_annotation ]  
[ -R administrator_name [ company_name address additional_info ] ]  
[ -T enrolled_licenses ]  
[ -I signature_information ]  
[ -S { serial_number | bundle_id } ]
```

Parameters:

-n *server_name*

Specifies the name of the license server to which you intend to add the product. If **-n** is omitted:

- If the product is customer-managed, and the licenses are network licenses, they are enrolled on the central registry.
- If the product is customer-managed, and the license is nodelocked, it is enrolled on the local machine.
- If the product is vendor-managed, and the enrollment certificate file specifies a target ID, the licenses are enrolled on that machine.
- If the product is vendor-managed, and the enrollment certificate file does not specify a target ID, the licenses are enrolled on the local machine.

-f *filename*[*filename*]...

(Only if you have the enrollment certificate) The complete path and file name of the enrollment certificate file containing the product license information that you intend to add. You can specify a list of file names if you want to enroll more than one certificate at a time.

-v *vendor_name vendor_id vendor_password*

(If you do not have the enrollment certificate)

vendor_name

The name of the vendor that manufactured the product that you intend to add.

vendor_id

The unique vendor ID string for the vendor that you specify in the *vendor_name* argument.

vendor_password

The unique vendor password string for the vendor that you specify in the *vendor_name* argument.

-p *product_name product_version license_password [license_annotation]*
(If you do not have the enrollment certificate)

product_name

The name of the product that you want to install.

product_version

The version of the product that you specified in the *product_name* parameter.

license_password

The unique license password string associated with the product.

license_annotation

The license annotation information (if any) provided by the vendor.

-R *administrator_name [company_name address additional_info]*
(for customer-managed use products only)

administrator_name

The name of the administrator who performs the operation. This parameter is required.

company_name

The name of your company.

address The address of your company.

additional_info

Comments, notices to future users, or other information about the initial enrollment of this product.

If you enroll several products, the value you specify for these options apply to all the license certificates.

-T *enrolled_licenses*
(for customer-managed use products only) The number of licenses you have acquired from the software supplier. This parameter is required.

If you enroll several products, the value you specify for this option applies to all the license certificates.

-I *signature_information*
(for customer-managed use products only) Information about the user issuing the command, to be stored with the signature stamp.

-S { *serial_number* | *bundle_id* }

The serial number of a custom configuration license, or the bundle identifier for a bundle. The number is a string of up to 31 alphanumeric characters that uniquely identifies a custom configuration or a bundle.

Examples: Add a customer-managed use product:

```
i4blt -a
-v "Venus 4ca0fd5cf000.0d.00.02.1a.9a.00.00.00 kz5esmu69hzyw"
-p "timer 1.1 wzx3ewdfrvu4v64d53bbrkzhheaaaaa"
-R "Alex IBM Rome" -T 100
-I "'Alex using root userid'"
```

Add a vendor-managed use product:

```
i4blt -a -n thelma
-p "scena 1.0 suf0fpeixfi5v78a22xxrkzhheaaaaa"
-v "Operatix 7gp4ac8jj000.0d.00.02.1a.9a.00.00.00 1b7usud93jdna"
```

-U Update a Product

This option is valid only for customer-managed use products. It is issued for the following purposes:

- To update the number of licenses you enrolled. Use it when you acquire new licenses for an already enrolled customer-managed use product, to update the total number of licenses you are entitled to use. In the case of a network compound password, the licenses must be distributed after the update to make them available to end users.
- For a product with per-server/per-seat licenses, to switch from per-server to per-seat licenses.
- For a product with the hard stop/soft stop policy enabled, to change the hard stop/soft stop policy and to reset the high-water mark.
- To update the threshold value of a product.

Syntax:

```
i4blt -U
-v vendor_name
-p product_name product_version
[ -n server_name ]
[ -T enrolled_licenses ]
[ -S enable_switch [ yes ] ]
[ -H hard_soft_mode [ yes | no ] ]
[ -M hwm_reset ]
[ -t threshold [ 1...100 ] ]
[ -I signature_information ]
```

Parameters:

- v *vendor_name*
The name of the vendor that manufactured the product that you intend to update.
- p *product_name product _version*
The information on the licensed product that you intend to update.
 - product_name*
The name of the product for which you have acquired the new licenses.
 - product_version*
The version of the product that you specified in the *product_name* parameter.
- n *server_name*
Name of the license server on which you want to update product information. This parameter is required if the product has nodelocked licenses and you are updating the product on a remote nodelocked license server. It is the name of the nodelocked license server. If you are updating the product on the local nodelocked license server, omit the -n parameter. If the product has network licenses, this parameter need not be specified, because the server is the central registry license server.
- T *enrolled_licenses*
The total number of licenses you have for the specified product; that is, the number of licenses you had, plus the new ones.
- S *enable_switch*
Use this parameter to migrate the license from per-server to per-seat. To use the per-seat license remember also to enroll the per-seat certificate. The only allowed value for -S is yes. When the licenses have been changed to per-seat, you cannot go back to per-server licenses.
- H *hard_soft_mode*
Use this parameter to switch the product behavior from hard stop to soft stop and vice versa. You can do it only on products the vendor has enabled to allow hard stop/soft stop switching. Allowed values for -H are:
 - no** Set the soft stop
 - yes** Set the hard stop
- M *hwm_reset*
Use this parameter to reset the high-water mark to 0. You can do it only on products the vendor has enabled to soft stop.

-t *threshold*

Use this parameter to set a specific value for the threshold value of a customer-managed product. Allowed values are 1 to 100.

-I *signature_information*

Information about the user issuing the command, to be stored with the signature stamp. Use this parameter with the -T parameter.

Examples: The Test Compiler product (version 1.1, vendor Psychosync) has network licenses. Update the number of licenses to 50.

```
i4blt -U -v "Psychosync" -p "'Test Compiler' 1.1"  
-T 50 -I "'Paula using root userid'"
```

For the same product, set the soft stop policy and reset the high-water mark.

```
i4blt -U -v "Psychosync" -p "'Test Compiler' 1.1" -H no -M
```

For the ScreenPic product (version 2, vendor ArtTools), update to 5 the number of nodelocked licenses on server *Virginia*:

```
i4blt -U -n Virginia -v "ArtTools" -p "ScreenPic 2" -T 5
```

-E Extract and Distribute Licenses

Use the i4blt -E command to extract licenses from an installed network compound password and distribute them to the network license servers.

Syntax:

i4blt -E

```
-n origin_server_name  
-v vendor_name  
-p product_name product_version  
-A license_number_per_server  
-w target_server_names  
[ -I signature_information ]
```

Parameters:

-n *origin_server_name*

The name of the server where the network compound password is enrolled.

-v *vendor_name*

The name of the vendor that manufactured the product whose licenses you want to distribute.

-p *product_name product _version*

The information on the licensed product whose licenses you intend to distribute.

product_name

The name of the product whose licenses you want to distribute.

product_version

The version of the product that you specified in the *product_name* parameter.

-A *license_number_per_server*

The number of licenses for the specified product you want to distribute on each of the servers specified after the **-w** parameter.

-w *target_server_names*

The servers on which you want to distribute the licenses.

-I *signature_information*

(For customer-managed use products only) Information about the user issuing the command, to be stored with the signature stamp.

Examples:

Extract and distribute 10 licenses to each of the servers Louise and Hall, for the Test Compiler product, Version 1.1 of vendor Psychosync, installed on server Thelma:

```
i4blt -E -n "Thelma" -v "Psychosync" -p "'Test Compiler' 1.1"  
-A 10 -w "Louise Hall" -I "'Paula using root userid'"
```

-d Delete a Product License or Bundle

This option deletes a product license or bundle from the license database on the license server that you specify, or an Application Client Identifier from the central registry.

Syntax:

i4blt -d

-n *server_name*

-v *vendor_name*

-p *product_name product_version*

{ **-t** *timestamp* | **-A** *ACID* | **-b** *bundle_id* }

[**-I** *signature_information*]

Parameters:

-n *server_name*

Either of the following:

- The name of the license server from which you intend to delete the product license.

- To delete a high-availability license, the name of one of the servers in the cluster on which the license is enrolled.

To delete a high-availability license, issue the command:

```
i4blt -d -n server_name -v vendor_name -p product_name
product_version -t timestamp
```

where `server_name` identifies one of the servers in the cluster on which the license is enrolled.

-v *vendor_name*

Name of the vendor whose product license you intend to delete.

-p *product_name product _version*

The information on the licensed product whose licenses you intend to delete.

product_name

Name of the product whose license you intend to delete.

product_version

Version of the product whose license you intend to delete.

-t *timestamp*

Unique timestamp of the product license that you intend to delete. To get the timestamp, issue the following command:

```
i4blt -lp -p "product_info" -i
```

Do not specify the timestamp when you delete an Application Client Identifier.

-A *ACID*

Unique identifier of the Application Client Identifier of an application client you want to delete from the central registry. After deletion the application client no longer has the license to use the specified product. To get the Application Client Identifier, issue the following command:

```
i4blt -s -lpt -v "vendor_name" -p "product_info"
```

Do not specify **-A** when you delete a product.

-b *bundle_id*

The identifier of the bundle you want to delete.

-I *signature_information*

(for customer-managed use products only) Information about the user issuing the command, to be stored with the signature stamp. Use this parameter when deleting a product license.

When the last license for the only remaining product of a vendor is deleted, the vendor is automatically deleted from the license database. Vendor-managed compound passwords and use-once licenses cannot be deleted until they expire.

Examples: Delete a bundle whose ID is AZ57561C:

```
i4blt -d -b AZ57561C
```

Delete an expired license for a VectorComp Corporation product called EZ-Vectors Version 1.0. The unique timestamp of the license to be deleted from the database on server **saturn** is 781401788:

```
i4blt -d -n saturn -v "'VectorComp Corporation'" -p  
"EZ-Vectors 1.0" -t 781401788
```

Delete an application client whose Application Client Identifier is **thelma** from the central registry. After this command the application client will no longer have licenses for the product EZ-Vectors Version 1.0 of VectorComp Corporation vendor:

```
i4blt -d -v "'VectorComp Corporation'" -p "EZ-Vectors 1.0"  
-A thelma
```

-R Reserve Licenses; Delete or Update Reserved Licenses

Use **i4blt -R** to reserve reservable licenses and to delete or update the reservation status of reserved licenses.

Syntax:

```
i4blt -R action_type [ r | d | u ]  
-n server_name  
-v vendor_name  
-p product_info  
[ -t timestamp ]  
[ -A license_number ]  
[ -g end_date ]  
[ -H end_time ]  
[ -u user_id user_group user_node ]
```

Parameters:

action_type

To reserve licenses, **r**; to delete licenses, **d**; to update an existing reservation, **u**.

-n *server_name*

The name of the server where the product license is enrolled.

-v *vendor_name*

The name of the vendor that manufactured the product.

-p *product_name product_version*

The information on the licensed product whose licenses you intend to reserve, delete, or update.

product_name

The name of the product.

product_version

The version of the product.

-t *timestamp*

Unique timestamp of the product license from which you intend to reserve, or that you intend to delete or update. To get the timestamp, issue the following command:

```
i4blt -lp -p "product_info" -i
```

If you are reserving licenses (option **-R r**), the timestamp is optional. If it is omitted, the first usable reservable license is used.

-A *license_number*

The number of licenses you intend to reserve. If you are updating a reservation (**-R -u**) or deleting licenses (**-R -d**), do not specify **-A**.

-g *end date*

The end date of the new or updated reservation (mm/dd/yyyy). The latest allowed expiration date of a reservation is 12/31/2037. If you are deleting licenses (**-R -d**), do not specify **-g**.

-H *end time*

The end time of the new or updated reservation (hh:mm). If you are deleting licenses (**-R -d**), do not specify **-H**.

-u *user_id user_group user_node*

The identification of the user, group, and node for which a license is being reserved or a reservation is being changed. Any of these values may be *, meaning "any". If you are deleting licenses (**-R -d**), do not specify **-u**.

Examples: Reserve three licenses for Test Compiler product, taken from the reservable license identified by the timestamp 389588975, Version 1.1 of vendor Psychosync for any member of the testers group. They expire March 2, 1998, at 11:00.

```
i4blt -R r -v "Psychosync" -p "'Test Compiler' 1.1"  
-t 389588975 -A 3 -g 03/02/1998 -H 11:00 -u "* testers *"
```

-C Clean Up Stale Licenses

Use **i4blt -C** to update the number of in-use concurrent, reservable, per-server, and concurrent nodelocked licenses.

When you issue this command, LUM Runtime polls all the license servers that have granted licenses of these types and verifies that the licenses are still in use. If any stale licenses are found, they are removed from the number of in use licenses.

Syntax:

```
i4blt -C  
[ -F server_type { l | w | a } ]  
[ -n server_names ]  
[ -v vendor_names ]  
[ -p product_names ]
```

Parameters:

-F *server_type*

A filter on the type of server to be searched. Specify **l** for nodelocked license servers, **w** for network license servers, or **a** (the default) for both network license servers and nodelocked license servers.

-n *server_names*

The names of the servers where the products are enrolled.

-v *vendor_names*

The name of the vendors that manufactured the products whose licenses are in use.

-p *product_names*

The names of the products whose stale licenses you want to clean up.

Examples: Clean up stale licenses for the Graphics product of vendor Alpha on servers **Thelma, Hall, and Louise**:

```
i4blt -C -n "Thelma Hall Louise" -v "Alpha" -p "Graphics"
```

Clean up stale licenses for the Graphics product of vendor Alpha on all nodelocked license servers in the network.

```
i4blt -C -F l -v "Alpha" -p "Graphics"
```

-l Display a List

You can use this option to display a list of servers, vendors, bundles, products, or licenses. You can also use it to display details about individual products or individual licenses.

Syntax:

```
i4blt -l list_type [ n | s | v | p [ -i ] | b | l [-k] ]  
[ -b bundle_id ]  
[ -F server_type { l | w | a } ]
```

```
[ -n server_names ]
[ -v vendor_names ]
[ -p { product_name [product_version ] } ... ]
[ -u user_names ]
```

Parameters:

list_type

Indicates the type of information that you want to list. You can specify any one of the following list types:

-ln or -ls

To display a list of active license servers.

Filters:

- You can use the **-F** filter option to display a list of active network license servers or nodelocked license servers.
- Do not specify the **-b**, **-n**, **-v**, **-p**, or **-u** filter option with this parameter.

-lb [-b bundle_id]

To display a list of bundles.

Filters:

- To list only the contents of a specified bundle, use the **-b** filter option, followed by the bundle identifier.
- To list bundles or bundle components for a specific type of license server, use the **-F** filter option to specify nodelocked license servers or network license servers.
- To list bundles or bundle components for servers that you specify, use the **-n** filter option followed by one or more server names.
- To list bundles or bundle components from particular vendors, use the **-v** filter option, followed by one or more vendor names.
- Do not specify the **-p**, **-u**, or **-t** filter option with this parameter.

-lv To create a vendor list.

Filters:

- To list vendor information gathered from a specific type of license server, use the **-F** filter option to specify nodelocked license servers or network license servers.
- To list vendor information gathered from servers that you specify, use the **-n** filter option followed by one or more server names.

- Do not specify the **-b**, **-v**, **-p**, or **-u** filter option with this parameter.

-lp [-i] [-k]

To create a product list.

Filters:

- To list product information gathered from a specific type of license server, use the **-F** filter option to specify nodelocked license servers or network license servers.
- To list product information gathered from servers that you specify, use the **-n** filter option followed by one or more server names.
- To list product information on products from particular vendors, use the **-v** filter option, followed by one or more vendor names.
- To list product information on particular products, use the **-p** filter option, followed by one or more product names.
- To list information on users who are currently using the products that you specify, use the **-u** filter option, followed by one or more user names.
- Do not specify the **-b** filter option with this parameter.

Specify the **-i** option to display detailed information about each product in a product list.

Specify the **-k** option to remove expired licenses from the list.

-ll

To create a list of individual licenses. The output includes all the information you get by specifying **lp** with the **-i** option, plus, for products with concurrent licenses that are administered in a high-availability environment, information about the cluster and servers within the cluster.

Filters:

- To list license information gathered from a specific type of license server, use the **-F** filter option to specify nodelocked license servers or network license servers.
- To list license information gathered from servers that you specify, use the **-n** filter option followed by one or more server names.
- To list license information on products from particular vendors, use the **-v** filter option, followed by one or more vendor names.

- To list license information on particular products, use the **-p** filter option, followed by one or more product names.
- To list information on users who are currently using the licenses that you specify, use the **-u** filter option, followed by one or more user names.

High-Availability Output:

- Cluster name
- **For each server in the cluster:**

- Server name
- Server status:

Serving

Running, serving licenses

Waiting

Server is ready, but the cluster is in incomplete or inactive state

Unavailable

Not started

Reserve

In reserve in case a serving server becomes unavailable

Not activated

Defined as a member of the cluster but the administrator has not yet activated the server or has deactivated the server

- Percentage of licenses being served by this server
- Target ID
- Number of licenses served by this server
- Number of in-use licenses served by this server

-F *server_type*

A filter on the type of server to be searched. Specify **l** for nodelocked license servers, **w** for network license servers, or **a** (the default) for both network license servers and nodelocked license servers.

-n *server_names*

Names of the servers about which you want to display information in a vendor or product list.

-v *vendor_names*

Names of the vendors about whose products you want to display information in a product list.

- p** { *product_name* [*product_version*] } ..
Names of the products and, optionally, their versions about which you want to display information in a product list.
- u** *user_names*
Names of users about whom you want to display license usage information in a product list.
- i** Specify the **-i** option in conjunction with a product list (**i4blt -lp**) to display the following detailed license usage information about an individual licensed product in a product list:
- Vendor name
 - Vendor ID
 - Product name
 - Product version
 - Product ID
 - Licenses (total on all the selected servers)
 - In-use licenses (total on all the selected servers)
 - **For each license instance:**
 - Number of licenses
 - License type
 - Capacity type
 - Bundle component
 - Server on which the license is installed
 - License annotation (if any)
 - Serial number or bundle ID (if any)
 - Start date
 - Expiration date
 - Time stamp
 - Password use control level
 - **For products with customer-managed use control and per-server, per-seat, or concurrent nodelocked licenses,** the following information is also displayed:
 - High-water mark licenses
 - Threshold value
 - Soft stop
 - Soft stop enabled
 - **For products with customer-managed use control and use-once nodelocked licenses,** the following information is also displayed:
 - Threshold

- **For per-seat licenses**, the following information is also displayed:
 - Enablement flag
- **For reservable licenses**, the following information is also displayed:
 - Number of reserved licenses
 - Number of unreserved licenses
- **For reserved licenses**, the following information is also displayed:
 - User for whom licenses are reserved
 - Group for which licenses are reserved
 - Node for which licenses are reserved
- **For concurrent, concurrent nodelocked, and per-server licenses**, the following information is also displayed:
 - Multiuse rules (if any)

For try-and-buy licenses, the following information is also displayed:

- Try-and-buy flag
- **For compound passwords**, the following information is also displayed:
 - Derived license type
 - Aggregate duration
 - Derived start type
 - Derived expiration date
 - **For products with customer-managed use control and concurrent or reservable licenses**, the following information is also displayed:
 - Enrolled licenses
 - Distributed licenses
 - To be distributed licenses
 - High-water mark licenses
 - Threshold value
 - Soft stop
 - Soft stop enabled
 - **For products with customer-managed use control and use-once licenses**, the following information is also displayed:
 - Enrolled licenses
 - Distributed licenses
 - To be distributed licenses
 - Threshold value

Examples: List all servers:

```
i4blt -ln
```

List all vendors on all servers:

```
i4blt -lv
```

List all vendors on all network license servers:

```
i4blt -lv -F w
```

List all vendors on server **Hall**:

```
i4blt -lv -n Hall
```

List all products on server **Hall**:

```
i4blt -lp -n Hall
```

List all products on server mercury provided by vendors Opticon, Inc. and Cybertronics Ltd.:

```
i4blt -lp -n mercury -v "'Opticon, Inc.' 'Cybertronics Ltd.'"
```

List detailed information for the product PsychoSynch on server **venus**:

```
i4blt -lp -n venus -p PsychoSynch -i
```

List all of the products on the server **neptune** that are currently being used by the user **Alex**:

```
i4blt -lp -n "neptune" -u Alex
```

-s Display Product License Status

root and non-root users can use this option to display information about current product usage on specified license servers.

Syntax:

i4blt -s

```
[ -l list_type [ c | pt | ps | ru | rr | cn ] ]  
[ -n server_names ]  
[ -v vendor_names ]  
[ -p { product_name[product_version ] } ... ]  
[ -u user_names ]
```

Parameters:

-l *list_type*

Indicates the type of license usage you want to list. You can specify one of the following list types:

- c** To display information related to concurrent users of concurrent licenses.
- pt** To display information related to application clients that use per-seat licenses.
- ps** To display information related to users of per-server licenses.
- ru** To display information related to users of unreserved reservable licenses
- rr** To display information related to users of reserved licenses.
- cn** To display information related to users of concurrent nodelocked licenses. If you omit **-l**, its default value is **c**.

-n *server_names*

The name of each of the license servers for which you want to display product usage information.

If you omit the **-n** parameter, the display defaults to all servers in your cell. This parameter is not used if you use **pt**, **ps**, **rr**, or **cn** as the list type.

-v *vendor_names*

The name of the vendor (or vendors) about whose products you want to display information.

-p { *product_name*[*product_version*] } ...

Names of the products and, optionally, their versions about which you want to display information.

-u *user_names*

Use the optional **-u** *user_names* argument to display product usage information for the specified products that are currently in use by the named users.

This command displays the following information for the servers, vendors, products, and users that you specify:

- Vendor name
- Product name
- Product version
- Total number of installed licenses
- Number of licenses currently in use
- Number of soft stop licenses currently in use
- Number of licenses not in use
- Number of queued users

For each user who currently holds a license, the following information is displayed:

- User name
- Node name
- Group name
- Number of licenses the user has been granted
- Check-out date for each granted license

Examples: Display current license availability and usage information for concurrent licenses of the Monolith Inc. product Megamail/2 on server **uranus**:

```
i4blt -s -lc -n "uranus" -v "'Monolith Inc.'" -p "Megamail/2"
```

-r Generate a Report

root and non-root users can use this option to list server, event, vendor, product, and user information on specified license servers.

Syntax:

```
i4blt -r report_type [ 1 | 2 | 3 | 4 | 5 | 6 ]  
[ -b start_date ]  
[ -g end_date ]  
[ -e event_filter ]  
[ -F server_type { l | w | a } ]  
[ -n server_names ]  
[ -v vendor_names ]  
[ -p { product_name[ product_version ] } ... ]  
[ -u user_names ]
```

Parameters:

-r *report_type*

Specifies the type of report to generate. The following report types are available:

1 - Standard Event Report.

Displays detailed information about significant events occurring on the license servers that you specify. Available for all license types.

2 - License Request by Product Report.

Displays statistical information about the use of the licenses of a product in the time interval you specify. For each product, it reports the licenses requested, the licenses granted, and the percentage of rejections. Not available for simple nodelocked or use-once (nodelocked or network) licenses.

3 - License Request by User Report.

Displays statistical information about the use of products by users in the time interval you specify. For each user, it reports the licenses requested, the licenses granted, and the percentage of rejections for each product the person is using. Not available for simple nodelocked or use-once (nodelocked or network) licenses.

4 - License Use by Product Report.

Displays statistical information about the use of the licenses of a product in the time interval you specify. For each product, it lists the maximum number of concurrent nodes that used the product, the maximum number of concurrent users, and the average time of use of the product. Statistical information about events appears after the license release. Not available for per-seat, simple nodelocked, or use-once (nodelocked or network) licenses.

5 - License Use by User Report.

Displays statistical information about the use of the licenses of a product in the time interval you specify. For each user, it lists the number of times each product was invoked, and the average time the user used each product. Statistical information about events appears after the license release. Not available for per-seat, simple nodelocked, or use-once (nodelocked or network) licenses.

6 - Customer-Managed Use Audit.

Reports the following information for customer-managed use product transactions:

- Vendor name
- Product name
- Product version
- Administrator information
- Time stamp of the event
- Number of licenses involved in the transaction
- Event list (product enrolled, license distributed, license deleted, license updated, per-server/per-seat license migrated)
- Signature stamp (user, group, and node)
- Signature information

Available for all license types.

-b *start_date*

Specifies the start date of a report. Be sure to express the date using

the mm/dd/yyyy format. If you specify a start date and do not specify an end date, the report will include all information logged from the specified start date until the present.

-g *end_date*

Specifies the end date of a report. Be sure to express the date using the mm/dd/yyyy format. If you specify an end date and do not specify a start date, the report will include all information logged prior to (and including) the specified end date.

-e *event_filter*

You can use the *event_filter* argument to generate a Standard Event report on the following types of events which you specify, by number, on the command line. (Separate multiple event type arguments with a comma.)

- 1 All events
- 2 License-related events
- 3 Vendor messages
- 4 License database modifications
- 5 Error events
- 6 Server start and stop events
- 7 Fatal errors

-F *server_type*

A filter on the type of server to be searched. Specify **l** for nodelocked license servers, **w** for network license servers, or **a** (the default) for both network license servers and nodelocked license servers.

-n *server_names*

Names of the servers about which you want to display information.

-v *vendor_names*

Names of the vendors about whose products you want to display information.

-p { *product_name*[*product_version*] } ...

Names of the products and, optionally, their versions about which you want to display information.

-u *user_names*

Names of users about whom you want to display license usage information.

Examples: Standard Event Report:

Report on license-related events (2) and server start and stop events (6) that were logged on server **neptune** since May 21, 1998:

```
i4blt -r1 -n "neptune" -b 05/21/1998 -e 2,6
```

License Use by Product Report:

Report current license usage information on server **saturn** for the products NetLS Test Product, Compiler, PsychoSynch, Megamail/2, EZ-Vectors, and DataVision:

```
i4blt -r4 -n "saturn" -p "'NetLS Test Product' 'Compiler'
PsychoSynch Megamail/2 EZ-Vectors DataVision"
```

License Request by User Report:

Report current license usage information on server **mercury** for users alex, ann, mary, christine, paul, and alby:

```
i4blt -r3 -n "mercury" -u "alex ann mary christine paul alby"
```

Customer-Managed Use Audit Report:

Report information about customer-managed use product transactions on all nodelocked license servers from May 1, 1999 to July 31, 1999:

```
i4blt -r6 -F l -b 05/01/1999 -g 07/31/1999
```

-x Delete Server Log Entries

This option deletes all entries before a specified delete date from the log file of the license servers that you specify. If one of the specified license servers has the central registry, the central registry log entries are also deleted. If the specified license server is the local node, the nodelocked license server log entries are also deleted.

Syntax:

```
i4blt -x delete_date
[ -F server_type { l | w | a } ]
[ -n server_names ]
```

Parameters:

- x *delete_date* Specifies an end date for the delete operation. All log entries recorded before the delete date are removed from the log file. You must specify a delete date in the mm/dd/yyyy format. If you do not specify a delete_date, all entries in the log file are deleted.
- F *server_type* A filter on the type of server to be searched. Specify l for

nodelocked license servers, w for network license servers, or a (the default) for both network license servers and nodelocked license servers.

-n *server_names* Specifies the license servers from whose log file you want to delete the entries.

Examples: Delete all the log file entries recorded on server neptune before August 25, 1998:

```
i4blt -x 08/25/1998 -n neptune
```

Delete all the log file entries recorded on all nodelocked license servers before August 25, 1998:

```
i4blt -x 08/25/1998 -F 1
```

-m Monitor and Log Threshold Events

This option displays the threshold messages and logs them if the threshold logging option is specified.

Syntax:

i4blt -m

```
[ -Tpercentage [ 1... ] ]  
[ -A periodic_mode [ yes | no ] ]  
[ -X frequency [ 1...1440 ] ]  
[ -l log [ yes | no ] ]
```

Parameters:

-T *percentage*

Specifies the level of threshold value. It can be any number between 1 and 100. The default is 80. This is the percentage over which you want to log the level of usage of each product installed on all the servers. For instance, if you have 100 licenses of the product Icon Editor Version 1.5, and you set the level of threshold to 10, a message appears in the vendor messages report only if more than 10 licenses are in use. If 20 licenses are being used, the message will say:

```
The 20% of licenses of Icon Editor 1.5 is in use.
```

Note that a customer-managed product may have its own threshold value, set with the **i4blt -U** command. Such a threshold value overrides the **-T** value.

-A *periodic_mode*

Specifies whether to check the license usage of the products only once, or periodically. Its values can be:

- no To check the threshold conditions on the products once, immediately. If **-A** is omitted, this is the default.
- yes To check the threshold conditions on the products periodically, with the frequency specified with the **-X** parameter.

-X frequency

Specifies the number of minutes between one license usage check and the next. Enter a value between 1 and 1440. It is mandatory if you set the **A** parameter to **yes**.

-l log Specifies whether or not the threshold messages must be logged on the license server to be reviewed with the report function.

Examples: Set the threshold percentage to 50% and set the check on the products' usage to every 4 hours:

```
i4blt -m -T 50 -A yes -X 240
```

-H Administer High-Availability Licensing

This option creates a cluster of network license servers; adds servers to an existing cluster; displays cluster status; and activates and deactivates servers in a cluster.

Syntax:

i4blt -H action_type

```
{ { c -N cluster_name -n "server_names" -T initial_number_of_servers} |
{ { a | d } -N cluster_name -n "server_names" } |
{ s { -N cluster_name | -n "server_names" } } }
```

Parameters:

action_type

Specifies the action to be taken:

- c** To create a cluster. With action type **c**, the **-N**, **-T**, and **-n** parameters are all required.
- a** To add a server to a cluster, or to activate a server in a cluster. With action type **a**, the **-N** and **-n** parameters are required.
- d** To deactivate a server in a cluster. With action type **d**, the **-N** and **-n** parameters are required.
- s** To request cluster status. With action type **s**, the **-N** or **-n** parameter is required. Use the **-N** parameter to get an overall view of cluster status. If you are having problems with cluster operation and you want to see a view of the cluster from the perspective of an individual server, use action type **s** with the

-n parameter. In either case, the cluster status display includes the following information about the cluster:

- Cluster name
- Cluster ID (available only after the cluster switches to Active status for the first time)
- Cluster status:

Active Running, serving licenses

Change Pending

Waiting for a change in the status of a server, or of the cluster, to be propagated to all the servers

Inactive Not enough servers up and running

Incomplete Not enough servers activated

- Initial number of servers
- Minimum number of members, maximum number of members, and minimum up and running for the cluster to work
- For each server in the cluster:
 - Server name
 - Server status:

Serving Running, serving licenses

Waiting Server is ready, but cluster is in incomplete or inactive state

Unavailable Not started

Reserve In reserve in case a serving server becomes unavailable

Not activated Defined as a member of the cluster but administrator has not yet activated the server or has deactivated the server

- Percentage of licenses being served
- Target ID

-N *cluster_name*

The name of the cluster to which the command is directed. The **-N** parameter is required if action type is **c**, **a**, or **d**, and it is recommended when action type is **s**.

-T *initial_number_of_servers*

The initial number of servers in the cluster that you are creating. The

-T parameter is required if action type is **c**, and is not valid if action type is not **c**. The **-n** parameter must specify a number of servers equal to the value of **-T**.

-n *server_names*

The names of the servers to which the command is directed. The **-n** parameter is required if action type is **c**, **a**, or **d**, and it can be used when action type is **s**. A cluster cannot contain an OS/2, Windows 95, or Windows 98 machine. If action type is **c**, this is the list of initial members of the cluster. You must specify a number of servers equal to the value of **-T**. After this command has been processed, the first server in the list is automatically activated. Issue `i4blt -H` again, using action type **a**, to activate each additional server. At the time the `i4blt -H c` command is processed, all the servers specified must be up and running. If not, the command fails. If action type is **a** or **d**, this is the name of the server to be activated or deactivated. You must specify exactly one server. If action type is **a**, the server must be up and running when the command is processed. If not, the command fails. If action type is **s**, this is the name of any server that is currently activated in the cluster. The command returns cluster status from the perspective of this server.

Note:

When the cluster is in **Change pending** status, different servers may return different data.

Examples: Create a cluster named **ruth** that has three members: anthony, germaine, and costanza:

```
i4blt -H c -N ruth -T 3 -n "anthony germaine costanza"
```

Activate the servers **germaine** and **costanza**:

```
i4blt -H a -N ruth -n germaine  
i4blt -H a -N ruth -n costanza
```

Add the server **sandra** to the cluster:

```
i4blt -H a -N ruth -n sandra
```

Deactivate the server **germaine**:

```
i4blt -H d -N ruth -n germaine
```

Get an overall report of the status of the cluster *nobel*:

```
i4blt -H s -N nobel
```

Get a report of the status of the cluster *nobel* from the perspective of one of its activated members, **pirandello** (recommended only for troubleshooting purposes):

```
i4blt -H s -n pirandello
```

-h Display Help

This option displays general syntax information for the Basic License Tool CLI.

Syntax:

i4blt -h

Examples: Display the i4blt syntax:

```
i4blt -h
```

i4cfg - Configuration Tool

Use the `i4cfg` command as an alternative to the Configuration Tool GUI or to the Configuration Tool script to configure your machine. Before coding the `i4cfg` command, see “Before You Configure” on page 69 to plan your configuration requirements. If issued with no options, the `i4cfg` command starts the Configuration Tool GUI.

Syntax

`i4cfg`

```
[ -a { { c,n,s,r } | { C,N,S,R } } ]
[ -e { a | { e,t,w,c,g,v,m,p,s } } ]
[ -l logfile_path ]
[ -S { a,n,s } ]
[ -R { a,n,s } ]
[ -b { "binding_list" | null } ]
[ -t "transport_list" ]
[ -n { c | l | g | n } ]
[ -c { d | a | cell_uuid } ]
[ -r { first | from:ip:host_name } ]
[ -G { "site_list" | null } ]
[ -d { option_string | all } ]
[ -script ]
[ -start ]
[ -stop ]
[ -list ]
[ -h ]
```

Parameters

- a** The roles the machine is to play in your licensing environment. Code any combination of these values, optionally separated by commas:
 - c** Reset the current role of the machine to network license client.
 - n** Reset the current role of the machine to nodelocked license server.
 - s** Reset the current role of the machine to network license server.
 - r** Reset the current role of the machine to central registry license server.
 - C** Update the current role of the machine to include network license client.
 - N** Update the current role of the machine to include nodelocked license server.

- S** Update the current role of the machine to include network license server.
- R** Update the current role of the machine to include central registry license server.

-b *"binding_list"*

The complete list of servers (network license servers, nodelocked license servers, and central registry license server) with which this machine will communicate in a direct binding environment. Enclose the complete list in double quotes. Specify the network license servers, nodelocked license servers, and central registry license server as follows:

```
'networkip:network_address1 [ port_number1 ] ip:network_address2
[ port_number2 ] ... '
'nodelocked ip:network_address1 [ port_number1 ]
ip:network_address2 [ port_number2 ] ... '
'registry ip:network_address [ port_number ]'
```

Code `-b null` to delete all previously specified entries from the binding list.

- c** The NCS cell the machine is to join. This parameter is meaningful only if namespace binding support is enabled (see the `-n` parameter). Code one of the following:

- d** The default cell.
- a** A new alternate cell. The Configuration Tool creates the UUID. You can retrieve the UUID from the `glb_obj.txt` file.

cell_uuid

An alternate cell with the specified UUID.

If you are configuring as a GLB replica (`-r from`), code this parameter to specify which cell this server is to join.

-d option_string

Display the current configuration settings for the `i4cfg` options specified in `option_string`. Code `all` to see the current settings of all the options. For example, `i4cfg -d e1S` requests a display of which events are being logged, the path to the log databases, and a list of startup options showing which are enabled and which are disabled.

- e** The list of events you want to be logged. Code `a` to log all events, or any combination of these values, optionally separated by commas:

e - Errors

Describes server errors that do not stop the server, but return a status code and a message. This is logged by default.

t - License timeout

Tells you that the server has canceled the request for a license because the check period expired. This is not logged by default.

w - License wait

Tells you when a license request cannot be satisfied because no licenses are available, and the user is added to a queue. This is not logged by default.

c - License checkin

Tells you when a licensed product has sent a check-in call to the server to notify that the product is running. This is not logged by default.

g - License grant/release

Tells you when a license was granted or released. This is not logged by default.

v - Vendor added/deleted

Tells you when a product of a new vendor was registered or deleted. This is logged by default.

m - Vendor messages

Provides the log messages the vendor inserted in the enabled product. This is logged by default.

p - Product added/deleted

Tells you when a new product was registered or deleted. This is logged by default.

s - Server start/stop

Logs the successful start or stop of a license server. This is not logged by default.

-G "*site_list*"

This parameter is meaningful only if namespace binding support is enabled (see the **-n** parameter). If your system does not support broadcasting or if the global location broker is running on a machine in a different subnetwork, use this parameter to set the list of hosts running the global location broker. Clients can contact the servers using the *site_list*. List each server that runs the global location broker, in the form:

`ip:network_address`

Separate the entries with spaces, and enclose the entire list in double quotes. Code `-G null` to delete a previously-specified site list. In this case, clients must locate global location brokers by broadcasting. Before configuring a machine to join an existing cell, check that there

is no `glib_site.txt` file, or, if the file exists, that it includes a server that is in the cell being joined. Otherwise, use `-G null` to delete the existing site list.

- h** Displays command syntax and usage information about the Configuration Tool CLI.
- l** *logfile_path*
The path in which you want log files to be stored.
- list** Displays a list of active subsystems.
- n** Specifies namespace binding support. Code one of the following:
 - c** Namespace binding support as a network license client only.
 - l** This machine is to run the local location broker but not the global location broker.
 - g** This machine is to run the global location broker and the local location broker.
 - n** No namespace binding support (direct binding only).
- R** Startup options that you want to disable. Code any combination of these values, optionally separated by commas:
 - a** Automatic startup of subsystems at system startup (disabled by default)
 - n** Remote administration of nodelocked license server (disabled by default)
 - s** Remote administration of network license server (enabled by default)

Note:

This parameter is not valid for network clients.

- r** This parameter is meaningful only if namespace binding support is enabled and this machine is to run the global location broker (see the **-n** parameter). Code **first** if this is to be the first global location broker in a cell. Code **from:ip:host_name** to replicate the global location broker that already exists on `host_name`. If you code **-r from**, you must also code the **-c** parameter to specify which cell this server is to join.
- S** Startup options that you want to enable. Code any combination of these values, optionally separated by commas:
 - a** Automatic startup of subsystems at system startup (disabled by default)

- n** Remote administration of nodelocked license server (disabled by default)
- s** Remote administration of network license server (enabled by default)

Note: This parameter is not valid for network clients.

-script Starts the interactive script to configure your machine using a guided step-by-step procedure.

-start Starts all the subsystems you have configured to run on the machine.

-stop Stops all the subsystems that are running on your machine.

-t "transport_list"

Use this parameter to change the default port numbers, as follows:

```
"ip 'netls_port,crls_port,nodls_port'"
```

The three subparameters are positional. If you omit one, its value is reset to the default. For example:

```
"ip ',10999,1215'"
```

Examples

1. Configure a standalone nodelocked license server, specifying automatic startup of the server and customizing the path to the log files and the selection of events logged:

```
i4cfg -a n -S a -e evmps -l /home/baratti
```

2. Configure a nodelocked license server in a network. Specify automatic startup of the server, make it possible to administer licenses on another nodelocked licensed server (**louise**) remotely, and customize the path to the log files and the selection of events logged. With direct binding:

```
i4cfg -a n -S a,n -e evmps -l /home/baratti -b 'nodelocked ip:louise' -n n
```

With namespace binding, joining an existing cell that has UUID 456b91c50000.0d.00.00.87.84.00.00.00:

```
i4cfg -a n -S a,n -e evmps -l /home/baratti -b null -n l  
-c 456b91c50000.0d.00.00.87.84.00.00.00
```

The nodelocked license server *louise* must belong to the same cell.

3. Configure a network license server (**thelma**). Specify automatic startup of the server, and customize the path to the log files and the selection of events logged. Configure to communicate with:

- Network license server **louise**
- Nodelocked license server **louise**
- Nodelocked license server **speedy**

- Central registry license server **speedy**

With direct binding:

```
i4cfg -a s -S a,s -e cegvp -l /home/baratti -b "'network ip:thelma
ip:louise' 'nodelocked ip:speedy ip:louise' 'registry ip:speedy'"
-n n
```

With namespace binding, starting a new alternate cell:

```
i4cfg -a s -S a,s -e cegvp -l /home/baratti -b null -n g -r first
```

speedy and **louise** must join this new cell.

4. Configure a network license client that will communicate with a machine named **thelma** that is configured as both a network license server and the central registry license server. With direct binding:

```
i4cfg -a c -b "'network ip:thelma' 'registry ip:thelma'" -n n
```

With namespace binding, joining an existing cell that has UUID 456b91c50000.0d.00.00.87.84.00.00.00:

```
i4cfg -a c -b null -n c -c 456b91c50000.0d.00.00.87.84.00.00.00
```

Note that **thelma** must belong to the same cell.

5. Configure a machine named **thelma** as the central registry license server and a network license server. Configure to communicate with a network license server named **hydra**. Specify automatic startup of the servers. With direct binding:

```
i4cfg -a s,r -S a,s -b "'network ip:thelma ip:hydra'
'registry ip:thelma'" -n n
```

With namespace binding, joining an existing alternate cell that has UUID 789b91c50000.0d.00.00.87.84.00.00.00 and replicating the global location broker at the server **hydra**:

```
i4cfg -a s,r -S a,s -b null -n g -r from:ip:hydra
-c 789b91c50000.0d.00.00.87.84.00.00.00
```

6. Cancel all entries previously made in the direct binding servers list:

```
i4cfg -b null
```

7. Display the command syntax and usage:

```
i4cfg -h
```

LUM Runtime and NCS Tools

This section contains information LUM Runtime and NCS tools.

Use the NCS tools only on servers that are configured in namespace binding mode, since the direct binding configuration does not use NCS location broker services.

The tools are:

Local Broker Administration (lb_admin)

Administers the registration of the servers in global location broker or local location broker databases. It can be used to look up information, add new entries, and delete existing entries in a specified database.

GLBD Replicas Administration (drm_admin)

Monitors and modifies the list of the replicated versions of the global location broker databases. It can be used to modify, or merge databases to force convergence among replicas, to stop servers, and to delete replicas.

GLBs List (lb_find)

Lists the servers running the global location broker in the network.

UUID Generator (uuid_gen)

Generates the UUID for an NCS cell.

Test Verification Tool (i4tv)

Verifies that license servers are running properly.

Target View Tool (i4target)

Displays the target ID of your machine. The vendor of a licensed product may ask you to provide the target ID of the machine on which the license is to be installed.

lb_admin - Local Broker Administration

The Local Broker Administration tool (`lb_admin`) administers the registrations of NCS-based servers in global location broker (GLB) or local location broker (LLB) databases. A server registers universal unique identifiers (UUIDs) specifying an object, a type, and an interface, along with a socket address specifying its location. A client can locate servers by issuing lookup requests to GLBs and LLBs.

Use the Local Broker Administration tool (`lb_admin`) to look up information, add new entries, and delete existing entries in a specified database.

The Local Broker Administration tool is useful for inspecting the contents of location broker databases and for correcting database errors. For example, if a server terminates abnormally without unregistering itself, use Local Broker Administration (`lb_admin`) to manually remove its entry from the GLB database.

When accepting input or displaying output, Local Broker Administration (`lb_admin`) uses either character strings or descriptive textual names to identify objects, types, and interfaces. A character string directly represents the data in a UUID in the format:

```
xxxxxxxxxxxx.xx.xx.xx.xx.xx.xx.xx
```

where each `x` is a hexadecimal digit.

Local Broker Administration (`lb_admin`) will examine or modify only one database at a time. This is referred to as the current database. The `use_broker` command selects the type of location broker database, GLB or LLB. The `set_broker` command selects the host whose GLB or LLB database is to be accessed. Of course, if one replica of a replicated GLB database is modified, the modifications will be propagated to the other replicas of that database.

Syntax:

```
lb_admin [ -nq ] [ -version ]
```

Parameters:

- nq** Do not query for verification of wildcard expansions in unregister operations.
- version** Display the version of NCS that this `lb_admin` tool belongs to, but do not start the tool.

Commands: When you type:

```
lb_admin
```

you are prompted with the following line, where you can enter the `lb_admin` commands:

```
lb_admin:
```

In `lookup`, `register`, and `unregister` commands, the *object*, *type*, and *interface* arguments can be either character strings representing UUIDs or textual names corresponding to UUIDs, as described earlier.

a[dd] Synonym for `register`.

c[lean]

Find and delete obsolete entries in the current database. When issuing this command, `lb_admin` attempts to contact each server registered in the database. If the server responds, the entry for its registration is left intact in the database. If the server does not respond, `lb_admin` looks up its registration in the LLB database at the host where the server is located, tells the result of this lookup, and asks if the entry is to be deleted. If a server responds, but its UUIDs do not match the entry in the database, `lb_admin` tells this result and asks if the entry is to be deleted. Entries that meet either of these conditions are probably safe to delete:

- The server does not respond. The `lb_admin` succeeds in contacting the LLB at the host where the server is located, but the server is not registered with that LLB. The server is probably no longer running.
- A server responds, but its UUIDs do not match the entry in the database. The server that responds is not the one that registered the entry.

Entries that meet either of these conditions are probably safe to delete. In other situations, it is best not to delete the entry unless it can be verified directly that the server is not running (for example, by listing the processes running on its host). When `lb_admin` asks to delete an entry, you can respond in four ways:

- A **y[es]** response deletes the entry.
- A **n[o]** response leaves the entry intact in the database. After a **yes** or a **no**, `lb_admin` proceeds to check the next entry in the current database.
- A **g[o]** response invokes automatic deletion, in which all eligible entries are deleted and all ineligible entries are left intact, without the user being queried, until all entries have been checked.
- A **q[uit]** response terminates the clean operation.

d[etele]

Synonym for `unregister`.

h[elp] [*command*] or ? [*command*]

Display a description of the specified command or, if none is specified, list all the lb_admin commands.

l[lookup] *object type interface*

Look up and display all entries with matching object, type, and interface fields in the current database. You can use an asterisk (*) as a wildcard for any of the parameters. If all the parameters are wildcards, lookup displays the entire database.

q[uit] Exit the lb_admin session.

r[egister] *object type interface location annotation [flag]*

Add the specified entry to the current database. Use an asterisk (*) to represent the null UUID in the *object*, *type*, and *interface* fields.

The *location* is a string in the format *family:host[port]*, where *family* is an address family, *host* is a host name, and *port* is a port number. A leading # can be used to indicate that a host name is in the standard numeric form.

The following are sample location specifiers:

```
ip:vienna[1756]
ip:#192.5.5.5[1791]
```

The *annotation* is a string of up to 64 characters annotating the entry. Use double quotation marks to enclose a string that contains a space or contains no characters. To embed a double quotation mark in the string, precede it with a backslash.

The *flag* is either **local** (the default) or **global**, indicating whether the entry should be marked for local registration only or for registration in both the LLB and GLB databases. The flag is a field that is stored with the entry but does not affect where the entry is registered. The **set_broker** and **use_broker** commands select the particular LLB or GLB database for registration.

s[et_broker] [*broker_switch*] *host*

Set the host for the current LLB or GLB. If specifying **global** as the broker switch, **set_broker** sets the current GLB, otherwise it sets the current LLB. The *host* is a string in the format *family:host*, where *family* is an address family and *host* is a host name. Use a leading # to indicate that a host name is in the standard numeric form. The following are sample location specifiers:

```
ip:prague
ip:#192.5.5.5
```

Issue **use_broker**, not this command, to determine if subsequent operations will access the LLB or the GLB.

set_t[imeout] [short | long]

Set the timeout period used by lb_admin Administration for all of its operations. With an argument of **short** or **long**, **set_timeout** sets the timeout accordingly. With no argument, it displays the current time-out value.

u[nregister] object type interface location

Delete the specified entry from the current database. The location is a string in the format *family:host[port]*, where *family* is an address family, *host* is a host name, and *port* is a port number. Use a leading # to indicate that a host name is in the standard numeric form. The following are sample location specifiers:

```
ip:vienna[1756]
ip:#192.5.5.5[1791]
```

You can use an asterisk as a wildcard in the *object*, *type*, and *interface* fields to match any value for the field. Unless queries have been suppressed by invoking lb_admin with the **-nq** option, **unregister** allows deletion of each matching entry.

- A **y[es]** response deletes the entry.
- A **n[o]** response leaves the entry in the database.
- A **g[o]** response deletes all remaining database entries that match, without querying.
- A **q[uit]** response terminates the unregister operation, without deleting any additional entries.

use_broker [broker_switch]

Select the type of database that subsequent operations will access, GLB or LLB. The *broker_switch* is either **global** or **local**. If a broker switch is not supplied, **use_broker** determines if the current database is global or local.

Use **set_broker** to select the host whose GLB or LLB is to be accessed.

Examples:

1. Set the global location broker as the default database.

```
lb_admin
lb_admin: use global
```

2. Find and delete obsolete entries in the global location broker database.

```
lb_admin: clean
```

This is the output, if there are no entries to be cleaned:

```
0 Entries deleted of 8 processed
```

3. Exit the tool: lb_admin: Quit

drm_admin - GLBD Replicas Administration

The GLBD Replicas Administration tool (`drm_admin`) administers servers based on the NCS location brokers such as `glbd`, the replicated version of the global location broker. With the GLBD Replicas Administration tool (`drm_admin`), the replica lists can be inspected or modified, databases can be merged to force convergence among replicas, servers can be stopped, and replicas can be deleted.

The role of the GLBD Replicas Administration tool (`drm_admin`) is to administer the databases, not to change the data they contain. For instance, you can use GLBD Replicas Administration (`drm_admin`) to merge two replicas of the global location broker database, but the Local Broker Administration (`lb_admin`) must be used to add a new entry to the database.

Also, although GLBD Replicas Administration (`drm_admin`) can stop or delete a global location broker replica, `glbd` must be invoked directly to start or create a replica. After you start it, GLBD Replicas Administration (`drm_admin`) enters an interactive mode in which it accepts the following commands.

Syntax:

drm_admin [**-version**]

Parameters:

-version Displays the version of NCS that this GLBD Replicas Administration (`drm_admin`) belongs to, but does not start the tool.

Commands: When you type:

```
drm_admin
```

you are prompted with this line:

```
drm_admin:
```

where you can enter the `drm_admin` commands. Most `drm_admin` commands operate on a default object (**default_obj**) at a default host (**default_host**). Together, **default_obj** and **default_host** specify a default replica. Defaults are established by the **set** command and are remembered until changed by another **set**. Currently, the only known object is `glb`.

Some `drm_admin` commands operate on a host other than the default. Identify this host as **other_host**. The host name supplied as a `default_host` or

an `other_host` takes the form *family:host*, where the host can be specified either by its name or by its network address. The following are examples of acceptable host names:

```
ip:bertie
ip:#192.5.5.5
```

addrep other_host

Add `other_host` to the replica list at `default_host`. The replica at `default_host` will propagate `other_host` to all other replica lists for `default_obj`.

chrep -from other_host -to new_other_host

Change the network address for `other_host` in the replica list at `default_host` to `new_other_host`. The replica at `default_host` will propagate this change to all other replica lists for `default_obj`. The `chrep` command will fail if a replica of `default_obj` is running at `other_host` or if `other_host` is not on the replica list at `default_host`.

delrep other_host

Delete the replica of `default_obj` at `other_host`. The `delrep` command tells the replica at `other_host` to do the following:

1. Propagate all of the entries in its propagation queue.
2. Propagate a delete request to all other replicas, causing `other_host` to be deleted from all other replica lists for `default_obj`.
3. Delete its copy of `default_obj`.
4. Stop running.

The `delrep` command returns you immediately to the GLBD Replicas Administration prompt, but the actual deletion of the replica can take a long time for configurations that are not stable and intact. Check to see if the daemon for the deleted replica has stopped by listing the processes running on its host.

info Get status information about the replica for `default_obj` at `default_host`.

lrep [-d] [-clocks] [-na]

List replicas for `default_obj` as stored in the replica list at `default_host`.

The `-d` option lists deleted as well as existing replicas.

The `-clocks` option shows the current time on each host and indicates the time difference between the replicas.

The `-na` option lists the network address of each host.

merge { -from | -to } other_host

The `merge` command copies entries in the `default_obj` database and replica list from one replica to another. It copies an entry if no corresponding entry exists in the destination database or if the

corresponding entry in the destination database bears an earlier time stamp. A merge does not cause entries to be propagated. The database and replica list at the origination are not changed.

The **-from** parameter copies entries from the default_obj database and replica list at other_host to the default_obj database and replica list at default_host.

The **-to** parameter copies entries from the database and replica list at default_host to the database and replica list at other_host.

A merge -from followed by a merge -to causes the replicas at the two hosts to converge.

merge_all

This command uses default_host as the hub for a global merge of all replicas for default_obj. For each host on the replica list at default_host, a merge_all first runs a merge -from, then runs a merge -to. All replicas of default_obj are thereby forced into a consistent state. The merge_all operation does not cause any entries to be propagated. You should run a merge_all when:

- A replica is purged
- A replica is reset
- A replica has been not communicating for two weeks or more
- A replica stops (for example, when its database is destroyed by a disk failure)

monitor [-r n]

This command causes drm_admin to read the clock of each replica of default_obj every *n* minutes and to report any clock skews or non-answering replicas. If -r is not specified, the period is 15 minutes.

purgerep other_host

This command purges other_host from the replica list at default_host. The replica at default_host then propagates a delete request to the replicas at the hosts remaining on its list, thereby removing other_host from all other replica lists for default_obj. The delete request is not sent to other_host. A purgerep can cause data to be lost and should only be used when a replica has stopped. It is strongly recommended that a **merge_all** operation be run after the purgerep to prevent the remaining replicas of the default_obj database from becoming inconsistent. If the purged replica is still running, it should be reset. It is recommended that you use **chrep** (rather than **addrep** and **purgerep**) to change entries on the replica list.

quit Quit the drm_admin session.

reset other_host

Reset the replica of default_obj at other_host. The reset command tells

the replica at *other_host* to delete its copy of *default_obj* and to stop running. It does not cause *other_host* to be deleted from any other replica lists. This command can cause data to be lost unless a successful **merge_all** is run first.

set [**-o** *obj_name*] **-h** *host_name*

Set the default object and host. All subsequent commands will operate on *obj_name*. Subsequent commands that do not specify a host will be sent to *host_name*. If the **-o** option is not specified, *drm_admin* keeps the current *default_obj*. If **set** is used with the **-o** option, *drm_admin* checks the clocks at all hosts with replicas of the object.

stop Stop the server for *default_obj* that is running at *default_host*.

Examples: The following example starts *drm_admin*, sets the default object to **glb**, and sets the default host to **ip:mars**:

```
drm_admin
drm_admin: set -o glb -h ip:mars
```

This is the output:

```
Default object: glb default host:
ip:mars state: in service
Checking clocks of glb replicas
ip:mars 1997/04/09.17:09
ip:pluto 1997/04/09.17:09
ip:mercury 1997/04/09.17:07
```

lb_find - GLBs List

The GLBs List (`lb_find`) lists global location broker processes and their attributes. It sends out inquiries to the NCS location broker processes and gathers the responses.

If on the machine where you issue the command there are not the two files:

`glb_site.txt`

`glb_obj.txt`

`lb_find` finds all the GLB processes of the same subnet, or all the GLB processes it can reach via broadcast.

If you want to see GLB processes of a different subnetwork you must have those two files. In such a case `lb_find` finds all the GLB processes that run on the hosts whose addresses are in the `glb_site.txt`, situated in the cell specified in the `glb_obj.txt`. If the `glb_obj.txt` is not on the machine, the default cell is taken.

The results are analyzed to determine whether or not the global location broker can be replicated, and which cell each daemon serves. After 10 seconds, the results are summarized, showing the server host's network address, the port number, the global location broker type, a cell name of either default or alternate_n, where n is a number greater than or equal to 1, and the cell's UUID.

Syntax:

lb_find [**-dl**] [**-f ip** | **-q**] [**-h**] [**-v**]

Parameters:

- dl** Turn on RPC remote procedure call (RPC) debugging while searching for GLB servers.
- f** Query for the global location broker servers that communicate with the specified protocol in all the cells.
- q** Query for a global location broker server using the standard RPC mechanism. At most, one global location broker server is printed, and only servers in the current machine's cell are searched. The program exits with a status of 0 if a global location broker server is found; otherwise, the status is nonzero.
- h** Print out the help for the command.
- v** Print out the NCS version string.

Examples:

A network contains two global location broker processes (glbd) in the default NCS cell.

```
lb_find
```

This is the output:

```
sent to broadcast address ip:#9.87.220.255
  waiting for replies
  ip:server5(9.87.220.5) 1024 replicatable default
  333b91c50000.0d.00.00.87.84.00.00.00
  ip:server3(9.87.220.3) 1072 replicatable default
  333b91c50000.0d.00.00.
  87.84.00.00.00
```

uuid_gen - UUID Generator

Use the `uuid_gen` tool to generate the UUID (universal unique identifier) for an NCS cell. The UUID is 28 hexadecimal characters string, and is contained in the `glb_obj.txt` file.

Syntax:

uuid_gen

Example: To generate the UUID:

```
uuid_gen
```

This is an example of the output:

```
54c7874546ae.0.2.81.87.92.34.0.0.00.00
```

i4tv - Test Verification Tool

Use the i4tv tool after the license servers are started to verify that they are running properly.

Run this tool from the appropriate directory for your operating system:

- /opt/lum/ls/os/hpux/bin
- /opt/lum/ls/os/svr4.sgi/bin
- /opt/lum/ls/os/solaris/bin

directory. A message describing a completed license transaction and a list of all license servers will be displayed. If an HAL cluster has been configured and activated, i4tv tries to request all the 10,000 licenses of the HAL Test Product in order to contact all the servers in serving state.

Syntax:

```
i4tv { [ -n hostname ] [ -z ] [ -v ] | { -h | -usage | -version }  
[-p number_of_transactions] }
```

Parameters:

- n *hostname*** Checks that the specified machine is running a network license server. It returns 0 if the hostname is running a network license server and 1 if the hostname is not running a network license server.
- z** Turns on NCS remote procedure call (RPC) tracing messages, which can be used to diagnose problems.
- v** Displays progress messages during the license request operation.
- h** Displays command usage information (same as -usage). This parameter is valid only when issued without other parameters.
- usage** Displays command usage information (same as -h). This parameter is valid only when issued without other parameters.
- version** Displays command version information. This parameter is valid only when issued without other parameters.
- p [*number_of_transactions*]** Specifies the number of transactions to be completed before performance information is displayed. This information provides averages for the specified period. It can be used for tuning the system and for troubleshooting performance problems. The default value is 1000.

Examples: Run the i4tv test and verification tool:

```
i4tv
```

Check for the presence of the license server **pluto**:

```
i4tv -n pluto
```

i4target - Target View Tool

Use the `i4target` tool to display the target ID of your machine. Run this tool from the appropriate directory for your operating system:

- `/opt/lum/ls/os/hpux/bin`
- `/opt/lum/ls/os/svr4.sgi/bin`
- `/opt/lum/ls/os/solaris/bin`

Syntax on IRIX and Solaris:

```
i4target [ -O | -V | -o | -l | -h ] [ -v ]
```

Syntax on HP-UX:

```
i4target [ -O | -V | -o | -c | -h ] [ -v ][ -q ]
```

Parameters:

- O** Displays the target identifier of the machine on which you issue the command, in the form that the license creation tool accepts.
- V** Displays command version information.
- o** Displays the operating system name of your machine.
- l** Displays all target IDs of the machine, starting with the most secure (the one based on the network adapter, if it is available).
- c** Displays multiple target IDs for machines, that have more than one network connection, and enables you to change from one that is currently in use to another. (HP-UX only).
- h** Displays command usage information.
- v** Displays information in verbose mode.
- q** Displays information in quite mode (comments are not displayed before the output). (HP-UX only.)

LUM Runtime and NCS Subsystems

Read this section for reference information on LUM Runtime and NCS subsystems.

llbd - Local Location Broker Subsystem

The local location broker subsystem (llbd) is part of the network computing system (NCS). It manages the local location broker (LLB) database, which stores information about NCS based server programs running on the local host.

A host must run llbd if it is to support the location broker forwarding function or to allow remote access, for example by the Local Broker Administration (lb_admin) to the LLB database. In general, any host that runs NCS-based servers should run an llbd, and llbd should be running before any such servers are started. Additionally, any network or internet supporting NCS activity should have at least one host running a global location broker subsystem (glbd).

Syntax:

```
startprc -s llbd [ -a " -dl " ]
```

Parameters:

-dl Prints debugging information.

glbd - Global Location Broker Subsystem

The global location broker (GLB) subsystem (glbd) helps clients to locate servers on a network or internet. The GLB database stores the locations (that is, the network addresses and port numbers) where server subsystems are running. A process maintains this database and provides access to it.

You can replicate the GLB database to increase its availability. Copies of the database can exist on several hosts, with glbd running on each of those hosts to maintain the consistency of the database replicas. (In an internet, at least one glbd must run in each network.) Each replica of the GLB keeps a list of all the other GLB replicas. The GLBDs Replicas Administration (drm_admin) tool administers the replication of the GLB database and of the replica list (see “LUM Runtime and NCS Tools” on page 164).

In an internet, all routing nodes must support the same family. If a set of global location broker replicas includes systems that support only AIX, all replicas must use IP protocols to communicate with each other. A replica running on an AIX system can communicate with other replicas using IP protocols, but still provide lookup and update services to its clients.

The glbd command writes diagnostic output to the file `/etc/ncs/glb_log`.

Syntax:

```
startprc -s glbd [ -a " [ -create { -first [ -family family_name ]  
| -from host_name } ] [ -debug ] [ -log_stdout ] " ]
```

Parameters:

- create** Creates a replica of the GLB. This option creates a GLB database in addition to starting a broker subsystem. It must be used with either **-first** or **-from**.
- first** Use this option only with **-create**. Use it to create the first replica (that is, the very first instance) of the GLB on the network or internet.
- family *family_name***
Use this option only with **-first**, to specify the address family that the first replica will use to identify itself on the replica list. Any subsequently created replicas must use this family to communicate with this replica. The family name can only be **ip**.
- from *host_name***
Use this option only with **-create**, to create additional replicas of the global location broker. A replica of the global location

broker must exist at *host_name*. The database and replica list for the new replica are initialized from those at *host_name*. The replica at *host_name* adds an entry for the new replica to its replica list and propagates the entry to the other global location broker replicas. A *host_name* takes the form *family:host*, where the host can be specified either by its name or by its network address.

The following are examples of acceptable host names:

```
ip:bertie
ip:#192.5.5.5
```

The new replica uses the same address family as *host_name* in identifying itself on the replica list. For example, if *host_name* is an IP address, the new replica is listed by its IP address on the replica list.

- debug** Prints debugging information.
- log_stdout** Redirects the log and debug printout to standard output instead of `/etc/ncs/glb_log`.

Examples: Create and start for the first time the first replica of the GLB on the network or internet:

```
startprc -s glbd -a "-create -first -family ip"
```

Start for the first time a subsequent replica of the GLB, initializing its database from host //buddy:

```
startprc -s glbd -a "-create -from ip:buddy"
```

Restart an existing replica of the GLB:

```
startprc -s glbd
```

i4lmd - Network License Server Subsystem

The i4lmd subsystem starts the network license server on the local node. If the machine is not configured to run the network license server, i4lmd has no effect.

The parameters of i4lmd override the corresponding settings in the i4ls.ini file.

Syntax:

```
startprc -s i4lmd [ -a " [ -no event_list ] [ -v ] [ -z ] [ -l log_name ]  
[ -s ] [ -r ] [ -c ] [ -p ] " ]
```

Parameters:

-no event_list Turns off logging of the events specified in event_list. Any combination of events is valid, but items in the list of events must not be separated by spaces or other characters. Following are the event types that you can specify:

- l** Grant and release licenses.
- c** Check in licenses. (Licensed products usually check in with the license server at regular intervals while a user is using the product.)
- w** Waiting events: these include wait events (a user was waiting for a license), wait grant events (a user was waiting for and then was granted a license), and wait remove events (a user was waiting for a license and then asked to be removed from the queues before a license was granted.)
- v** Vendor events: a vendor was added, renamed or deleted.
- p** Product events: a product was added, renamed, or deleted.
- e** Errors.
- m** Messages.
- s** Starts and stops of this license server.
- t** License timeout events. (When a licensed product fails to check in with the license server, it may stop running after it times out. The vendor of the product sets the timeout interval, which is how long a product can run after it has lost contact with the license server.)

- v** LUM Runtime library verbose mode.
- z** Debugging flag. Prints RPC debugging information.
- l *log_name*** Overrides the default name and location of the file used to store log information. This allows the I/O activity to the files used by the license server to be spread across multiple file systems that may become important for large installations.
- s** Instructs the license server to ignore attempts from administrators on remote systems to modify the license database. Records in the database remain readable by all instances of the LUM Runtime Administration Tool.
- r** Recovers files from the automatic backup version.
- c** Specifies that this is a cold start, meaning that the license server restarts from scratch, as if it had granted no licenses before stopping.
- p** Specifies that i4lmd is to display performance information at specified intervals. The default and maximum interval is 1000 calls received from clients. To change the frequency of reporting, change the environment variable I4_POLL_FREQ.

This option is linked to the TraceActivities tag in the i4ls.ini file.

Examples: Start a license server and do not log checkin, vendor, product, timeout, or message events:

```
startprc -s i4lmd -a "-no cvptm"
```

Start a license server changing the default log-file:

```
startprc -s i4lmd -a "-l /ifor/ls/my_log"
```

i4llmd - Nodelocked License Server Subsystem

The i4llmd subsystem starts the nodelocked license server on the local node. If the machine is not configured to run the nodelocked license server, i4llmd has no effect.

The parameters of i4llmd override the corresponding settings in the i4ls.ini file.

Syntax:

```
startprc -s i4llmd [ -a " [ -no event_list ] [ -v ] [ -l log_name ] [ -s ]  
[ -r ] [ -c ] " ]
```

Parameters:

-no event_list Turns off logging of the events specified in the event list. Any combination of events is valid, but items in the event list must not be separated by spaces or other characters. Following are the event types that you can specify:

- l** Grant and release licenses.
- v** Vendor events: a vendor was added, renamed or deleted.
- p** Product events: a product was added, renamed, or deleted.
- e** Errors.
- m** Messages.
- s** Starts and stops of this license server.
- t** Time out.

-v LUM Runtime library verbose mode.

-l log_name Overrides the default name and location of the file used to store log information. This allows the I/O activity to the files used by the license server to be spread across multiple file systems that may become important for large installations.

-s Instructs the license server to ignore attempts from administrators on remote systems to modify the license database. Records in the database remain readable by all instances of the Basic License Tool.

-r Recovers files from the automatic backup version.

-c Specifies that this is a cold start, meaning that the license server restarts from scratch, as if it had granted no licenses before stopping.

Examples: Start a nodelocked license server and do not log checkin, vendor, product, or message events:

```
startprc -s i411md -a "-no cvpm"
```

Start a nodelocked license server changing the default log file:

```
startprc -s i411md -a "-l /ifor/ls/my_log"
```

Start a nodelocked license server, disabling remote administration from instances of the Basic License Tool on other machines:

```
startprc -s i411md -a "-s"
```

i4gdb - Central Registry License Server Subsystem

The Central Registry is a LUM Runtime subsystem that provides a mechanism for storing data pertaining to licensing information. There must be one and only one central registry license server running per cell. This ensures that the data is accurate and complete.

The Basic License Tool requires a central registry license server up and running to administer customer-managed use products.

In namespace binding, if more than one i4gdb is found in a given cell, the newly started i4gdb automatically shuts down.

In direct binding there is no such control, and you must double-check that you have started one and only one central registry license server in your licensing environment by issuing the following command on every LUM Runtime server:

```
i4cfg -list
```

If the machine is not configured to run the central registry license server, i4gdb has no effect.

The parameters of i4gdb override the corresponding settings in the i4ls.ini file.

Syntax:

```
startprc -s i4gdb [ -a " [ -no event_list ] [ -v ] [ -l log_name ]  
[ -r ] [ -c ] [ -z ] " ]
```

Parameters:

-no event_list Turns off logging of the events specified in the event list. Any combination of events is valid, but items in the event list must not be separated by spaces or other characters. Following are the event types that you can specify:

- l** Grant and release licenses.
- c** Check in licenses. (Licensed products usually check in with the license server at regular intervals while a user is using the product.)
- v** Vendor events: a vendor was added, renamed or deleted.
- p** Product events: a product was added, renamed, or deleted.
- e** Errors.

- m** Messages.
- s** Starts and stops of this license server.
- t** Time out.
- v** LUM Runtime library verbose mode.
- l *log_name*** Overrides the default name and location of the file used to store log information. This allows the I/O activity to the files used by the license server to be spread across multiple file systems that may become important for large installations.
- r** Recovers files from the automatic backup version.
- c** Specifies that this is a cold start, meaning that the license server restarts from scratch, as if it had granted no licenses before stopping.
- z** Debugging flag. Prints RPC debugging information.

i4glbcd - Global Location Broker Database Cleaner Subsystem

The i4glbcd subsystem automatically cleans up incorrect entries in the global location broker database. Do not start more than one instance of i4glbcd in an NCS cell.

Syntax:

```
startprc -s i4glbcd [ -a "-nq" ]
```

Parameters:

-nq Verbose mode. This causes i4glbcd to display debugging information to standard output. Use this information if you need to call IBM support.

i4lct - License Creation Tool

The license creation tool is intended for:

- Software vendors, to create test passwords while enabling a product
- Software vendors, to create production passwords and bundles
- Sales representatives, who can be provided with a compound password containing many licenses, from which they extract licenses for individual customers.

This tool is not intended for administrators or end users.

Run this command on a machine where LUM Runtime is installed.

Notes:

1. The passwords you generate with the license creation tool of LUM Runtime Version 4.6 also work on LUM Runtime servers and clients of previous releases. High-availability licenses, introduced in Version 4.5.0, can be installed only on machines running Version 4.5.x or later. Licenses of types introduced in Version 4 (such as reservable and per-seat), cannot be installed on machines running earlier releases of LUM Runtime. Custom configuration licenses, introduced in Version 4.5.5, can be installed only on machines running Version 4.5.5 or later.

In the enrollment certificate file, the **PasswordVersion** parameter is set as follows:

- | | |
|---|---|
| 8 | If the password is for a capacity license or for bundle component licenses |
| 7 | If the password is for a custom configuration license |
| 6 | If the password is for a high-availability license (and can therefore be installed only on machines running Version 4.5 or later) |
| 5 | If the password is for a license type, or exercises a policy, introduced in Version 4 (and therefore is not installable on machines running earlier versions) |
| 4 | Otherwise |
2. To create test passwords, use **test** as the value of the **-i**, **-k**, and **-v** parameters.
 3. To create a bundle:
 - Create a license for each product in the bundle.
 - Use **b** as the value of the **-A** parameter.
 - Use the same value for the **-C** parameter for all products in the bundle.

Optionally, you can create a separate *master license* for the bundle. The master license is used to check the consistency of the bundle. It does not appear as a product in the Basic License Tool.

If you create a master license:

- Use **b** as the value of the **-A** parameter.
- Use the same value for the **-C** parameter as you used for each product in the bundle.
- Use 102 as the value for the **-F** parameter.

If you create a master license, the bundle appears in the Basic License Tool as **incomplete** when either of the following conditions is true:

- The number of products in the package, or the number of licenses in a bundle, is different from the value specified in the **-n** parameter
 - The master license is not enrolled.
4. To extract licenses for individual customers from a compound password assigned to a sales representative, use **supplier** as the value of the **-k** parameter.
 5. To create production licenses, vendors must acquire the license for this tool from IBM or from Isogon Corp.

The address of Isogon Corp. is:

Isogon Corporation
 330 Seventh Avenue
 New York, New York 10001
 U.S.A.
 Tel: (+1) 212-376-3200
 Fax: (+1) 212-376-3280

Table 9 summarizes the valid combinations of license type, password use control level, password type, and enabled policies the vendor can specify with `i4lct`.

Table 9. Valid Uses of `i4lct`

| License Type | Password Use Control Level | Password Type | Policies |
|-------------------|----------------------------|-----------------|---|
| Concurrent (-l c) | Customer-Managed (-R c) | Compound (-w c) | Hard Stop/Soft Stop (-A s)† Multiuse Rules (-m) License Annotation (-a) Capacity (-F)† |

Table 9. Valid Uses of *i4lct* (continued)

| License Type | Password Use Control Level | Password Type | Policies |
|-------------------------------|----------------------------|-----------------------------------|--|
| Concurrent (-I c) | Vendor-Managed (-R v) | Simple (-w l) | Soft Stop (-A s) Multiuse Rules (-m) License Annotation (-a) Custom Configuration (-C) Capacity(-F) Bundle (-A b) |
| Concurrent (-I c) | Vendor-Managed (-R v) | Compound (-w c) | Soft Stop (-A s) Multiuse Rules (-m) License Annotation (-a) Capacity(-F) |
| Reservable (-I r) | Customer-Managed (-R c) | Compound (-w c) | Hard Stop/Soft Stop (-A s) License Annotation (-a) |
| Reservable (-I r) | Vendor-Managed (-R v) | Simple or Compound (-w l or -w c) | License Annotation (-a) |
| Use-Once (-I u) | Customer-Managed (-R c) | Compound (-w c) | License Annotation (-a) |
| Use-Once (-I u) | Vendor-Managed (-R v) | Simple or Compound (-w l or -w c) | License Annotation (-a) |
| Per-Seat (-I pt) | Customer-Managed (-R c) | Simple (-w l) | Hard Stop/Soft Stop (-A s) License Annotation (-a) |
| Per-Server (-I ps) | Customer-Managed (-R c) | Simple (-w l) | Hard Stop/Soft Stop (-A s) Multiuse Rules (-m) License Annotation (-a) |
| Simple Nodelocked (-I n) | Vendor-Managed (-R v) | Simple (-w l) | License Annotation (-a) Custom Configuration (-C) Capacity (-F) Bundle (-A b) Product-Specific Program (-I) |
| Simple Nodelocked (-I n) | Vendor-Managed (-R v) | Compound (-w c) | License Annotation (-a) Capacity (-F) |
| Simple Nodelocked (-I n) | Vendor-Managed (-R v) | Compound Nodelocked (-w cn) | Try-and-Buy (-A t)* License Annotation (-a) Capacity (-F) |
| Concurrent Nodelocked (-I cn) | Customer-Managed (-R c) | Simple (-w l) | Hard Stop/Soft Stop (-A s)† Multiuse Rules (-m) License Annotation (-a) Capacity (-F)† Bundle (-A b) |

Table 9. Valid Uses of *i4lct* (continued)

| License Type | Password Use Control Level | Password Type | Policies |
|-------------------------------|----------------------------|---------------|--|
| Concurrent Nodelocked (-I cn) | Vendor-Managed (-R v) | Simple (-w l) | Soft Stop (-A s) Multiuse Rules (-m) License Annotation (-a) Custom Configuration (-C) Capacity(-F) Bundle (-A b) |
| Use-Once Nodelocked (-I un) | Customer-Managed (-R c) | Simple (-w l) | License Annotation (-a) Capacity (-F) |
| Use-Once Nodelocked (-I un) | Vendor-Managed (-R v) | Simple (-w l) | License Annotation (-a) Capacity (-F) |

* When -w is set to cn, the try-and-buy attribute is required.

† Soft-stop does not work with capacity for customer-managed use licenses.

Syntax

i4lct

Parameters required to generate a license:

```
-i {vendor_id | create | test }
-k { vendor_key | test | supplier }
-v { vendor_name | test }
-I license_type
-F capacity_type
-A -b (required only for a product that is part of a bundle)
-C { serial_number | bundle_id } (required only for a custom configuration
or for a product that is part of a bundle)
-p product_id
-N product_name
-w password_type
{ -d duration | -e expiration_date }
-r revision
-R password_registration_level
{ -T target_id -t target_type | -X extended_target_id -x extended_target_type }
```

Parameters required to generate a master license for a bundle:

```
-F 102
-N bundle_name
```

| **-r** *revision*
| **-A -b**
| **-C** *bundle_id*

Parameters valid only if **-w** is set to **c** or **cn** (compound or compound nodelocked passwords):

 [**-S** *derived_start_date*]
 [**-E** *derived_expiration_date*]

Parameter valid only if **-R** is set to **v** (vendor-managed product):

 [**-n** *number_of_licenses* | *capacity_units*]

Parameter valid only if **-w** is set to **c** or **cn** (compound or compound nodelocked passwords) and **-R** is set to **v** (vendor-managed product):

 [**-D** *aggregate_duration*]

Parameter valid only if **-l** is set to **c**, **cn**, or **ps** (concurrent, concurrent nodelocked, or per-server license):

 [**-m** *multi-usage_specification*]

Optional parameters:

 [**-a** *annotation*]
 [**-A** *attributes*] (optional only for a product that is not part of a bundle)
 [**-c** *customer_information*]
 [**-C** *serial_number*] (optional only for products that are not a custom configuration or part of a bundle)
 [**-L** *log_file*]
 [**-O**]
 [**-P** *16_bit_flag*]
 [**-s** *start_date*]

Parameters valid only when entered without any other parameters:

 [**-f** *batch_file_name*]
 [**-h**]
 [**-V** *version*]
 [**-u** *upgrade_flag*]
 [**-U**]

Parameters

-a *annotation* The license annotation string. Up to 255 characters for simple nodelocked licenses, up to 80 characters long for all others.

- A attributes** Possible values are:
- s** To enable the end user to modify the product policy from soft stop to hard stop and vice versa. Valid only for customer-managed products (**-R** set to **c**).
 - t** To specify a try-and-buy license. Valid only for vendor-managed products (**-R** set to **v**) with nodelocked licenses (**-l** set to **n**) and password type compound nodelocked (**-w** set to **cn**).
 - b** To specify a product that is part of a bundle, or to specify the master license for a bundle.

-c customer_information

Specifies additional customer details for logging purposes. This parameter is useful only if used with the **-L log_file** parameter.

-C { serial_number | bundle_id }

Specifies the serial number of a custom configuration license or the identifier for a bundle. This parameter is a string of up to 31 alphanumeric characters.

-d duration

The duration of the password. If the password type is license, this value indicates the number of days for which the licenses are valid. If the password type is compound, this value indicates the number of days during which license passwords can be derived from the compound password. Its maximum allowed value is 32 767.

For vendor-managed compound passwords, the product obtained by multiplying **-d** (duration) and **-n** (number_of_licenses) cannot exceed 2 147 483 647.

For example, if **-n** is 70 000, the maximum duration is 30 678 days (2 147 483 647/70 000).

You must specify at least one of **-d** and **-e**.

-D aggregate_duration

Valid only for vendor-managed products (**-R** set to **v**) and compound or compound nodelocked passwords (**-w** set to **c** or **cn**). This is the maximum aggregate duration, in days, of all licenses that are to be derived from a compound password. Its maximum allowed value is 2 147 483 647.

In the case of a try-and-buy license (**-w** set to **cn**, **-A** set to **t**, and **-l** set to **n**), this represents the duration of the try-and-buy license extracted from the compound password.

For example, a compound password from which 100 licenses may be derived might have an aggregate duration of 36500 days. From this password there can be derived 100 1-year licenses, or 50 6-month licenses and 50 18-month licenses, and so on.

-e *expiration_date*

The end date of the password. The date format is mm/dd/yyyy. If the password type is license, this value indicates the end date beyond which the licenses are no longer valid. If the password type is compound, this value indicates the end date beyond which license passwords can no longer be derived from the compound password.

The latest expiration date that can be specified with the **-e** parameter is 02/05/2106. Note, however, that the standard time functions of the operating system do not properly handle expiration dates later than 12/31/2037, so it is recommended that you not create licenses that expire after that date. Note also that the current version of the operating system does not allow system dates later than 01/18/2038.

You must specify at least one of **-d** and **-e**.

Valid combinations of the start, duration, and end options are as follows:

- d** The start date defaults to the current date. i4lct calculates the expiration date for you.
- s and -d** i4lct calculates the expiration date for you.
- e and -d** i4lct calculates the start date for you.
- s and -e** i4lct calculates the duration for you.

-E *derived_expiration_date*

Valid only with compound or compound nodelocked passwords (**-w** set to **c** or **cn**). The date format is mm/dd/yyyy. This is the derived license end date, the date after which no license password derived from the compound password is valid.

-f *batch_file_name*

Specify the fully qualified path and file name of a batch file containing the full i4lct command to issue the full i4lct command contained in such a file.

-F *capacity_type*

Specifies the capacity of the license and can take the following values:

- 100** The units specified are a number of configured processors.
- 101** The units specified are a number of online processors.
- 102** The units specified are the number of components in a bundle. This unit code is used only for the master license of a bundle.
- 103** The units specified are a number of physical disks.
- 104** The units specified are a number of megabytes. Used only for physical memory.
- xxx** The units are vendor-specified. This can be any number between 128 and 255.

-h Displays help for the `i4lct` command.

-i *vendor_id*

Specifies the vendor ID. It can also take the following values:

- create** Generate a new vendor ID while generating a production password.
- test** Create test passwords.

-k *vendor_key*

Specifies the vendor key. This must be an integer between 1 and 2 147 483 647, or one of the following values:

- test** Create test passwords.
- supplier** When you specify this value the license server must be up and running, and there must be a compound password enrolled for a vendor-managed use product.

By specifying this value you create an enrollment certificate file for a simple password extracted from the existing compound password. You specify the compound password by means of the other `i4lct` parameters.

The following example creates the certificate file for 497 concurrent licenses with duration 10 days, extracted from the compound password of the vendor-managed use product **cmpLev3** of the vendor Operatix:

```
i4lct -i 6pw4cilxw000.0n.00.03.4g.5y.00.00.00 -k supplier  
-n 497 -l c -d 10 -N "cmpLev3" -p 317 -r 1.0 -t any -T any  
-v "Operatix" -w l
```

Use this parameter when you need to provide sales representatives in other locations with a compound password for several licenses, for example. The representatives enroll the compound password, then generate the licenses for customers, extracting simple passwords from it. Thus you do not need to generate the enrollment certificate files for all the customers or to supply the production `i4lct` to all your representatives.

-l *license_type* The license type. Use one of the following keywords:

| | |
|-----------|-----------------------|
| c | Concurrent |
| cn | Concurrent nodelocked |
| n | Nodelocked |
| u | Use-once |
| un | Use-once nodelocked |
| ps | Per-server |
| pt | Per-seat |
| r | Reservable |

Multiuse rules, **-m**, can be specified only if this parameter is set to concurrent, concurrent nodelocked, or per-server.

-L *log_file* Specify the `i4lct` log file path and name. If you do not specify it the default is
`var/lum/i4lct.log`

-m *multi-usage_specification*

This argument is optional and is used to define multiuse rules for concurrent, concurrent nodelocked, and per-server licenses.

You can define conditions for multiuse of a single concurrent license as any combination of the following key letters: **u** (same user), **n** (same node), **g** (same group or same display, depending on the license-enabled application), **j** (same job ID), **a** (same accessor ID).

You can define conditions for multiuse of a single concurrent nodelocked or per-server license as any combination of the following key letters: **u** (same user), **g** (same group or same display, depending on the license-enabled application), **j** (same job ID), **a** (same accessor ID).

Specify the letters without spaces, commas, or other separators. For example, **-m un** means that if the user and

node are the same as those associated with a previously granted license, granting a new concurrent access license is not required.

-n {*number_of_licenses* | *capacity_units* }

For a compound password, this is the maximum number of licenses that can be derived from the password. It is valid only for vendor-managed products (**-R** set to **v**). Its maximum allowed value is 65 534. For customer-managed products, you cannot specify this parameter, and the value is set to 65 535.

For vendor-managed compound passwords, the product obtained by multiplying **-d** (duration) and **-n** (number_of_licenses) cannot exceed 2 147 483 647.

For example, if **-n** is 70 000, the maximum duration is 30 678 days (2 147 483 647/70 000).

-N *product_name*

The name of the product. It can be up to 31 alphanumeric characters long. If it is omitted, a product name with value **NULL** is created by **i4lct**. All product name specifications must be enclosed within double quotation marks ("*product_name*"). Product name specifications are case-sensitive.

-O

Specify this option to generate, at the top of the enrollment certificate file, the command the end user issues to enroll the password. If the license is a type supported in releases of LUM Runtime earlier than Version 4.0, two commands are generated: the **i4blt** command for use with LUM Runtime Version 4 and the **ls_admin** command for use with previous releases. Otherwise, only the **i4blt** command is generated.

-P *product_id*

The product ID. This is an integer between 1 and 2,147,483,647 that identifies a vendor's licensed software product. Product IDs are used by the license server to distinguish between different products from the same vendor. Product ID must be unique among all the products you create licenses for.

-P *16_bit_flag*

The *product_id* field in the password is limited to 16 bits.

-r *revision*

A string that identifies a particular version of a product; by means of version identifiers, the license server can distinguish between products that use the same product ID. It can be up to 11 characters long. If this parameter is omitted, a revision with value **NULL** is created by **i4lct**.

-R *password_registration_level*

Specifies the password registration level. Its allowed values are:

- c** Specify that the password is for a customer-managed use product.
- v** Specify that the password is for a vendor-managed use product.

Issue the `i4lct -h` command and see the notes at the end for information about the valid values of this parameter.

-s *start_date*

Specifies the start date of the password. The date format is `mm/dd/yyyy`. If the password type is license, this value indicates the effective start date of the licenses; if the password type is compound, this value indicates the start date at which you can create license passwords that are derived from the compound password.

To provide concurrency of licensing across the international date line, you can specify a date value of *current date - 1 day*. If you specify a date earlier than that, `i4lct` issues an error message and does not create a license certificate file.

The maximum start date you can specify is 4095 days from the current date.

If this option is omitted, the start date of the password defaults to the current date.

-S *derived_start_date*

Valid only with compound or compound nodelocked passwords (**-w** set to `c` or `cn`). The date format is `mm/dd/yyyy`. This is the derived license start date, the date before which no license password derived from the compound password is valid.

To provide concurrency of licensing across the international date line, you can specify a date value of *current date - 1 day*. If you specify a date earlier than that, `i4lct` issues an error message and does not create a license certificate file.

If this option is omitted, the derived start date of the password defaults to the current date.

-t *target_type*

The target type of the license server on which the licenses are to be installed.

Valid values are **any**, **aix**, **dg[ux]**, **do[main]**, **h[pux]**, **i[ntergraph]**, **m[sdos]**, **ne[xt]**, **no[vell]**, **os2**, **os2mac**, **sco**, **sgi**, **sun**, **svr4**, **u[ltrix]**, **v[ms]**, **apollo**, **open**, **sun**, **vax**, **hposf**, **clipper**, **osfl**, **win32**, **win32mac**, **hiux**, **nec**.

The **win32mac** and **os2mac** parameters specify that the target ID to be used is based on the network adapter. The **win32** and **os2** parameters specify a software-based target ID. For customer-managed licenses, the value of **-t** must be set to **any**.

-T target_id Specifies the target ID of the license server where the license password is to be installed. The target ID can be either the old style (32-bit) or the new style (64-bit).

If the target type, **-t**, is set to **any**, the target ID, **-T**, is set to **any** by default.

-u The upgrade flag for a custom configuration license. This flag indicates whether the customer's initial configuration and password have been modified. The replacement password is used thereafter. For concurrent network licenses, the initial password is deleted, leaving only the replacement password available. For simple nodelocked licenses, the initial password remains in the file and must not be deleted, though only the most recent replacement password is used.

-U Display the command line usage information.

-v vendor_name

Specifies the vendor name. It can be up to 31 characters long. All vendor name specifications must be enclosed within double quotation marks ("**vendorname**"). Vendor name specifications are case-sensitive.

If you are generating test passwords, specify the value **test**.

-V Display the i4lct version string.

-w password_type

The type of password to be created; supply one of the following keywords:

l Simple password

c Compound password

cn Compound nodelocked password; valid only in conjunction with the try-and-buy attribute (**-A** set to **t**)

-x extended_target_type

The type of target for an extended target ID. In LUM Runtime Version 4.5.x and 4.6, the only valid value for **-x** is **cluster**.

-X extended_target_id

The ID of the extended target on which the password is to be installed. In LUM Runtime Version 4.5.x and 4.6, -X is the ID of a cluster.

Examples

The following command creates an enrollment certificate that contains the password to test a vendor-managed use product. It represents 100 concurrent access licenses, with one year of duration, and with multiuse rules specified.

```
i4lct -i test -k test -v "test"  
-N "Example Licensed Product" -p 1 -r 1.0 -R v  
-w 1 -l c -t any -a "Example Product" -s 01/01/1998 -d 365 -n 100 -m ug
```

The following command creates the enrollment certificate that contains the password to test a customer-managed use product with a per-seat license.

```
i4lct -i test -k test  
-v test -N "Example Licensed Product6"  
-p 6 -r 1.1 -w 1 -l pt -a "Example Product Core Package"  
-s 1/1/1998 -d 365 -t aix -T any -R c
```

The following command creates an enrollment certificate that contains an initial custom configuration key for a nodelocked license:

```
i4lct -i 5242378dbf8d.02.c0.09.c8.93.00.00.00 -k 53989 -l n -p 50  
-N "Mechanical Design" -d 730 -t aix -T 152c234 -v "Mechanical Systems"  
-w 1 -r 1.2 -C 85AB2215691 -a "MD2"
```

The following command creates an enrollment certificate that contains a replacement custom configuration key for the nodelocked license in the preceding example. In this example, the duration of the license is extended from the initial 730 days to 5000 days. The other values remain unchanged.

```
i4lct -i 5242378dbf8d.02.c0.09.c8.93.00.00.00 -k 53989 -l n -p 50  
-N "Mechanical Design" -d 5000 -t aix -T 152c234 -v "Mechanical Systems"  
-w 1 -r 1.2 -C 85AB2215691 -a "MD2" -u
```

The following commands create a bundle that contains two products. Three licenses are created (two for the products and one for the master license).

To create the license for the first product (20 concurrent network licenses):

```
i4lct -i 92cd55ef995d.02.92.54.b1.74.00.00.00 -k 53989 -d 100 -w 1  
-A b -l c -n 20 -N "Mechanical Design Product1" -p 54 -r 2.0  
-C BNDL016D -t any -v "Mechanical Systems"
```

To create the license for the second product (nodelocked license):

```
i4lct -i 92cd55ef995d.02.92.54.b1.74.00.00.00 -k 53989 -d 100 -w 1  
-A b -l n -N "Mechanical Design Product2" -p 56 -r 2.5  
-C BNDL016D -t any -v "Mechanical Systems"
```

|
|
|
|
|

To create the master license for the bundle:

```
i4lct -i 92cd55ef995d.02.92.54.b1.74.00.00.00 -k 53989 -d 100 -w 1  
-A b -F 102 -l c -n 2 -N "Mechanical Design Bundle" -p 52 -r 1.0  
-C BNDL016D -t any -v "Mechanical Systems"
```

Chapter 7. Tips and Hints

Using the Built-In Backup and Recovery Procedure

Because the breakdown of license servers may have a potentially severe impact on production, it is important to be prepared in case definitions and database files are corrupted.

The minimum backup activity the administrator should do is to keep the enrollment certificate files (or e-mail or hard copy equivalents) received from the license provider in a secure place.

LUM Runtime implements a backup procedure of all databases on license server machines.

Causes for Corrupted Definition or Database Files

There are many situations that can cause the definition or database files to become corrupted. The most common causes may be split into two groups:

- NCS-related issues
- LUM Runtime-related issues

NCS-Related Issues

The NCS definition and database files are static and linked to network addresses. For this reason, changing definitions or adapters within the network may lead to connection errors. The following files are used by the local location broker (llbd) and global location broker (glbd) subsystems during startup to establish connection with the network and to register objects.

- The llbd subsystem uses the `/tmp/llbdbase.dat` file
- The glbd subsystem uses the `/etc/lum/ncs/glb.e` and the `/etc/lum/ncs/glb.p` databases.

LUM Runtime-Related Issues

Since LUM Runtime uses the database files dynamically, any disk-related problems such as the following may cause the database files to become corrupted:

- Hardware failures (media surface errors)
- File-system problems (for example, file system full)
- Synchronization errors during writing of data (that is, loss of electrical power)

When a LUM Runtime database is corrupted, after the database has been recovered, try to find out the real cause of the problem.

The contents of the definition and database files used by NCS and by LUM Runtime are changed only by defined administrative commands and tools.

Automatic Backup Procedure

LUM Runtime does an automatic periodic backup on license servers by copying all files and databases to the filesystem:

```
/tmp
```

You can choose to get the backup on any other device by changing the **BackupPath** parameter in the configuration file (i4ls.ini). You can set the automatic backup to occur daily, at a certain time, (the default), or weekly, on a certain day, or at every change on the license database, according to the **BackupMode** and **BackupParm** parameters specified in the configuration file. You can also disable the automatic backup procedure by setting the **BackupMode** parameter to none.

For detailed information on the configuration file (i4ls.ini) see “Appendix A. LUM Runtime Configuration File” on page 235.

Be sure that the **BackupMode** and **BackupParm** parameters have the same value on all servers in the licensing environment.

The objects listed in:

```
/var/lum/scripts/db_back.sh
```

are backed up if found.

Recovery Procedure

To recover the files and databases saved with the automatic procedure described in “Automatic Backup Procedure”:

1. Identify the machine that has corrupted files or databases.
2. Stop the LUM Runtime services by issuing the following command:

```
i4cfg -stop
```

3. Issue the following command :

```
i4lmd -r
```

4. Start services by issuing the following command:

```
i4cfg -start
```

This replaces the current objects with those saved with the backup procedure.

Important: In case of corruption, run this command according to the following rules:

- If the **BackupMode** in the configuration file (`i4ls.ini`) is set to **changes**, run the recovery command only on the server where corruption occurred.
- If the **BackupMode** is set to **daily** or **weekly**, first check that the backup copies have the same date on all the servers of your licensing environment, then run the backup command on all the servers.

Manual Backup

You can run the backup procedure manually by running:

```
/var/lum/scripts/db_back.sh
```

On a machine configured only as a network license client, only manual backup is available.

This command copies the files and databases to the backup file:

```
/tmp/iforls_bak_DATE_SERVERNAME
```

Manual Recovery

To start the recovery procedure in case of corruption, use:

```
/var/lum/scripts/db_recov.sh
```

on the failing machine. This script restores the files and databases that were saved by the `db_back.sh` script. Use the command:

```
/var/lum/scripts/db_recov.sh iforls_bak_DATE_SERVERNAME
```

where `iforls_bak_DATE_SERVERNAME` is the name of the backup file.

Managing the Reports Log Files

When you ask for a report, the Basic License Tool reads the current log files:

```
/var/lum/logdbnn_ (network license server)
```

```
/var/lum/crlognn_ (central registry license server)
```

```
/var/lum/lmlgnn_ (nodelocked license server)
```

The names of the current log files end with an underscore.

The files `logdbnn`, `crlognn`, and `lmlgnn` contain all the collected LUM Runtime events. You can specify which events are to be collected when you configure each license server. See the examples in “Scenario 1: Configuring a Standalone Nodelocked License Server” on page 74, and “Scenario 3: Configuring a Network License Server” on page 80. `nn` can assume values from 00 to 99. When a file is full, a new one is started. You determine the maximum value `nn` can assume and the maximum size of each file by setting the

NumberOfLogFile and **MaxLogFileSize** parameters in the configuration file, `i4ls.ini`. When the maximum value for *nn* is reached, LUM Runtime wraps to 00. The filled log files are retained so that you can archive them if you wish before the numbering wraps. For details see “Appendix A. LUM Runtime Configuration File” on page 235.

The numbering of log files starts from 00. Suppose you have the following files on the machine:

```
logdb00
logdb01_
logdb02
```

The second file is the current, the first is the previous, and the third is the oldest.

If the current files, marked with the underscore, get too big, do not delete them. You can decrease the size of the current files with the following command:

```
i4blt -x delete_date -n server_name
```

where:

- delete_date** Specifies an end date for the delete operation. All log entries recorded up to the delete date are removed from the log files. If you do not specify a date all the entries are deleted.
- server_name** Specifies the license server where you want to delete the entries of `logdbnn_`, `crlognn_`, and `llmlgnn_` if they exist on the server.

Managing Trace Files

Because the trace function can produce a large amount of output, it would be helpful to have a procedure to store only the most recent part of the trace. The following example procedure enables you to split the server’s trace output across several files. These files can then be periodically removed in their chronological sequence, starting with the oldest files.

- To start the server in trace mode and split the output across several files, issue the command:

```
print "/opt/lum/ls/os/hpux/bin/i4lmd -v -z
-no lcvptms 2>&1 | split -a3 -l 120000 -
/tmp/i4lmd.trc" | at now
```

The output of the license server is written to files whose names are in the format:

```
i4lmd.trcxxx
```

where `xxx` identifies a particular file in the sequence. For example, the first three files would be named `i4lmd.trcaaa`, `i4lmd.trcaab`, and `i4lmd.aac`. You can change the path and base name of the output files (`i4lmd.trc`).

- To periodically remove the oldest files, set up a **cron** job. Use the **crontab** command to add to the crontab file a line similar to this:

```
0,15,30,45 * * * * rm -f 'ls -lr /tmp/i4lmd.trc* | tail -n +4'
```

Note that the characters `'ls -lr.....+4'` are enclosed in single quotation marks.

This **cron** job deletes all but the three most recent trace files.

Managing Coexistence of NCS and DCE (HP-UN only)

If in your network environment you have applications, such as Directory Services and Security (DSS), that use the Distributed Computing Environment (DCE), and LUM Runtime configured in namespace binding, read this section.

The default operation of the startup process, as described in this section, will probably be appropriate if both DCE and the LUM Runtime subsystems are started at machine startup and DCE is started first. Check the `/etc/inittab` file to verify that this is how your machine is configured.

Both the NCS local location broker and the DCE daemon use the same TCP/IP port number, 135, which has been assigned to them. Since the NCS local location broker can be replaced by the DCE daemon, when you start services, LUM Runtime checks whether DCE is installed before starting the local location broker. If DCE is installed, LUM Runtime checks if the DCE daemon is running. If it is not running, LUM Runtime waits for 20 seconds (default value), then, if the DCE daemon does not start, the local location broker is started. The local location broker is started if DCE is not installed or if it does not start within the 20 seconds.

If the 20-second delay is either too much or too little for your environment, open the configuration file:

```
/var/lum/i4ls.ini
```

and change the entry:

```
DCEWAITTIME=
```

in the section:

```
[iFOR/LS NCS-Server]
```

If your machine is not configured to start the DCE daemon, and therefore you do not want any delay, change this entry to 0.

Tuning the Environment to Manage the Workload

When a high volume of client/server interactions reaches the server in a short timeframe (for example, 15 license requests per second), the server may not be able to keep up with the volume of workload. The external symptom is that the server seems to hang.

To optimize the license server daemon throughput and better balance its workload, use the environment variables:

PASSIVE_TIME
MAX_ACTIVITIES_THRESHOLD
MAX_ACTIVITIES

Tuning and Monitoring Your Environment

Experiment with the PASSIVE_TIME, MAX_ACTIVITIES, and MAX_ACTIVITIES_THRESHOLD environment variables, assigning different values to them, to find the best combination of values. Use the LOG_TRACE environment variable to enable tracing.

Table 10. Optimizing Environment Variables

| | Default value | Minimum value | Maximum value |
|--------------------------|---------------|---------------|---------------|
| PASSIVE_TIME | 300 sec | 1 sec | 300 sec |
| MAX_ACTIVITIES | 512 | 1 | 512 |
| MAX_ACTIVITIES_THRESHOLD | 100 | 1 | 100 |
| LOG_TRACE | Not set. | | |

If LOG_TRACE is set to YES, the i4lmd daemon writes the messages to stdout.

If you start the license server by issuing the command

```
i4cfg -start
```

you can set the values for the following parameters in the i4ls.ini file only, not by changing the values of their corresponding environment variables:

- PassiveTime
- MaxActivities
- MaxActivitiesThreshold
- TraceActivities

If the value of the **TraceActivities** parameter in the i4ls.ini file is "yes", trace output is redirected to the file i4lmd.out.

Because information is buffered before being written to the `i4lmd.out` file, some messages may appear either after a number of characters have been written or after services have been stopped.

The initial values of these `i4ls.ini` parameters are set to the default values of the corresponding environment variables, which are described under “iFOR/LS Parameters” in “Appendix A. LUM Runtime Configuration File” on page 235.

The value of **TraceActivities** must be specified in lowercase, while the value of the `LOG_TRACE` environment variable must be specified in uppercase.

Changing the Values of the Environment Variables

Each time you want to change the values of the environment variables, stop the `i4lmd` daemon, set the required values, and restart the `i4lmd` daemon. Changing environment variables while the `i4lmd` daemon is running has no effect.

Displaying the Trace Output on the Monitor

If you want to display the trace output on the monitor, do not start `i4lmd` as a subsystem, but instead follow this procedure:

1. Stop the `i4lmd` process
2. Set the required environment variables. For example:

```
>export MAX_ACTIVITIES=100
>export MAX_ACTIVITIES_THRESHOLD=50
>export PASSIVE_TIME=120
>export LOG_TRACE=YES
```

3. Start `i4lmd`:

```
>/opt/lum/ls/os/hpux/bin/i4lmd
```

Allowing for Log File Growth

The `standard_output_file` grows by about 100 bytes each time a message is logged. Its growth rate depends on the server’s workload. Make sure, therefore, that the file system on which the `standard_output_file` is placed is large enough. For example, if you leave `i4lmd` running for a week, the `standard_output_file` will grow to about 12 MB. When the daemon is stopped and restarted, the log file is overwritten.

Removing the Log Files

You can remove the `standard_error_file` and `standard_output_file` even if `i4lmd` is active, but no more messages will be logged. The only way to start logging the messages again is to stop and restart the `i4lmd` daemon.

The Effect on Performance

Tests have indicated that the effect on `i4lmd` daemon performance when writing log messages to a file or to the monitor does not exceed 5%.

Measuring Performance

To measure performance, run `i4cfg -start`, which automatically starts `i4lmd -p` when `TraceActivities` is set to `yes`.

Suggested Parameter Tuning

Tune the parameters as follows:

1. Set a small `PASSIVE_TIME` value, so that new requests (for example, license request or license release) overwrite old requests as soon as possible.

2. Set the following environment variables:

```
LOG_TRACE=YES
MAX_ACTIVITIES_THRESHOLD=100
```

3. Change `MAX_ACTIVITIES` to find the minimum value for which the message:

```
(get_activity) ... maximum of activities (value) is reached
```

is not issued while the server is managing licenses. This value is the maximum activities threshold, beyond which only **LicenseCheck** and **LicenseRelease** requests will be accepted.

4. Set `MAX_ACTIVITIES` to $x\%$ more than the limit found in step 3. An initial suggested value is 20%.
5. Set `MAX_ACTIVITIES_THRESHOLD=100-x` (where x was determined in step 4).

Note: For each license server, the minimum value for:

```
MAX_ACTIVITIES * MAX_ACTIVITIES_THRESHOLD / 100
```

is limited by the minimum number of simultaneous license requests you need the server to handle. For example, if a license-enabled application starts with X license requests, set:

```
MAX_ACTIVITIES * MAX_ACTIVITIES_THRESHOLD / 100
```

to a value greater than or equal to $n*X$ for each license server, where n is the number of applications that users might try to start at the same time.

Background Reference Information

Each LUM API call results in one or more client/server interactions between the calling application and one or more license server daemons (`i4lmd`). For each client/server interaction, the license server daemon allocates a control block in memory called an "activity block", which represents a virtual connection between the client and server.

An activity is kept in the activity pool of the license server daemon until the timeout specified in the `PASSIVE_TIME` parameter expires. A subsequent client/server interaction between the same client and server pair overrides a previous, unexpired activity.

When the current number of activities reaches the threshold value specified in `MAX_ACTIVITIES_THRESHOLD`, the following actions are performed:

- All new **LicenseCheck** or **LicenseRelease** requests are accepted, and the server writes the following message to stdout:

```
(get_activity) Can allocate slot even if maximum of
activities threshold (value) is reached
```

This message means the request is being processed, but the maximum activities threshold has been reached.

- All new requests other than **LicenseCheck** or **LicenseRelease** (that is **LicenseRequest** or requests for administrative actions) are immediately rejected, to prevent them hanging, until the end of the server timeouts. The server writes following message to stdout:

```
(get_activity) Can't allocate slot: maximum of activities
threshold (value) is reached
```

This message means the request was rejected, and the maximum activities threshold has been reached. When the number of activities reaches the maximum value specified in `MAX_ACTIVITIES`, the following actions are performed:

- If an old activity in **Passive** state can be overwritten, the request is accepted and the server writes the following message to stdout:

```
(get_activity) Can allocate slot even if maximum of
activities (value) is reached
```

This message means the request is being processed, but the maximum activities value has been reached.

- Otherwise, any kind of new request is immediately rejected and the server logs to stdout the following message:

```
(get_activity) Can't allocate slot: maximum of activities
(value) is reached
```

This message means the request was rejected, and the maximum activities value has been reached.

Tuning the timeout to detect a non responding server

You can increase or decrease the timeout using a scaling factor. You can modify the timeout for connections between client and server by changing the `TIMEOUT_FACTOR` environment variable on the client side of the connection.

The default value of `TIMEOUT_FACTOR` is 1000; values greater than 1000 increase the timeout interval, while values below 1000 decrease it.

Managing a Custom Configuration

This section offers advice about custom configurations and their licenses.

Before Requesting a License Upgrade

Before you request an upgrade to your current custom configuration license, double-check the serial number.

Deleting Products or Reducing Numbers

When you upgrade a custom configuration, you can add products and increase the number of seats; however, you can neither delete products nor reduce the number of seats.

Deleting Keys

The initial key is always required. Do not delete it from either the network license server or the nodelock file. You can, however, delete intermediate upgrade keys from a nodelock file. (These intermediate keys are deleted automatically on network license servers.)

Chapter 8. Troubleshooting

This chapter provides suggestions for improving , problem determination, and debugging when using products managed with LUM Runtime. This chapter assumes you have read the preceding chapters in this book.

Checking the Version of LUM Runtime

The suggestions in this chapter pertain only to LUM Runtime Version 4, not to earlier versions of LUM Runtime. If you are in doubt about which LUM Runtime version is installed on your system check the `var/lum/VERSIONS` file.

Checking License Details

Before you proceed, be sure you know the following details about the product that is not starting properly. Check the product enrollment certificate file for all these details.

- Product name (ProductName tag)
- Product version (ProductVersion tag)
- Vendor name (VendorName tag)
- Target type (TargetType tag)
- Whether the product implements customer-managed or vendor-managed use control (RegistrationLevel tag; 1=customer-managed, 3=vendor-managed)
- Whether the product is enabled for a custom configuration policy (SerialNumber tag)
- Whether the password is simple or compound (LicenseStyle tag=compound, or LicenseStyle tag=license type if the password is simple)
- License type (LicenseStyle tag if the password is simple; DerivedLicenseStyle tag if the password is compound)
- Whether the product is enabled for the hard stop/soft stop policy (SoftStop tag)
- When the license becomes valid and when it expires (LicenseStartDate and LicenseEndDate tags)
- Whether the password specifies a license type or a policy introduced in Version 4 (PasswordVersion tag: 8=new in Version 4.6, 7=new in Version 4.5.5, 6=new in Version 4.5.0 5=new in Version 4.0, 4=not new in Version 4)

This is an example of an enrollment certificate file:

```
i4blt -a
-v "'IBM Corporation' 8499f53d66dd.8d.01.51.32.4c.00.00.00 673mr5dfvm2w6"
-p "'DataWare' '2.1a' fgm63s65v4edb9y5fjujtbnce2dmhjhqgajuupibaaaaa "
-S 00102293AE8
```

```
[LicenseCertificate]
Checksum=ED729ADF511FE95361CF28FD87B943A1
TimeStamp=961160135
PasswordVersion=8
VendorName=IBM Corporation
VendorPassword=673mr5dfvm2w6
VendorID=8499f53d66dd.8d.01.51.32.4c.00.00.00
ProductName=DataWare
ProductID=2222
ProductVersion=2.1a
ProductPassword=fgm63s65v4edb9y5fjujtbnce2dmhjhqgajuupibaaaaa
ProductAnnotation=
LicenseStyle=concurrent
LicenseStartDate=10/01/2000
LicenseDuration=13606
LicenseEndDate=12/31/2037
LicenseCount=24
MultiUseRules=Node/Accessor
RegistrationLevel=3
TryAndBuy=No
SoftStop=No
Bundle=No
Registration=No
Uniqueness=No
Capturable=No
TargetType=ANY
TargetTypeName=Open Target
TargetID=ANY
ExtendedTargetType=
ExtendedTargetID=
SerialNumber=00102293AE8
Upgrade=No
InstallProgram=
CapacityType=Processors configured
DerivedLicenseStyle=
DerivedLicenseStartDate=
DerivedLicenseEndDate=
DerivedLicenseAggregateDuration=
```

The `i4blt` command at the top of the certificate file is the command that could be used to enroll the password. In the actual enrollment certificate file it would appear on one line; here it is shown on four lines because of space constraints.

Troubleshooting Licenses (All Types)

If a user tries to start a license-enabled product and it does not start, some of the first things to check are:

- First, check the product documentation.
- Check to be sure the license for the application you are running is installed, and, if not, install it. See “Enrolling the Product” on page 99 for information on how to install a license.
- Check that the license you have installed is the correct license for the version of the software you are trying to run.
- Check that the date and time on the machine are set correctly. Each license has a start date and an end date built in. If the date or time is set incorrectly on the machine where you are trying to run the product or on a license server, the license may not be recognized as active.
- Check that the time zone and daylight saving time settings are correct.
- Check that the start date of the enrolled license is not later than the current date, and that the license has not expired.

Troubleshooting Nodelocked Licenses

If a machine with a nodelocked license does not allow an end user to use a license-enabled product, check the product documentation to determine whether the product was enabled for LUM Runtime Version 4 or for an earlier version. Then check the suggestions under “Products Enabled for LUM Runtime Version 4” or “Products Enabled for Earlier Versions of LUM Runtime” on page 218.

Products Enabled for LUM Runtime Version 4

If the product uses non-runtime-based enabling:

- Check that the enrollment certificate file is in the path specified by the vendor of the product and that its permissions are set so that all users can read it.
- Check that the license is correctly installed in the nodelock file specified by the vendor and that its permissions are set so that all users can read it.

The default location of the nodelock file is:

```
/var/lum/nodelock
```

If the file is not in the default directory, check your product documentation or contact the product vendor.

If the product uses runtime-based enabling:

- Check that the nodelocked license server (i4llmd) is up and running (see “Starting Required Subsystems” on page 224).
- If the request waits for some time and then fails with error message:

Inter process communication failure: check log file i4ipc.out

it may be that the maximum wait time for an application to receive a response from the nodelocked license server via Interprocess Communications, as specified in the configuration file, is too short. Edit the configuration file and increase the value of the **ReadTimeout** parameter, for example to 20:

```
ReadTimeout=20
```

Products Enabled for Earlier Versions of LUM Runtime

- You may need to install the backward compatibility package and use the commands in that package to manage the product, especially if the product uses LUM Runtime Version 1.1 concurrent nodelocked licenses.
- Check that the enrollment certificate file is in the path specified by the vendor of the product (if enrollment was done automatically when the product was installed).
- Check that the license is correctly installed in the nodelock file (if you enrolled the product manually).
- Check that the name and path of the nodelock file are correct. The default name is nodelock and the path `/var/lum`, unless changed by the product vendor.
- Check that the permissions on the nodelock file are set so that all users can read the file.
- Check that the specific user has write and execute authority into the directory `/var/lum`, if the application does not run with root authority.
- If the product uses LUM Runtime Version 1.1 concurrent nodelocked licenses, check that the concurrent nodelock manager subsystem (i4conmgr) is up and running. Type the following command:

```
i4cfg -list
```

If it is not up and running, start it by typing the following command:

```
i4cfg -start
```

- If the product uses LUM Runtime Version 1.1 concurrent nodelocked licenses, check that the **ConcurrentNodelock** parameter in the `i4ls.ini` file is set to **Yes**:

```
ConcurrentNodelock=Yes
```
- Check that the vendor ID, product password, product version and annotation of the nodelocked license for your product appear in the Nodelocked Administration Tool or in the nodelock file exactly as they appear in the certificate file, or other source in which it was delivered to you. Pay special attention to the following:
 - Licenses are case-sensitive. All letters are lowercase.
 - Do not confuse the number 1 with the lowercase letter l.

- Do not confuse the number 0 with the uppercase letter O.
- Do not try to replace a single quotation mark (') with a double quotation mark (") in the license.
- Licenses cannot be split by a carriage return.

Troubleshooting Network Licenses (All Types)

If a user tries to start a product with a network license and the product does not start, try the following steps. These suggestions apply to concurrent, use-once, reservable/reserved, and per-seat licenses.

- Use the `i4tv` command from the client machine to verify the connection to the license server where you have the licenses installed.
 - If `i4tv` shows no active servers, check that the network license server is running on the server machines where you have the licenses installed.
 - If `i4tv` does display active servers, check that they include a machine where licenses for the product are installed. Use `i4blt -lp` to display the licenses installed on each server. You may need to reconfigure the client to connect to the proper servers.
 - In direct binding, verify that the client is configured to connect to the correct servers.
 - If you are using namespace binding, verify that the client is in the same cell as a server where the licenses are installed. (See “Quick Checklist” on page 227 .)
 - If you are using namespace binding, verify that the location brokers are running. See “Starting Required Subsystems” on page 224.
 - If you are using namespace binding, use the `lb_admin` tool to verify that the network license server where you have the licenses installed is registered to the global location brokers.
 - If you are using namespace binding with more than one global location broker, use the `drm_admin` tool to verify that the global location broker databases are synchronized.
- If you get the error message:
Time disparity is too large

check that the date and time on the servers and client are synchronized. If server and client are in different time zones, be sure that time zone and daylight saving time have been set correctly.

- If an enabled application requests more than one license to run, be sure the requested number of licenses is available on one server.
LUM Runtime does not combine licenses installed either on different servers or on the same server but with multiple enrollment actions, to satisfy the same request.

Similarly, if you received the licenses in a compound password, check that you have distributed, in one single distribution, on one server, at least the number of licenses requested. LUM Runtime does not combine licenses distributed either on different servers, or on the same server but with multiple distribution actions, to satisfy the same request.

For the same reason, if the product is enabled for soft stop, you may see soft stop licenses in use even if there are still some available licenses.

Troubleshooting Reservable and Reserved Licenses

Reservable licenses are enrolled on a network license server. When reserved they are moved to the central registry, and when granted they are moved to the nodelocked license server on the client machine. If a license has been reserved for a user but, when that user tries to use the product, it does not start:

- Check that the central registry license server is up and running (see “Starting Required Subsystems” on page 224).
- Check that the client machine can reach the central registry.
- Check that the nodelocked license server is up and running at the client (see “Starting Required Subsystems” on page 224).
- Check that the date and time set on the central registry are the same as that set on the network license client. It is possible that, according to the date and time set on the central registry, the license is not yet valid or has expired.
- Double-check the name of the user, group, or node for which licenses are reserved. Be careful with leading and trailing blanks. Note that the domain is part of the node specification.
-

Check the local host name specification of the client machine in the `/etc/hosts` file. Make sure it is in the form:

ip_address hostname_including_domain hostname_without_domain

For example:

```
69.100.67.70 lab67070.rome.tivoli.com lab67070
```

Troubleshooting Per-Server and Per-Seat Licenses

- If an application with per-server licenses fails to start, be sure the nodelocked license server is running on the machine where the application server runs (see “Starting Required Subsystems” on page 224).
- If an application with per-seat licenses fails to start:

- Be sure the central registry license server is up and running, and that the nodelocked license server is running on the machine where the application server runs (see “Starting Required Subsystems” on page 224).
- Be sure the per-seat license is enrolled and that per-seat licensing has been enabled (see “Scenario 8: Switching from Per-Server to Per-Seat Licenses” on page 111).
- Be sure the machine where the application server runs can reach the central registry.

Troubleshooting Licenses of Customer-Managed Use Products

If you are unable to enroll, update, or distribute licenses for a customer-managed product, a customer-managed use product fails to start, if soft stop does not work, or the high-water mark does not work:

- Be sure that the central registry license server is up and running, and that you have defined only one central registry license server in the direct binding servers list or NCS cell (see “Starting Required Subsystems” on page 224).
- Be sure the machine where you are working can reach the central registry.
- If you received the licenses in a compound password, make sure you have distributed the licenses. See “Distributing the Licenses” on page 103 for information on how to distribute licenses.
- If soft stop does not work, be sure the soft stop policy is enabled.

Troubleshooting Licenses of Vendor-Managed Use Products

If enrollment of a vendor-managed use product fails, check that the target ID and the target type in the license match the target ID and target type of the machine where the license is installed. To get the target ID of the machine, run the i4target tool (i4target - Target View Tool) on that machine.

If there is a mismatch, it is possible that:

- The vendor put the wrong target ID or target type into the license.
- You are trying to use the license on the wrong machine.
- The CPU planar of your license server machine has changed (see “Troubleshooting the Hardware” on page 229).

Troubleshooting License Databases

If the Basic License Tool fails to display enrolled licenses, you can try to remove invalid records from the license databases. To do so, you can use the `-clean` option of the license server.

To use this option you must first stop the license services with the command `i4cfg -stop` and do a backup of the files `/var/lum/licdb.dat` and `/var/lum/licdb.idx`. Then issue the

```
i4lmd -clean -v
```

command from the appropriate directory for your operating system:

- `/opt/lum/lum/os/hpux/bin`
- `/opt/lum/lum/os/svr4.sgi/bin`
- `/opt/lum/lum/os/solaris/bin`

When on the screen you see the string 'Listening ...' you can stop the command with `Ctrl+C` and then restart the license services using `i4cfg -start`.

Troubleshooting Custom Configuration Licenses

If, for a custom configuration, you are unable to install a network concurrent license or nodelocked license from the certificate file:

- Check the serial number.
- Check whether another license with the same serial number is already installed. For a concurrent license, use `i4blt`. For a nodelocked license, use the nodelock file.
 - If you are installing the initial key, no other key can already be installed.
 - If you are installing a replacement key, another key must already be installed.

Troubleshooting Performance Problems

Read this section for assistance with optimizing performance.

Basic License Tool Performance

In a network with many users, or when you are creating large reports, if performance is consistently slow when you use the Basic License Tool graphical user interface, consider switching to the command line interface.

Performance in a Direct Binding Environment

In a direct binding environment, careful configuration can help you to optimize performance. See the performance notes under "Planning Direct Binding" on page 43.

Performance in a Namespace Binding Environment

In a namespace binding environment when an NCS cell is running two or more global location brokers (GLBs), the database at each GLB node must be kept synchronized with the others, so that any GLB in the cell can satisfy a location request by a client. Occasionally, a license server is removed or is stopped without being shut down properly, with the result that invalid entries

are left in the GLB databases. The invalid entries can introduce significant delays when applications attempt to get licenses, or when running the Basic License Tool.

In such situations, you can clean up the database manually (“Manual Cleanup of GLB Databases”). To schedule automatic periodic cleanup of the databases, see “Periodic Cleanup of GLB Databases” on page 224.

Manual Cleanup of GLB Databases

To do an immediate cleanup by hand, you must remove the invalid entries by using local broker administration (`lb_admin`) and resynchronize the GLB databases by using GLBDs replicas administration (`drm_admin`). Both tools are interactive. For more information on how to use these tools, see “Chapter 6. LUM Runtime CLI” on page 129.

- To remove the invalid entries, follow these steps:
 1. Start the `lb_admin` tool at one of the GLB servers. Enter the command:
`lb_admin`
 2. Set the object to be worked on to be the local location broker:
`lb_admin: use local`
 3. Enter the clean subcommand to remove any invalid entries:
`lb_admin: clean`
 4. If prompted to remove entries, type `y`.
 5. Set the object to be worked on to be the global location broker:
`lb_admin: use global`
 6. Use the clean subcommand to remove any invalid entries:
`lb_admin: clean`
 7. If prompted to remove entries, type `y`.
 8. Exit `lb_admin` by using the **quit** subcommand:
`lb_admin: quit`
- To synchronize the GLB databases at all nodes, follow these steps:
 1. Start the GLBD Replicas Administration tool by entering the following command:
`drm_admin`
 2. Set the object to be worked on to **global location broker** on your machine (replace `HostName` with your actual machine host name):
`drm_admin: set -o glb -h ip:HostName`
 3. Synchronize all the GLBs in the cell:
`drm_admin: merge_all`
 4. If messages inform you that a host is unreachable, remove it from the global replica list:
`drm_admin: purgerep ip:HostName`

where HostName is the host name of this machine that is no longer acting as a server. If a host machine is purged from the replica list, it should no longer be running the global location broker process (glbd). If the global location broker needs to be run on this machine at a later date, configure it and join it to the cell.

5. Synchronize all the GLBs in the cell:

```
drm_admin: merge_all
```

6. To exit `drm_admin`, type the quit subcommand:

```
drm_admin: quit
```

Periodic Cleanup of GLB Databases

An automatic periodic cleanup of stale entries in the global location broker database is set up by default. If you want to change the settings of the periodic cleanup, edit the `i4ls.ini` configuration file and set the values of the following tags:

| | |
|------------------|---|
| SelfClean | The cleanup enabling flag. Its possible values are yes or no . The default value is no . When a network license server is heavily loaded, its performance could be severely impacted. In such situations, the <code>i4glbcd</code> subsystem may clean up the network license server entry in the global location broker. To prevent this, set the SelfClean parameter to no . |
| Frequency | The number of minutes between cleanups. The allowed values are 15 to 43,200. The default value is 180. |
| Timeout | The type of timeout. Its possible values are long or short . The default value is long . |

Troubleshooting Heavy Server Workloads

When a License Use Management server is stressed by a heavy workload, performance could deteriorate to the point that the server can no longer manage licenses. To avoid this situation, spread the workload over two or more servers.

Troubleshooting LUM Runtime Subsystems

This section covers problems that could arise if LUM Runtime and NCS subsystems are not started, or go down.

Starting Required Subsystems

When a license-enabled product fails to start, the problem may be that a required LUM Runtime or NCS subsystem is not running.

To get a list of the LUM Runtime and NCS subsystems that are running on a machine, use the `i4cfg -list` command. The names of the subsystems are

shown in Table 11. For an overview of which license servers are required for each license type, see Table 8. In a namespace binding environment, the local location broker is required on every network license server and the central registry license server. The global location broker is required on one license server, and the global location broker database cleaner is required on one license server.

Table 11. LUM Runtime and NCS Subsystems

| Subsystem | Name |
|---|---------|
| Nodelocked License Server | i4llmd |
| Network License Server | i4lmd |
| Central Registry License Server | i4gdb |
| Local Location Broker | llbd |
| Global Location Broker | glbd |
| Global Location Broker Database Cleaner | i4glbcd |

To start the subsystems, use the `i4cfg -start` command to start all subsystems configured on a machine.

If the subsystem fails to start when you issue the command, check the error messages in the `i4ls.log`, `i4lmd.log`, `l4llmd.log`, and `l4gdb.log` files in the `/var/lum` directory or the `glb_log` file in the `/etc/ncs` directory.

Automatic Startup of Subsystems

If the LUM Runtime and NCS subsystems do not start automatically when you start your machine, do the following:

1. Login with root authority.
2. Check if the file `/etc/i4ls.rc` exists. If not, create a text file called `/etc/i4ls.rc` containing the following string:

```
"i4cfg -start -nopause"
```
3. Check the permission on the file `/etc/i4ls.rc`. If it is different from **744**, change it by running the following command:

```
chmod 744 /etc/i4ls.rc
```
4. Check that the `i4ls` entry is in the `inittab` file, by running the following command:

```
lsitab -a
```

If not, add it by running the following command:

```
mkkitab i4ls:2:wait: "/etc/i4ls.rc > /dev/console 2>&1 #Start i4ls"
```

Restart and Recovery

- If a network license server, a nodelocked license server, or the central registry license server goes down, a record of users who currently have licenses is kept on disk. When the server is restarted, the record is reinstated and the licenses are still assigned to those users.

If you want a cold start (that is, if you want the server to restart as if it had granted no licenses before going down), use the `-c` parameter on the command used to restart the server (`i4lmd`, `i4llmd`, or `i4gdb`, all described in “Chapter 6. LUM Runtime CLI” on page 129). To change the default permanently to cold start, edit this parameter of the `i4ls.ini` file:

```
ColdStart=yes
```

and then restart services (`i4cfg -start`).

Cold start is not possible for reserved and per-seat licenses.

- If the client machine goes down or the network fails, the licenses it was using become *stale* (after a check period expires, if the application is enabled using concurrent access or reservable licenses, and the application is programmed to check in with the server after a specified check period). In this case, the licenses are available to be granted to other clients. Note that those licenses will still be displayed as in use until you perform the **Clean up stale licenses** function or until a license is newly requested and none is available, in which case the server does its own cleanup of stale licenses. The client behavior depends on the software product that is in use.

Troubleshooting Network Connections

If connections to license servers seem not to be working properly, use the `i4tv` (test verification) tool to verify that the license servers are up and running, or use the `i4blt -ln` command to get a list of active servers (network license servers and the central registry). For more information about these commands, see “Chapter 6. LUM Runtime CLI” on page 129.

Troubleshooting Namespace Binding

If the license server uses namespace binding, a failure in NCS can cause LUM Runtime to degrade in performance or fail altogether. It may be the case that a LUM Runtime problem is actually a problem in the state of NCS.

Under high-volume conditions, if all client machines are unable to contact a server that runs the global location broker, it is possible that the global location broker database cleaner was unable to contact the server and therefore deregistered it.

It is not necessary to have the database cleaner running on every global location broker server. It is enough to run the database cleaner on one global

location broker server in the cell. Choose one that has relatively low-volume traffic, and on the others, do the following to stop the database cleaner:

1. Stop services (`i4cfg -stop` command).
2. Edit the `i4ls.ini` file and set **SelfClean=no**.
3. Start services (`i4cfg -start` command).

Quick Checklist

1. Check that the `llbd` subsystem is running.
2. Check that the `glbd` subsystem is running.
3. Check that all the system clocks specify the same time. Use the **setclock** command to synchronize all systems for a short-term solution. It is recommended to implement external time providers and a distributed time service on the network.
4. Check that the `/etc/ncs/glb_obj.txt` file is the same on all machines in the NCS cell and that it has at least permission **-rw-r--r 644** (all users can read it).
5. Check that the `/etc/ncs/glb_site.txt` file (if any) points to one or more valid GLB hosts and that it has at least permission **-rw-r--r 644** (all users can read it).
6. Check that the GLB database files still exist. Check particularly for the existence of the files `/etc/ncs/glb.e` and `/etc/ncs/glb.p`
7. Check whether `llbd` was able to create its temporary file `/tmp/llbdbase.dat`.
8. Check that no more than one default cell has been defined at your location.
9. Use the `ncs_test.sh` script to test setup and runtime parameters.
10. If you choose to use the default cell, be sure no other user of NCS at your location has created or might create a default cell. Since the default cell always has the same UUID, results would be unpredictable.

LUM Runtime Clients Fail to Communicate with Servers

If a client is not communicating with a server properly, it is possible that the client machine is in a different NCS cell from the license server. To put the client in the same cell as the license server, reconfigure your client machine. Refer to “Planning Namespace Binding” on page 43.

It is also possible that the client machine is in a different communications subnetwork from the global location broker (GLB), and cannot contact the GLB. In this case, see “Reaching a Global Location Broker in a Different Subnetwork” on page 46.

LUM Runtime Servers Fail to Communicate with Global Location Broker
On LUM Runtime servers that run the global location broker, if the UUID stored in the file `/etc/ncs/glb_obj.txt` is changed, the `glbd` subsystem continues to use the old UUID even after the `glbd` subsystem is stopped and restarted. The communication between the `glbd` subsystem and the `i4lmd` or `i4gdb` subsystems will fail.

For an example, observe the following scenario on the server `rouse`:

```
Cell UUID:
    65d6f8f6471e.02.09.03.01.45.00.00.00
Content of the /etc/ncs/glb_obj.txt
    657cab79f66f.02.81.23.1c.51.00.00.
```

The `i4tv` command displays the following error message:

```
i4tv Version 4.6 -- LUM Test and Verification Tool
(c) Copyright 1995-2000, IBM Corporation, All Rights Reserved
US Government Users Restricted Rights - Use, duplication or disclosure
restricted by GSA ADP Schedule Contract with IBM Corp
(c) Copyright 1991-1998, Gradient Technologies Inc, All Rights Reserved
(c) Copyright 1991,1992,1993, Hewlett-Packard Company, All Rights Reserved
?(ls_tv) request_license: No servers available for this vendor
Active License Servers:
No servers found
Active Central Registry License Server:
No Central Registry License Server found
```

This failure will occur even if there is a `glbd` replica on another node in the cell. The UUID is a 16-byte alphanumeric string and is hard to remember; therefore it is recommended that a copy of the current valid UUID be kept in a secure place.

The `lb_find` command is still able to communicate with the `glbd` subsystem and displays a message similar to the following:

```
# lb_find
sent to broadcast address 9.3.1.255
waiting for replies received response from glbd subsystem at
ip:rouse.itsc.austin.ibm.com(9.3.1.69)
port 1765.....
replicable ip:rouse.itsc.austin.ibm.com alternate_2
65d6f8f6471e.02.09.03.01.45.00.00..00
```

If the change to the file `glb_obj.txt` was made without the administrator's awareness, the administrator probably will not compare the displayed UUID with the UUID currently stored in the `glb_obj.txt` file.

The problem can be solved with the following manual steps:

1. Stop all running NCS and LUM Runtime subsystems:
`i4cfg -stop`

2. Remove the files:

```
/etc/ncs/glb_log  
/etc/ncs/glb.e  
/etc/ncs/glb.p  
/tmp/llbbase.dat
```

3. To put the correct UUID into the `/etc/ncs/glb_obj.txt` file, reconfigure the license server to start the global location broker or to start a replica from any other existing global location broker in the cell (if any).
4. Restart the NCS and LUM Runtime subsystems:

```
i4cfg -start
```

Troubleshooting Direct Binding

If servers and clients are not communicating correctly in a direct binding environment (the `i4tv` command reports `No servers found`), check that exactly the same server names and direct binding port numbers were configured for each client, each network license server, and the central registry license server.

For example, if you have a server called *louise* running the network license server and the central registry license server, and clients connected to *louise*, the direct binding configuration for each machine, including *louise* itself, must contain the entries:

```
ip:louise[10999]  
ip:louise[1515]
```

The port numbers must match the values of the **ipPort** and **ipGDBPort** parameters in the configuration file of *louise*. *louise* and its clients all must have TCP/IP installed.

Troubleshooting the Hardware

Following is a brief checklist to help you make sure your hardware is OK.

1. If you get the error message:

```
Invalid target ID
```

check that the CPU planar of your LUM Runtime server has not changed.

Vendor-managed licenses on the LUM Runtime server may be tied to the CPU ID, which changes after a CPU planar swap.

2. Check that the cables are still where they should be.
3. Check whether you have reached the Ethernet length limitations on your LAN.
4. Check whether a security feature has been enabled on a router.

Some routers allow enabling of security features. It is possible to block certain TCP/IP ports. In namespace binding, the `llbd` program is runs on

port 135. The `glbd`, `i4lmd`, and `i4gdb` programs use runtime-assigned ports whose port numbers are greater than 1024. In direct binding, the ports are predefined in the configuration file.

5. Check whether any adapters or other network definitions have been changed. Because the NCS definition and database files are linked to network addresses, changes may lead to connection errors.

Collecting Error Log Data

In order to help IBM help you in problem determination, you should gather additional information to send to your IBM representative when you request support. LUM Runtime subsystems and tools can be run in traced mode as explained in the following sections.

Running Subsystems in Traced Mode

To run LUM Runtime subsystems in traced mode, follow these steps:

1. Stop all active subsystems by issuing the following command:

```
i4cfg -stop
```

2. Edit the file:

```
/var/lum/i4ls.ini
```

and set the following tags to **yes**:

```
DebugProc=yes  
DebugNCS=yes  
DebugToFile=yes  
TraceActivities=yes
```

3. Restart the subsystems by issuing the following command:

```
i4cfg -start
```

4. Stop the subsystems again using the following command:

```
i4cfg -stop
```

In the directories `/var/lum` and `/etc/ncs` a file named `subsystem_name.out` is generated for each subsystem you had started. In the directory `/var/lum` the files `i4lmd.err`, `i4gdb.err`, and `i4llmd.err` are generated.

Depending on the activity performed by the subsystems, these files could become extremely large. Make sure you have enough space in the `/var` file system.

Running Enabled Applications in Traced Mode

To run enabled applications in traced mode, set the environmental variables `I4LIB_VERB` and `IFOR_LT_DEBUG` as follows:

```
export I4LIB_VERB=Yes  
export IFOR_LT_DEBUG=Yes
```

Trace messages will be displayed in the same window where you have set the variable and from which you run the application.

Running Tools in Traced Mode

To run tools in traced mode use the flag **-B** as first option when you invoke `i4blt` and `i4cfg`. The trace records will be printed into the window where you run the tools.

Collecting Other Data

Other information concerning LUM Runtime servers is automatically collected by the global location broker (`glbd`) and by the license server subsystems (`i4llmd`, `i4lmd`, and `i4gdb`). This data is stored in the following files:

```
/etc/ncs/glb_log  
/var/lum/i4ls.log
```

Most of the messages you find in these files and the related return codes are not documented.

Other files you need to provide are:

- `/var/lum/i4ls.ini` (the configuration file)
- `/var/lum/user_file` (the user file)
- `/etc/ncs/glb_obj.txt` (must be always present when the machine is part of a non-default NCS cell. Its content must be the uuid of the cell this machine belongs to, the same as the `NCSCell` keyword in the `i4ls.ini` file.)
- `/etc/ncs/glb_site.txt` (if any; a list of servers running the global location broker that this server can reach.)
- LUM Runtime Databases
 - License Databases

```
/var/lum/licdb.dat  
/var/lum/licdb.idx  
/var/lum/llmdb.dat  
/var/lum/llmdb.idx  
/var/lum/crpdb.dat  
/var/lum/crpdb.idx  
/var/lum/usrdb.dat  
/var/lum/usrdb.idx
```
 - Log Databases

```
/var/lum/logdbnn_.dat  
/var/lum/logdbnn_.idx  
/var/lum/llmlgnn_.dat  
/var/lum/llmlgnn_.idx  
/var/lum/crlognn_.dat  
/var/lum/crlognn_.idx
```

Troubleshooting LUM Java Client Support

If you are having trouble with LUM Java Client Support:

- Check the WebSphere `servlet_log` and `error_log` files in:
`/usr/lpp/IBMWebAS/logs/servlet/servletservice`
- To enable native DLL plug-in logging in the
`/usr/lpp/IBMWebAS/logs/native.log` file, edit the file:
`/usr/lpp/IBMWebAS/properties/server/servlet/servletservice/jvm.properties`

and change `ncf.native.logison` from `false` to `true`.

- To enable Java virtual machine logging in the
`/usr/lpp/IBMWebAS/logs/ncf.log` file, change both
`ncf.jvm.stdoutlog.enabled` and `ncf.jvm.stdoutlog.file` from `false` to `true`.

Web Server Fails

If the Web server fails because it lacks a permission:

- **For Lotus Domino Go**
 - In the file `/etc/httpd.conf`, set:
`UserID=root`
`GroupID=system`
 - In the file `opt/IBMWebAS/properties/server/servlet/server.properties` set:
`server.user=root`
- **For Netscape FastTrack and Netscape Enterprise**

During installation of these products set:

`UserID=root`
`GroupID=system`
- **Alternatively, for either Lotus Domino Go or for Netscape FastTrack or Netscape Enterprise:**
 1. Create a new user name and a new group name with the required permission.
 2. Set the `UserID` variable to the value of the new user name and the `GroupID` variable to the value of the new group name.

Java Program Cannot Read the User Name

If a Java applet, loaded on Netscape Communicator, cannot read the user name, install the latest version of Netscape Communicator.

Incomplete View of an Applet

If, when you run `LicenseTest` as an applet, you cannot see the whole applet window in your Web browser, change the window's width or height, or both. These are specified in the `LicenseTest.htm` file.

Installing More than One Web Server on the Same Machine

If you install more than one Web server on a machine, the first Web server creates log files in the directory `../websphere_base_directory/logs/servlet`. Depending on the access permissions set for those files, any Web server you may subsequently try to start may be unable to access those log files. In this case, the new Web server cannot start.

To start the second or subsequent Web server in such circumstances:

1. Delete the log files before you start the second Web server.
2. If the second Web server still will not start:
 - a. Uninstall Java Client Support.
 - b. Uninstall IBM WebSphere.
 - c. Delete the IBM WebSphere directory.
 - d. Reinstall IBM WebSphere 1.1, 2.0 or 2.0.2.
 - e. Reinstall Java Client Support.

Installing Java Client Support after Installing a Web Server

If a Web server, its plug-in, and IBM WebSphere 1.1, 2.0 or 2.0.2 are already installed before you install Java Client Support, and if the Web server cannot find the Java Development Kit or License Use Management Java Client Support libraries:

1. Try this first:
 - a. Stop all Web servers.
 - b. Uninstall the plug-in.
 - c. Install Java Client Support.
 - d. Reinstall the plug-in.
 - e. Restart Web servers.
2. If, after you have tried step 1, the Web server still cannot find the libraries:
 - a. Before you start the Web server, add the following lines to the `.profile` file:

```
export LIBPATH=$LIBPATH:/opt/lum/1s/os/hpux/bin/dll
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/lum/1s/os/hpux/bin/dll
```
 - b. Restart the machine.
3. If the Web server still cannot find the libraries, add the following line to the `.profile` file:

```
export PATH=newpaths:$PATH
```

where *newpaths* are the paths assigned, after Java Client Support has been installed, to the variable `ncf.jvm.libpath` in the file:

```
opt/IBMWebAS/properties/server/servlet/servletservice/jvm.properties
```

Appendix A. LUM Runtime Configuration File

This appendix describes the LUM Runtime `i4ls.ini` configuration file. The file is located in the `/var/lum/` directory. You should normally use the configuration tool to configure LUM Runtime. In case you have no access to the configuration tool or you want to change just a few parameters of your configuration, the information in this appendix will enable you to modify the parameters by editing the file. Also, some parameters (designated in this appendix) can be changed only by editing the configuration file.

If a parameter has a default value, it is shown with the parameter name (for example, **BackupMode=daily**).

[iFOR/LS Machine-Configuration]

ConfigureAs=client

Obsolete; supported only for backward compatibility with earlier versions of LUM Runtime. Specifies whether the machine is a server or a client only. Possible values are **server** and **client**.

Transport=tcPIP

Specifies the transport protocol used in LUM Runtime client-server communications. The only possible value in AIX is **tcPIP**.

MachineName=

Not used on the AIX platform.

NCSCell=333b91c50000.0d.00.00.87.84.00.00.00

The NCS uuid of the cell this machine belongs to. If you are configuring the machine as a network license client only, just specify the NCS cell you want to join. If you are configuring a network license server as a GLB replica, specify the NCS cell you want your server to join. The keyword **CreateFrom** must be set to the `ip:servername` of any of the replicable GLB replicas of the cell. If you are configuring a network license server as a first GLB, specify the NCS cell uuid of the cell you are creating (the keyword **Create** must be set to **new**). The uuid specified here must be the same as that specified in the `/etc/ncs/glb_obj.txt` file, if the file exists. In the case of the default cell, there must not be a `/etc/ncs/glb_obj.txt` file.

UserName= Not used on HP-UX, IRIX and Solaris platforms.

GroupName= Not used on HP-UX, IRIX and Solaris platforms.

DebugProc=no

Specifies whether or not the LUM Runtime subsystems must be started in debug traced mode. Possible values are **yes** and **no**. This parameter can be changed only by editing the configuration file.

DebugNCS=no

Specifies whether or not the LUM Runtime subsystems must be started in debug traced mode and additional communication-related information collected, and whether or not the NCS subsystems must be started in debug traced mode. Possible values are **yes** and **no**. This parameter can be changed only by editing the configuration file.

DebugToFile=no

Not used on HP-UX, IRIX and Solaris platforms.

ConcurrentNodelock=No

Obsolete; supported only for backward compatibility with earlier versions of LUM Runtime. Specifies whether or not the LUM Runtime concurrent nodelock subsystem has to be started. Possible values are **Yes** and **No**. This keyword is set by the system to **Yes** when the first concurrent nodelocked password is installed and is set to **No** when the last concurrent nodelocked password is deleted from the nodelock file.

LogLevel=1

Obsolete; supported only for backward compatibility with earlier versions of LUM Runtime. Level of logging of the concurrent nodelock subsystem:

- 0** No logging
- 1** Logging of license add, delete, change events
- 2** Logging of license not granted events
- 3** Logging of all level 1 and 2 events plus initializations, requests and releases of licenses. Error conditions are logged too.

LogMsgsMaxNum=1000

Obsolete; supported only for backward compatibility with earlier versions of LUM Runtime. Maximum number of messages logged by the concurrent nodelock subsystem

LogFile=/var/lum/i4conmgr.log

Obsolete; supported only for backward compatibility with earlier versions of LUM Runtime. Log file path and name of the concurrent nodelock subsystem log.

CommunVersion=V4R6

Version of LUM Runtime communication subcomponent.

RuntimeVersion=V4R6

Version of LUM Runtime runtime subcomponent.

NCSSupportVersion=V4R6

Version of LUM Runtime namespace binding support subcomponent.

Communication=yes

The machine is configured to communicate in a network.

NamespaceBindingSupport=yes

Namespace binding support is configured on the machine.

AdvancedConfiguration=no

The user selected **Advanced Configuration** when configuring the machine.

[iFOR/LS GLBD-Configuration]**Create=new**

Whether or not the started GLB is the first one in the cell or one of the possible subsequent GLBs replicas. Possible values are **new** and **replicate**.

CreateFrom=

If you are configuring as a GLB replica, the tcpip ip:servername of any of the replicable GLBs of the cell. Also specify the associated NCS cell UUID in the NCSCell keyword.

Family=ip

Transport protocol used between GLB replicas of the same cell. The only possible value in AIX is **ip**.

DefaultCell=yes

Whether or not you are starting the new GLB in a default NCS cell. If you do, make sure you also specified the default UUID in the NCSCell keyword and the new value in the Create keyword, and do not create the /etc/ncs/glb_obj.txt file.

SelfClean=no

Whether of not you want an automatic periodic cleaning of the location broker's database. This parameter can be changed only by editing the configuration file.

Frequency=180

The frequency in minutes of the automatic periodic cleaning of the location broker's database. This parameter can be changed only by editing the configuration file.

Timeout=long

The timeout used to make sure the license server is alive in the automatic periodic cleaning of the location broker's

database. Possible values are **long** and **short**. This parameter can be changed only by editing the configuration file.

[iFOR/LS LMD]

BackupMode=daily

The mode of the LUM Runtime database backup procedure. Possible values are:

- | | |
|----------------|--|
| daily | The backup is started at the time specified in the BackupParm parameter. |
| weekly | The backup is started at approximately midnight (00:00) of the day specified in the BackupParm parameter. |
| changes | The backup is made each time the database is changed, such as when an object is added or deleted. |
| none | No backup takes place. |

This parameter value must be the same on all servers within your licensing environment. This parameter can be changed only by editing the configuration file.

BackupParm=0

If **BackupMode** is **daily**, the hour when the backup occurs (midnight=0). If **BackupMode** is **weekly**, the day of the week when the backup occurs (Sunday=0).

This parameter value must be the same on all servers within your licensing environment. This parameter can be changed only by editing the configuration file.

BackupPath=/tmp

The path where the server files and databases are copied during the automatic backup procedure. This parameter can be changed only by editing the configuration file.

NumberOfLogFile=2

The number of log files LUM Runtime writes. For example, if logdb is the log file name, and **NumberOfLogFile** is set to **2**, LUM Runtime changes the name to logdb00_. When it is full, it starts logging events on logdb01_. When this is full, it restarts writing on logdb00_. This parameter can be changed only by editing the configuration file.

MaxLogFileSize=10

The maximum length of the log files, in tens of kilobytes.

After that size is reached, LUM Runtime starts writing on another log file. This parameter can be changed only by editing the configuration file.

ValidityPeriod=15

Internal period, in days, to validate per-seat licenses stored on the nodelocked license server against the central registry. This parameter can be changed only by editing the configuration file.

HALFrequency=30

The length, in seconds, of the interval at which servers in a cluster synchronize data among themselves. You can increase this number if you have performance problems, but doing so delays synchronization between members of a cluster.

[iFOR/LS NCS-Server]

llbd=no

Whether or not you want to start the local location broker subsystem on this server and have the LUM Runtime subsystem use it. Possible values are **yes** and **no**. The **llbd** and **glbd** parameters must always be set to the same value.

glbd=no

Whether or not you want the network and central registry license servers running on this machine to register themselves into the global location broker database. Possible values are **yes** and **no**. By specifying **no**, you disable namespace binding support on this server; it will support only clients locating the server in direct binding mode. The **llbd** and **glbd** parameters must always be set to the same value.

ipPort=1515

The TCP/IP port number the license server listens to when supporting its clients.

ipGDBPort=10999

The TCP/IP port number the central registry license server listens to when supporting its clients.

ipNDLPort=12999

The TCP/IP port number the nodelocked license server listens to for remote administration.

ipHALPort=11999

The TCP/IP port number used for internal communication between by servers in a cluster. Change this number only if 11999 is already used for some other purpose. If you change this value, change it on cluster members.

netbiosPort=115

Not used on HP-UX, IRIX and Solaris platforms.

netbiosGDBPort=109

Not used on HP-UX, IRIX and Solaris platforms.

netbiosNDLPort=12999

Not used on HP-UX, IRIX and Solaris platforms.

ipxPort=1515 Not used on HP-UX, IRIX and Solaris platforms.

ipxGDBPort=10999

Not used on HP-UX, IRIX and Solaris platforms.

ipxNDLPort=12999

Not used on HP-UX, IRIX and Solaris platforms.

RunGLBD=no

Whether the global location broker subsystem is to be started on this machine. Possible values are **yes** and **no**.

RunGDB=no Whether the central registry license server is to be started on this machine. Possible values are **yes** and **no**.

DisableRemoteAdmin=no

Whether or not the administration of this network license server is to be disabled when using the administration tool started on a different server. Possible values are **yes** and **no**.

DisableRemoteNDLAdmin=yes

Whether or not the administration of this nodelocked license server is to be disabled when using the administration tool started on a different server. Possible values are **yes** and **no**.

LogAllEvents=no

Whether or not all the events are to be logged on the license servers. Possible values are **yes** and **no**.

LogFile=/var/lum/logdb

Obsolete; supported only for backward compatibility with earlier versions of LUM Runtime. Log file path and name of the license server subsystem log.

LogPath=/var/lum/

Log file path of the license server subsystem log.

ColdStart=no Whether the license servers restart from scratch, with no record of licenses in use granted before stopping (**yes**), or not (**no**). Cold start is not possible for reserved and per-seat licenses. This parameter can be changed only by editing the configuration file.

DCEDWAITTIME=20

The maximum number of seconds to wait for the dce daemon to start in place of the llbd subsystem. During `i4cfg -start`, if

the dce is installed but not running after this number of seconds, the llbd subsystem is started. This parameter can be changed only by editing the configuration file.

RunNDL=yes Whether the nodelocked license server is to be started on this machine. Possible values are **yes** and **no**.

RunLMD=no Whether the network license server is to be started on this machine. Possible values are **yes** and **no**.

UseHostTable=no
Change this parameter to **yes** on a machine with multiple network interfaces if you want to control on which network interface (such as token ring or Ethernet) the network license server and the central registry license server will start. The first entry in the `/etc/hosts` file on the local machine will be used.

PassiveTime=300
Specifies the length of time in seconds that an activity is to be kept in the server activity pool after the activity has been completed. You can change this parameter only by editing the configuration file.

MaxActivities=512
Specifies the maximum number of activities that any server can manage. The actual maximum for any particular server depends on the server's capabilities. The actual maximum could therefore be lower. You can change this parameter only by editing the configuration file.

MaxActivitiesThreshold=100
Specifies the percentage of activities beyond which license requests are rejected. Licenses can still be checked and released beyond this threshold. You can change this parameter only by editing the configuration file.

TraceActivities=no
Specifies whether the server is to write activity-related messages to stdout. You can change this parameter only by editing the configuration file.

[iFOR/LS Server Logging]

LogGrant=no Log when a license was granted or released. Possible values are **yes** and **no**.

LogCheckin=no
Log when a licensed product has sent a check-in call to the server to notify it that the product is running. Possible values are **yes** and **no**.

- LogWait=no** Log when a license request cannot be satisfied because no licenses are available, and the user is added to a queue. Possible values are **yes** and **no**.
- LogVendor=yes**
Log when a new vendor was added or deleted Possible values are **yes** and **no**.
- LogProduct=yes**
Log when a product of a new vendor was registered or deleted. Possible values are **yes** and **no**.
- LogTimeout=no**
Log when the server has canceled the request for a license because the check period has expired. Possible values are **yes** and **no**.
- LogErrors=yes** Log server errors that do not stop the server, but return a status code and a message. Possible values are **yes** and **no**.
- LogVendorMsg=yes**
Log error messages the vendor inserted in the product. Possible values are **yes** and **no**.
- LogSvrStartStop=no**
Log the successful start or stop of the license server. Possible values are **yes** and **no**.
- [iFOR/LS NetBIOS-Configuration]
- LanAdaptor=** Not used on HP-UX, IRIX and Solaris platforms.
- NCBS=** Not used on HP-UX, IRIX and Solaris platforms.
- HasOS2Clients=**
Not used on HP-UX, IRIX and Solaris platforms.
- [iFOR/LS Client]
- Threshold_Level=80**
The default value of the threshold level used in the Basic License Tool GUI. Used for vendor-managed use products, and for customer-managed use products when no specific threshold value is specified.
- Threshold_Automatic=0**
Whether or not the threshold is automatically checked periodically. Possible values are **0** (no) or **1** (yes).
- Threshold_Frequency=60**
Not used on HP-UX, IRIX and Solaris platforms.

Refresh_Automatic=0

Whether or not the Basic License Tool is to do a periodic automatic refresh. Possible values are **0** (no) or **1** (yes).

Refresh_Frequency=60

The frequency, in minutes, of the automatic refresh.

ReadTimeout=4

The maximum wait time, in seconds, for an application to receive a response from the nodelocked license server via Interprocess Communications. The minimum is 1 and the maximum is 60. You may need to increase this value if performance on your machine is poor. This parameter can be changed only by editing the configuration file.

CleanupAutomatic=No

Whether or not the Basic License Tool automatically cleans stale licenses. Possible values are **yes** and **no**. You can change this parameter only by editing the configuration file.

[iFOR/LS NCS-Client]

UseDirectBindingOnly=no

Whether or not the client licensed applications running on this machine are to locate the license servers using direct binding only. The administration tool is considered a client application.

FilterNDL=no Whether or not nodelocked licenses are to be excluded from the set of licenses administered by the Basic License Tool.

FilterNet=no Whether or not network licenses are to be excluded from the set of licenses administered by the Basic License Tool.

NumDirectBindServers=3

The number of direct binding servers the client applications are configured to point to directly, using just name and port number. Specify the DirectBindServer keyword for each server the client points to. If you need to contact the central registry license server, there must also be an entry for it. The default ip port numbers are 1515 for the license server and 10999 for the administration server. Make sure you insert the correct ones if you are not using the defaults.

DirectBindServer1=ip:thelma.rnsl.ibm.com[1515]

The format is *ip:servername[port]*.

DirectBindServer2=ip:louise.rnsl.ibm.com[1515]

The format is *ip:servername[port]*.

DirectBindServer3=ip:louise.rnsl.ibm.com[10999]

The format is *ip:servername[port]*.

OS2NumServers=0

Not used on HP-UX, IRIX and Solaris platforms.

OS2NetbiosServer1=no

Not used on HP-UX, IRIX and Solaris platforms.

GDBServer=ip:louise.rnsl.ibm.com[10999]

The format is *ip:servername[port]*.

NumDirectBindNDLServers=2

The number of nodelocked license servers whose licenses can be administered remotely from this machine.

DirectBindNDLServer1=ip:lab68082.rome.lab.tivolicom[12999]

The format is *ip:servername[port]*.

DirectBindNDLServer2=ip:lab68084.rome.lab.tivolicom[12999]

The format is *ip:servername[port]*.

Appendix B. Using the Nodelock File

This appendix explains how to prepare the nodelock file manually and how to use it. You might need to modify the nodelock file for configurations without a nodelocked license server or for backward compatibility.

To prepare and use the nodelock file:

1. Log in as root, or use the **su** command.
2. Create or edit the file `/var/lum/nodelock`

The format of the nodelock file is:

```
# comment  
vendorID productPassword Annotation version [serialNumber]
```

where: The first line starts with a comment character, #, and is included for information only. It indicates the product name and license expiry date.

The second line is the product license. Its fields and their content are as follows:

vendorID The vendor ID.

productPassword The long alphanumeric password that enables the nodelock license.

Annotation The annotation field, which is used by the application developer to provide any unique enablement options of the license. This optional field, which is set to null ("") in the example, can contain up to 255 alphanumeric characters.

version The version number of the product.

serialNumber The serial number of a custom configuration license. This field can contain up to 31 alphanumeric characters.

Initially, this file could have entries similar to the following lines:

```
# nodelock example for the licensed product  
expires 12/25/2003  
543b0f87c093.02.81.87.92.34.00.00.00  
gganccupqb5dauxabdw "" "2.0" "85AB2215691"
```

3. To help yourself and others identify the license in the future, because there may be other nodelocked software on the same computer, you should enter a comment above the license. That comment should include the full product name, version, and any expiration date.

4. Double-check the information to ensure that it is the same as that supplied by the vendor.
5. Test the product.

Appendix C. Operating Systems and License Use Management Support

This appendix identifies the operating systems supported by License Use Management Versions 4.5.2 and 4.5.5 (Table 13 on page 249), and Versions 4.5.8, 4.5.9, and 4.6.0 (Table 13 on page 249). It also indicates which have been tested and the level of support provided.

Table 12. Operating Systems and LUM Versions 4.5.2 and 4.5.5 Support

| Operating System | LUM Version 4.5.2 | | LUM Version 4.5.5 | |
|-------------------|---------------------------------|---------|---------------------------------|---------|
| | Application Developer's Toolkit | Runtime | Application Developer's Toolkit | Runtime |
| AIX 4.3.x | Static link only | ✓ | Static link only | ✓ |
| AIX 4.1 and 4.2 | ✓ | ✓ | ✓ | ✓ |
| HP-UX 10.20 | ✓ | ✓ | ✓ | ✓ |
| HP-UX 11.0 | | | | ✓ |
| OS/2 | Shared link only | ✓ | Shared link only | ✓ |
| Solaris 2.6 | ✓ | ✓ | ✓ | ✓ |
| Solaris 2.7 | ✓ | ✓ | ✓ | ✓ |
| Solaris 2.8 | | | | |
| IRIX 6.3 and 6.4 | Static link only | ✓ | ✓ | ✓ |
| IRIX 6.5 | Static link only | ✓ | ✓ | ✓ |
| Windows 95 and 98 | | ✓ | | ✓ |
| Windows NT 4.0 | Shared link only | ✓ | ✓ | ✓ |
| Windows 2000 | | | | |

Table 13. Operating Systems and LUM Versions 4.5.8, 4.5.9, and 4.6.0 Support

| Operating System | LUM Versions 4.5.8 and 4.5.9 | | LUM Version 4.6.0 | | | |
|-------------------|---------------------------------|---------|---------------------------------|---------|--|----------|
| | Application Developer's Toolkit | Runtime | Application Developer's Toolkit | Runtime | Application Developer's Toolkit 64-Bit | Java GUI |
| AIX 4.3.x | ✓ | ✓ | ✓ | ✓ | Static link only | |
| AIX 4.1 and 4.2 | ✓ | ✓ | ✓ | ✓ | | |
| HP-UX 10.20 | ✓ | ✓ | ✓ | ✓ | | |
| HP-UX 11.0 | | ✓ | Static link only | ✓ | | ✓ |
| OS/2 | Shared link only | ✓ | | | | |
| Solaris 2.6 | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Solaris 2.7 | ✓ | ✓ | ✓ | ✓ | Static link only | ✓ |
| Solaris 2.8 | | | | ✓ | | ✓ |
| IRIX 6.3 and 6.4 | ✓ | ✓ | ✓ | ✓ | | |
| IRIX 6.5 | ✓ | ✓ | ✓ | ✓ | Static link only | ✓ |
| Windows 95 and 98 | | ✓ | | ✓ | | |
| Windows NT 4.0 | ✓ | ✓ | ✓ | ✓ | | |
| Windows 2000 | ✓ | ✓ | ✓ | ✓ | | |
| AIX 5.0 for IA-64 | | | | ✓ | | ✓ |

Glossary

A

accessor ID. In License Use Management, a generic string identifying the requestor of a license. Vendors can define their own multiuse rule based on the accessor ID.

ACID. See application client identifier.

application client identifier. In License Use Management, the unique identifier of the application client.

When a license is granted to a client, the ACID of the client is recorded in the central registry, which is checked at any new license request. This avoids granting a license twice to the same application client.

administrator. In License Use Management, the person who is responsible for setting up the LUM Runtime environment. The tasks of the administrator include:

- Installing and configuring nodelocked license servers, network license servers, network license clients, and the central registry.
- Installing the software product licenses on the servers
- Monitoring the software products use through the Basic License Tool.
- Configuring the network.

application client. A computer that runs a software product and plays the role of the client in the traditional client-server model.

application server. A computer where an enabled product is installed, which provides shared access to the product to workstations (the application clients) over the network. In License Use Management, the application server is the LUM Runtime client. It requests the licenses for all its application clients.

annotation. See license annotation.

B

Basic License Tool. In License Use Management, the administration tool included in LUM Runtime, which enables the administrator to add or delete licenses from the server database, display the licenses installed, distribute the licenses among the servers available on the network, and generate reports on license usage and server events.

binding. In License Use Management, one of two methods by which a network license client can locate a server in order to request a license. See direct binding and namespace binding.

bundle. In License Use Management, a set of product licenses with a single serial number called the bundle ID. The set of licenses can include any combination of license types. All products that are part of a bundle are enrolled together when the bundle is enrolled. A product that is part of a bundle cannot be removed separately, it can be removed only by removing the bundle.

C

capacity type. In License Use Management, a number that specifies the type of unit that a license applies to. The type of unit can be: users, processors, or another unit chosen by the vendor. If no capacity type is specified by the vendor, the license applies to users.

cell. See NCS cell.

central registry. In License Use Management, a database that contains information about:

- The enrollment and distribution of customer-managed use control products.
- Which application clients already have a per-seat license.
- Reservation of reservable licenses.

check period. In License Use Management, a time period during which a product holding a concurrent or unreserved reservable license must check in with the network license server. If the product does not check in during this period, the network license server assumes that the product is not running, and may release a granted license to another user.

cluster. In License Use Management, a group of network license servers that jointly serve vendor-managed concurrent licenses that are tied to the cluster rather than to an individual server. While some servers in the cluster are serving licenses, one or more servers remain in reserve, ready to take over should an active server fail.

compound password. In License Use Management, a password from which it is possible to extract multiple simple passwords, each representing one or more licenses. Enabled applications cannot use the compound password directly.

concurrent license. In License Use Management, a type of license, administered by the network license server, that can be used by different users from any node that is connected to a network license server. Concurrent licenses enable as many users to use a particular software product concurrently as there are licenses.

concurrent nodelocked license. In License Use Management, a nodelocked license that allows a limited number of concurrent uses of the licensed product on the node where the license is installed. Concurrent nodelocked licenses enable as many concurrent uses of a particular software product as there are licenses.

custom configuration. A selected combination of products, tailored by a vendor to the needs of one or more users. Each custom configuration is identified by unique serial number, which is incorporated into the custom configuration license.

custom configuration license. A special case of either a concurrent network license or a simple

nodelocked license that contains a unique serial number identifying a custom configuration. See also license.

customer-managed use control. In License Use Management, a level of password use control in which the customer manages compliance with the terms of the software product acquisition. It is the customer's responsibility to set the upper limit on the number of licenses that can be extracted and distributed, based on the terms of the software product acquisition.

D

default NCS cell. A cell that is identified by the default GLB object UUID. Machines in the default cell do not have the `glb_obj.txt` file.

direct binding. In License Use Management, a type of binding between network license servers and clients in which client applications locate license servers by means of a local text file that contains network addresses of the license servers.

direct binding servers list. In License Use Management, a set of network license servers and a central registry license server that collectively serve a set of network license clients.

dynamic nodelocking. In License Use Management, a way of using licensing APIs in which a compound password installed on a network license server carries simple nodelocked licenses. Upon first invocation of the product at a client, a simple nodelocked license is extracted from the compound password and installed on the client machine.

E

end user. In License Use Management, a user of license-enabled software products. The tasks of the end users may include:

- Installing LUM Runtime with the help of the administrator.
- Configuring LUM Runtime as a network license client.

enrollment certificate. In License Use Management, a mechanism for the distribution of licenses to end users. It is usually in the form of an electronic file, and contains all the information that is related to the licenses acquired for a license-enabled product.

G

gdb server. See central registry.

GLB. See global location broker.

glbd replica. In License Use Management, a copy, on a newly configured network license server, of a global location broker database that already exists on another server.

glb_obj.txt. A file that specifies the object UUID of the global location broker. The glb_obj.txt file makes it possible to override the default value by specifying a different GLB object UUID for a particular machine. The glb_obj.txt file is used only in special configurations that require several disjoint GLB databases (each of which is possibly replicated). In most networks and internets, there is only one GLB database (possibly replicated), and machines do not need to have a glb_obj.txt file. If a machine has a glb_obj.txt file, the UUID in the file identifies the GLB object to which that machine directs lookups and updates.

global location broker. Part of the Network Computing System (NCS) that enables clients to locate servers in a network or internet. It is a process that manages a database that stores the locations (network addresses and port numbers) where server processes are running. The global location broker process maintains this database and provides access to it.

H

hard stop. In License Use Management, a policy according to which, if the end user starts the product and there are no licenses available, the product does not start.

high-availability licensing. In License Use Management, an option that makes it possible

for a cluster of network license servers to jointly serve concurrent licenses, with one or more servers in reserve in case a server goes down. The software vendor must create passwords to be enrolled on the cluster rather than on an individual server.

high-water mark. In License Use Management, the maximum number of soft stop licenses that have been granted for a given product, over the number of licenses enrolled for that product. It is updated when the soft stop policy is set. In hard stop policy no updating of the high-water mark occurs, since it is assumed that the product stops its execution if no licenses are available.

I

internet. A set of two or more connected networks. The networks in an internet do not necessarily use the same communications protocol. LUM Runtime supports the following protocols on OS/2:

- NetBIOS
- TCP/IP
- IPX

LUM Runtime supports the following protocols on Windows NT:

- NetBIOS
- TCP/IP
- IPX

On Windows 95 and Windows 98, NetBIOS is not supported. On Windows 98, IPX is not supported. On AIX, HP-UX, IRIX, Solaris and UNIXWARE, LUM Runtime supports only TCP/IP.

initial key. A license key for a custom configuration license generated without using the Upgrade flag. It is an encrypted character string that specifies some terms of the acquisition of the selected combination of software products in a customer's initial custom configuration. Contrast with replacement key.

IPX. A communication protocol that creates, maintains, and terminates connections among network devices (workstations, file servers, or routers, for example).

J

Java. An object-oriented programming language for portable interpretive code that supports interaction among remote objects. Java was developed and specified by Sun Microsystems, Incorporated.

JavaBeans. The platform-independent, component architecture for the Java programming language. JavaBeans enables software developers to assemble pieces of Java code ("Beans") into a graphical drag-and-drop development environment.

K

key. See password.

L

license. Permission to use an instance of a licensed software product or service, according to the basis on which the vendor charges for the product or service. Sometimes, a user needs more than one license to make full use of a particular product features. The term license as used in the context of License Use Management does not refer to the license agreement that governs use of and rights to a product.

license annotation. A string that the vendor can use to modify the use of a license.

license database. In License Use Management, the database of licenses that a license server maintains.

license-enabled product. A product that is enabled for license use management. A vendor provides a license-enabled product together with a password that authorizes use of the product. The password contains an encryption of certain terms of the acquisition of the product (such as

how many licenses the customer can use, the expiration date of the licenses, and the type of license).

license information. In License Use Management, the information that describes licenses. This information consists of product name, product version, number of licenses, license type, start and end dates for the licenses, and a time stamp.

license key. See password.

licensed product. See license-enabled product.

license server. A program that provides the license services, administering licenses for software products. It may be a network license server or a nodelocked license server.

local location broker. Part of the network computing system (NCS). It manages the local location broker (LLB) database, which stores information about NCS-based server programs that run on the local host.

location broker. See local location broker and global location broker.

log file. A database that records messages and errors from the license server, and sometimes from licensed products as well.

M

multiuse rules. In License Use Management, rules that define the conditions under which multiple invocations of a product require only a single license. These rules are applicable only to concurrent access, concurrent nodelocked, and per-server licenses. The vendor of the product defines multiuse rules.

N

namespace binding. In License Use Management, a binding mechanism in which the network license servers register themselves with the global location broker, which locates an

appropriate license server when a client requests a license. Namespace binding is not available on Windows platforms.

NCS. A set of software components, developed by Apollo Computer Inc., that conform to the Network Computing Architecture. These components include the Remote Procedure Call (RPC) runtime library and the Location Brokers.

NCS cell. A logical grouping of clients and servers; a subset of a network. Machines in one cell cannot communicate with machines in other cells. Machines cannot be in more than one cell at a time. Machines in the same cell are identified by the same global location broker (GLB) object Universal Unique Identifier (UUID).

network. A group of nodes and the links that interconnect them.

network license. In License Use Management, a license that is maintained on a network license server for use upon request by a LUM Runtime client.

network license client. In License Use Management, a node configured to make use of licenses by requesting them from a network license server.

network licensed product. In License Use Management, a licensed product that is enabled such that the licenses are maintained on a server for use upon request by a LUM Runtime client.

network license server. In License Use Management, a node in the network on which network licenses are stored for use by LUM Runtime clients.

node. A machine in the network. In License Use Management, it can be configured as a nodelocked license server, a network license client, a network license server, the central registry license server, or a combination

nodelocked license. In License Use Management, a type of license locked to a specific node, so that the product can be used

only at that node. The nodelocked license is installed on the machine for which it was created.

nodelocked license server. In License Use Management, a server on a node that manages nodelocked licenses on that node.

non-runtime-based enablement. In License Use Management, a type of license enablement for a product with simple nodelocked licenses that does not make use of LUM Runtime on the end user's machine. The password is stored in a special file when the enabled product is installed. When the enabled product is started, it checks the file to ensure that there is a valid license.

O

object. In the Network Computing System, an entity that is manipulated by well-defined operations. Databases, files, directories, devices, processes, and processors are all objects.

P

password. An encrypted character string that specifies some terms of the acquisition of a software product. See also simple password, compound password.

password use control level. In License Use Management, a level of control of compliance with the terms of the acquisition of a license-enabled product. The password use control levels are:

- customer-managed use control
- vendor-managed use control

per-seat license. In License Use Management, a license used to enable client/server applications that are constructed for multiple-server solutions. Assignment of a per-seat license to an application client is permanent. Unused application client licenses are kept in a central repository, which all the application servers share. They also share a central list of application clients that have an assigned license. If an

application client connects to multiple application servers, only one license is assigned to it.

per-server license. In License Use Management, a license used to enable client/server applications that are constructed for multiple-server solutions. Each server license is associated with a specific number of clients. This number represents the maximum number of clients that may concurrently request that server application services at any given time. Assignment of a per-seat license to an application client is temporary. If an application client connects to multiple application servers at the same time, it is assigned more than one license.

product ID. In License Use Management, a number that identifies a vendor licensed software product. By means of product IDs, the license server can distinguish between products from the same vendor.

Q

queue. In License Use Management, a sequence of users who are waiting for a concurrent license to become available so they can run a product. The administrator can monitor the number of users in queue through the Basic License Tool.

R

replacement key. A license key for a custom configuration license generated using the Upgrade flag. It is an encrypted character string that specifies some terms of the acquisition of the selected combination of software products in a customer's upgraded custom configuration. Contrast with initial key.

replica. See glbd replica.

report. In License Use Management, a summary of the events related to the licenses that are installed on the selected servers, filtered as the administrator specified. Examples of events are:

- Requests for licenses for a product in a given interval of time.

- Server startup.

reservable license. In License Use Management, a network license that the administrator can reserve for the exclusive use of a user, a group, or a node. The reservation is for a specified time period.

reserved license. In License Use Management, a license that the administrator has reserved for the exclusive use of a user, a group, or a node.

runtime-based enablement. In License Use Management, a type of license enablement for a product with nodelocked licenses that uses LUM Runtime on the end user's machine to manage the licenses.

S

selected servers. In License Use Management, the servers that the administrator is working with through the Basic License Tool. All the products whose licenses are installed on the selected servers are displayed in the Basic License Tool main window.

simple nodelocked license. In License Use Management, a nodelocked license that allows an unlimited number of simultaneous uses of the licensed application on the local machine.

simple password. In License Use Management, a password that, once enrolled on a license server, represents one or more licenses. Enabled applications can use the simple password directly.

socket server. The process that allows LUM Runtime clients and servers to communicate among themselves through the NetBIOS protocol.

soft stop. A policy according to which, if the end user starts the product and there are no licenses available, the product starts.

T

target. In License Use Management, the node at which a password is to be installed. If the password specifies a nodelocked license, the

target is the node where the licensed product is run. If the password specifies multiple nodelocked license (that is, a compound password for nodelocked licenses) or network licenses, the target is a node at which the network license server (i4lmd) is running.

target ID. In License Use Management, a unique identifier of a node. A vendor can generate a password that can be installed only on a node that has a specific target ID. The target ID can be based on hardware or generated by LUM Runtime.

TCP/IP. Transmission Control Protocol/Internet Protocol. A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks.

threshold. In License Use Management, a percentage of licenses; if more than this percentage of licenses for a product are in use, messages about the level of use are logged.

time stamp. In License Use Management, a number that identifies the date and time at which a set of licenses was created.

try-and-buy license. In License Use Management, a nodelocked license that has a fixed duration and a start date equal to the date when the license is enrolled. A try-and-buy license is made available for purposes of evaluating the application, and can be replaced by a production license after evaluation.

U

universal unique identifier. An identifier that is used by NCS to identify interfaces, objects, and types.

use-once license. In License Use Management, a type of license, administered by the license server, that is effective for only a single instance of starting a product or using a service. The license server decrements the number of available use-once licenses each time the product or service is used.

use-once nodelocked license. In License Use Management, a license that is valid for only a single instance of starting a product or using a service, on the node where the license is installed.

user file. In License Use Management, a flat ASCII file, which the administrator creates with a text editor, that lists users who specifically are or are not allowed to use specified products.

UUID. See universal unique identifier.

V

vendor ID. In License Use Management, the identifier of a vendor of licensed products. Vendor IDs are a LUM Runtime specific usage of NCS Universal Unique Identifiers (UUIDs).

vendor-managed use control. In License Use Management, a level of password use control in which the vendor manages compliance with the terms of the software product acquisition. The customer of a vendor-managed use product supplies a unique identifier (target ID) of each machine where product licenses are to be installed. The vendor uses this information to create the password, which is tied to the target workstation and cannot be used on another workstation.

Index

A

- accessor ID 13
- addresses, list of glb addresses 46
- administering licenses using the
 - basic license tool (BLT) 20
- Admintool on Solaris 62
- AIX
 - version
 - compatible versions of LUM Runtime 4
- alternate cells, for test environments 44
- ANY target id, use with VMU 6
- authorization policy, user ensuring consistency 116

B

- backup
 - and recovery, using built in procedure 205
 - procedure
 - automatic 206
 - manual 207
- balance, workload 42
 - troubleshooting heavy workloads 224
 - tuning 210
- basic license tool (BLT)
 - CLI 130
 - description 20
 - GUI
 - clean up stale licenses 98
 - filtering licenses and servers 98
 - starting 97
 - troubleshooting 222
 - using 97
 - help for 158
- binding
 - direct
 - configuring 72
 - description 40
 - example 53
 - HAL cluster
 - considerations 50
 - need to identify all servers 43
 - no problems with multiple network interfaces 93

- binding (*continued*)
 - direct (*continued*)
 - planning for 43
 - servers list 40
 - troubleshooting 229
 - how to select the correct type 40
 - namespace
 - configuring 72
 - description 41
 - HAL cluster
 - considerations 50
 - managing namespace binding with DSS or DCE 209
 - planning for 43
 - problems with multiple network interfaces 93
 - troubleshooting 226
 - performance considerations when choosing 42
- broadcasting
 - configuring namespace binding if broadcasting unsupported 73
 - what to do if your system does not support 46
- bundle
 - creating 194
 - deleting 138
 - displaying a list 142
 - new policy 14

C

- capacity 12
- cell, NCS
 - description 41
 - generating a UUID for 46
- central registry license server
 - configuring 85
 - description 24
 - planning 46
 - subsystem 188
- changes
 - in book, from previous edition xvii
- clean up stale licenses
 - CLI 141
 - GUI 98
- CLI commands
 - conventions 129
 - drm_admin (GLBD replicas administration) 171

CLI commands (*continued*)

- glbd (global location broker subsystem) 182
 - i4blt (basic license tool) 130
 - i4cfg (configuration tool) 159
 - i4gdb (central registry license server subsystem) 188
 - i4glbcd (glb database cleaner subsystem) 190
 - i4lct (license creation tool) 191
 - i4llmd (nodelocked license server subsystem) 186
 - i4lmd (network license server subsystem) 184
 - i4target (target view tool) 180
 - i4tv (test verification tool) 178
 - lb_admin (local broker administration) 166
 - lb_find (GLBs list tool) 175
 - llbd (local location broker subsystem) 181
 - summary 129
 - uuid_gen (UUID generator tool) 177
- ## client
- configuring 159
 - configuring a network license client 89
 - network license clients on one LAN 95
 - network license clients on two LANs 94
 - using internet gateway 95
- ## client/server applications 8
- ## cluster, for HAL
- activating members
 - CLI 122
 - GUI 118
 - adding a member
 - CLI 122
 - GUI 120
 - creating
 - CLI 122
 - GUI 116
 - deactivating a server
 - CLI 122
 - GUI 121
 - description 22

- cluster, for HAL (*continued*)
 - enrolling and removing licenses 122
 - examples 49
 - membership considerations 50
 - number of servers in a cluster 48
 - planning 47
 - report on status 123
 - size and composition 47
 - viewing licenses being served 121
- commands, CLI
 - parameter length restriction 132
 - summary 129
- concurrent
 - network license
 - description 28
 - nodelocked license 7, 10
- configuration
 - determining what is needed 68
 - file (i4ls.ini), description 235
 - need to decide machine roles 69
 - tools available 73
- configuration tool
 - CLI 74, 159
 - GUI 74
 - script 73
- configurations, possible network 51
- configuring
 - a network license client 89
 - a network license server 80
 - a nodelocked license server in a network 76
 - a standalone nodelocked license server 74
 - direct binding 72
 - namespace binding 72
 - the central registry license server 85
 - to reach a global location broker in a different subnetwork 92
- connections
 - troubleshooting 226
 - verifying network connections 51, 93
- custom configuration 14
 - adding a product
 - CLI 126
 - GUI 123
 - managing 214
 - serial number 15, 123, 245
 - troubleshooting licenses 222
- customer managed use control (CMU)
 - description 6
 - troubleshooting 221
- D**
- database
 - automatic backup 205
 - central registry 46
 - glbd
 - changing tag values 224
 - troubleshooting 223
 - glbd (global location broker subsystem)
 - database file 205
 - llbd (local location broker subsystem) 205
 - troubleshooting 221
- database cleaner for global location broker 45
- debugging, suggestions for 215
- deinstallation
 - Java Client Support 65
 - on HP-UX 56
 - on IRIX 60
 - on Solaris 63
- demonstration versions of software
 - license type for 8
- direct binding
 - configuring 72
 - description 40
 - example 53
 - HAL cluster considerations 50
 - no problems with multiple network interfaces 93
 - planning for 43
 - server list
 - changing if Java Client Support installed 72
 - servers list 40
 - need to identify all servers 43
 - troubleshooting 229
- directory services and security (DSS)
 - managing namespace binding with DSS 209
- disk requirements
 - Java Client support 64
 - on HP-UX 55
 - on IRIX 59
 - on Solaris 61
- displaying license status 148
- distributed computing environment (DCE)
 - managing namespace binding with 209
- distributing licenses
 - CLI 107, 137
 - GUI 103
- download site
 - using for HP-UX 56
 - using for IRIX 59
 - using for Solaris 62
- drm_admin (GLBD replicas administration tool) 171
 - description 45
- E**
- enrolling licenses
 - CLI 106, 132
 - description 5
 - for HAL clusters 122
 - GUI 99
 - multiple xviii
 - running a vendor program on enrollment 15
- enrollment certificate file (ECF)
 - example 215
 - PasswordVersion parameter 191
 - shows license type 68
- evaluation period 13
- event
 - logging 71
 - logging threshold events 154
- F**
- filtering
 - licenses and servers displayed 98
- free code for LUM Runtime 1
- FTP site
 - using for HP-UX 56
 - using for IRIX 59
 - using for Solaris 62
- G**
- glb_site.txt, list of global location broker servers 46, 92
- glbd
 - changing tag values 224
 - troubleshooting 223
- glbd (global location broker subsystem) 182
 - database file 205
- GLBD replicas administration tool 171
 - description 45
- GLBs list tool 175

- global location broker 41
 - configuring to reach a global location broker in a different subnetwork 92
- database
 - list tool 45
- database cleaner subsystem 190
- database file 205
- list of servers 92
- reaching a glb in a different subnetwork 46
- selecting a server 44
- global location broker database cleaner subsystem 45
- global location broker subsystem 182

H

- hard stop/soft stop 15
 - using 112
- hardware
 - requirements on HP-UX 55
 - requirements on IRIX 59
 - requirements on Solaris 62
 - troubleshooting 229
- high-availability cluster testing xviii
- high-availability licensing (HAL)
 - activating members of a cluster
 - CLI 122
 - GUI 118
 - adding a member to a cluster
 - CLI 122
 - GUI 120
 - cluster membership 50
 - creating a cluster
 - CLI 122
 - GUI 116
 - deactivating a server
 - CLI 122
 - GUI 121
 - description 22
 - enrolling and removing licenses 122
 - managing 116
 - CLI 155
 - planning clusters 47
 - viewing licenses being served 121
- high-water mark, for soft stop licenses 15
- HP-UX
 - adding path to profile 56
 - disk requirements 55
 - hardware and software requirements 55

- HP-UX (*continued*)
 - installation on 55
 - obtaining License Use Runtime code 56
 - uninstalling on 56

I

- i4blt (basic license tool)
 - starting the GUI 97
 - summary of options 130
- i4cfg (configuration tool) 159
- i4gdb (central registry license server subsystem) 188
- i4glbcd (glb database cleaner subsystem) 190
- i4lct (license creation tool) 191
- i4llmd (nodelocked license server subsystem) 186
- i4lmd (network license server subsystem) 184
- i4ls.ini, configuration file, description 235
- i4target (target view tool) 180
- i4tv (test verification tool) 178
- installation
 - of Java Client Support 64
 - on HP-UX 55
 - on IRIX 58
 - on Solaris 61
- installation utility on IRIX 59
- installing
 - LUM Runtime 55
 - product licenses 19
- internet gateway, configuring for network clients 95
- IRIX
 - adding path to profile 60
 - disk requirements 59
 - hardware and software requirements 59
 - installation on 58
 - obtaining License Use Runtime code 59
 - uninstalling on 60
- Isogon Corporation, address 20

J

- Java
 - Java Client Support
 - changing the direct binding server list 72
 - troubleshooting 232
 - new API xvii
 - products
 - planning for 47
 - web server 47

- Java Client support
 - disk requirements 64
- Java Client Support 65
 - installation 64
 - software requirements for 64
- Java Development Kit 65
- Java Runtime Environment 65

L

- lb_admin (local broker administration tool) 166
 - description 45
- lb_find (GLBs list tool) 175
- lb_find (global location broker database list tool)
 - description 45
- license
 - administration using the basic license tool (BLT) 20
 - clean up stale licenses
 - CLI 141
 - creating 19
 - creation tool, acquiring a license for 20
 - deleting
 - CLI 138
 - displaying a list
 - CLI 142
 - displaying status 148
 - distributing
 - CLI 107, 137
 - GUI 103
 - enrolling
 - CLI 132
 - enrolling and removing licenses
 - on HAL clusters 122
 - installing 19
 - managing 3
 - master license for bundle, creating 194
 - multiple enrollment xviii
 - network
 - description 3
 - nodelocked
 - description 3
 - non-runtime-based
 - description 7
 - password
 - compound, description 5
 - description 5
 - simple 5
 - policy
 - description 12
 - reservable
 - managing 107

- license (*continued*)
 - reserving
 - CLI 140
 - runtime-based
 - description 7
 - servers on a system with
 - multiple network interfaces 93
 - summary of types and policies 17
 - switching from per-server to per-seat licenses 111
 - switching from per-server to per-seat licensing 16
 - troubleshooting 217
 - type
 - description 7
 - getting from the ECF 68
 - updating
 - CLI 135
- license annotation 14
 - now 256 characters xviii
- license creation tool 191
- license-enabling a product
 - overview 2
- License Use Management
 - basic concepts 2
 - overview 1
 - products 1
 - web site 1
- licenses
 - nodelocked and network 3
- licensing, high-availability 22
- list of servers, vendors, bundles, products, or licenses
 - CLI 142
- llbd (local location broker subsystem) 181
 - database file 205
- local broker administration tool 166
 - description 45
- local location broker 45
- local location broker subsystem 181
 - database file 205
- location broker, NCS tool 39
 - running 45
- log
 - allowing for growth of file 211
 - collecting data for problem determination 230
 - customizing information 70
 - deleting entries for server 153
 - logging threshold events 154
 - removing the log files 211
- LUM Runtime
 - compatible versions of AIX 4
- LUM Runtime (*continued*)
 - configuring 67
 - installation 55
 - platforms supported in 4.6 4
 - subsystems 180
 - troubleshooting subsystems 224
 - where to get the free code 1
- M**
 - managing licenses 3
 - master license for bundle, creating 194
 - multiple-server
 - license type for 8
 - multiuse rules 13
 - for same accessor ID xviii
- N**
 - namespace binding
 - adding the page to the notebook binding 78
 - configuring 72
 - description 41
 - HAL cluster considerations 50
 - managing with DSS or DCE 209
 - planning for 43
 - problems with multiple network interfaces 93
 - troubleshooting 226
 - network
 - binding
 - how to select the correct type 40
 - configuring
 - a network license client 89
 - a network license server 80
 - a nodelocked license server in a network 76
 - example
 - license clients on one LANs 95
 - license clients on two LANs 94
 - license
 - configuring for 67
 - description 3, 9
 - reservable 10
 - troubleshooting 219
 - use-once 11
 - license servers 37
 - license servers on a system with multiple network interfaces 93
 - managing namespace binding with DSS or DCE 209
- network (*continued*)
 - no problems with multiple network interfaces using direct binding 93
 - planning a licensing network 37
 - possible configurations 51
 - problems with multiple network interfaces using namespace binding 93
 - troubleshooting connections 226
 - use-once license
 - how it works 26
 - using internet gateway 95
 - verifying connections 51, 93
 - network computing system (NCS) cell
 - description 41
 - description 39
 - generating a UUID for cell 46
 - subsystems 180
 - tools, summary 45
 - network license server subsystem 184
 - nodelock file, preparing and using 245
 - nodelocked and network licenses 3
 - nodelocked license
 - concurrent 7, 10
 - configuring a standalone nodelocked license server 74
 - configuring for 67
 - description 3, 7
 - non-runtime-based enabling, description 24
 - per-server 8
 - runtime-based enabling, description 25
 - simple 7
 - troubleshooting 217
 - use-once 8
 - nodelocked license server subsystem 186
 - non-runtime-based license description 7
- O**
 - operating systems supported 247
- P**
 - password, license
 - compound
 - description 5
 - description 5
 - simple
 - description 5

- PasswordVersion parameter, ECF 191
- per-seat license
 - description 34
 - switching from per-server licenses 111
- per-server license
 - description 33
 - switching to per-seat licenses 111
 - troubleshooting 220
- per-server/per-seat licensing
 - for network licenses 11
 - for nodelocked licenses 8
 - switching between 16
- performance
 - choosing a binding 42
 - measurement 212
 - suggestions for improving 215
 - troubleshooting 222
- pkgadd command on Solaris 62
- platforms
 - new in LUM Runtime 4.6 xvii
 - supported in LUM Runtime 4.6 4
- platforms supported 247
- policy
 - capacity 12
 - custom configuration 14
 - ensuring consistency in user authorization 116
 - evaluation period 13
 - hard stop/soft stop 15
 - hard stop/soft stop, using license 112
 - description 12
 - license annotation 14
 - multiuse rules 13
 - summary of policies 17
 - try-and-buy 13
 - user access restriction 16
 - vendor controlled 12
 - wait queues 13
- port numbers, server
 - do not change defaults without reason 72
- problem determination 215
- product
 - adding a product to a custom configuration
 - CLI 126
 - GUI 123
 - checking the number of users
 - CLI 107
 - GUI 106
- product (*continued*)
 - displaying a list 142
 - displaying license status 148
 - enrolling
 - CLI 106
 - GUI 99
 - installing licenses 19
- profile file (.profile)
 - adding path on HP-UX 56
 - adding path on IRIX 60
 - adding path on Solaris 62
- R**
- recovery
 - procedure
 - for files backup up by the automatic backup procedure 206
 - manual 207
- remote administration
 - disabling 71
- remote procedure call (RPC) runtime library 39
- report
 - checking the number of product users
 - CLI 107
 - GUI 106
 - cluster status 123
 - generating
 - CLI 107, 150
 - GUI 104
 - log files, managing
 - log 207
- reservable license
 - description 10, 30
 - managing 107
 - troubleshooting 220
- reserving licenses
 - CLI 140
- runtime-based license
 - description 7
- S**
- SAM on HP-UX 56
- serial number 15
 - custom configuration 14, 123, 126, 245
- server
 - automatic start 71
 - central registry license server
 - description 24
 - planning 46
 - configuring 159
 - a network license server 80
- server (*continued*)
 - configuring 159 (*continued*)
 - a nodelocked license server in a network 76
 - a standalone nodelocked license server 74
 - for network licenses 67
 - for nodelocked licenses 67
 - the central registry license server 85
 - deactivating a HAL server
 - CLI 122
 - GUI 121
 - deleting log entries 153
 - direct binding, need to identify all servers 43
 - displaying a list 142
 - for HAL 47
 - numbers in a cluster 48
 - for high-availability licensing (HAL) 22
 - license servers on a system with multiple network interfaces 93
 - list of global location broker servers 92
 - locating the global location broker 46
 - minimum and maximum number for HAL 48
 - multiple
 - license type for 8
 - planning
 - direct binding 43
 - planning network license servers 37
 - port numbers, do not change without reason 72
 - report on cluster status 123
 - selecting network servers 37
 - structure enhancement xviii
 - troubleshooting heavy workloads 224
 - tuning the timeout 213
 - verifying network connections 93
 - web, for Java products 47
- simple nodelocked license 7
- soft stop policy, VMU only 16
- software
 - requirements for Java Client Support 64
 - requirements on HP-UX 55
 - requirements on IRIX 59
 - requirements on Solaris 62

- Solaris
 - adding path to profile 62
 - disk requirements 61
 - hardware and software requirements 62
 - installation on 61
 - obtaining License Use Runtime code 62
 - uninstalling on 63
- subsystems
 - LUM Runtime and NCS 180
 - running subsystems in traced mode 230
 - starting and listing 93
- supported operating systems 247
- swinstall command on HP-UX 56
- switching from per-server to per-seat licensing 111
- swmgr on IRIX 59
- syntax, conventions used for CLI commands 129

T

- target view tool 180
- TCP/IP
 - requirement on HP-UX 56
 - requirement on IRIX 59
 - requirement on Solaris 62
- test environments, need to use alternate cells for 44
- test verification tool 178
- threshold
 - logging events 154
- timeout
 - setting for non-responding server 213
- trace
 - displaying output when tuning 211
 - files, managing 208
 - running applications in traced mode 230
 - running subsystems in traced mode 230
- try-and-buy 13
- tuning
 - environment 210
 - parameters 212
 - server timeout 213

U

- uninstallation 65
- uninstalling
 - Java Client Support 65
 - on HP-UX 56
 - on IRIX 60

- uninstalling (*continued*)

- on Solaris 63

- use control

- customer managed (CMU), description 6
 - description 5
 - vendor managed (VMU), description 5

- use-once

- network license 11
 - description 26
 - nodelocked license 8
 - as supplement for concurrent 8

- user

- access, restricting 115
 - access restriction 16
 - authorization policy, ensuring consistency 116
 - user file, creating 115

- UUID, node

- identifier,description 43

- uuid_gen (UUID generator tool) 177

- description 46

- UUID generator tool 177

- description 46

V

- vendor

- displaying a list 142

- vendor-controlled policy 12

- vendor managed use control (VMU)

- description 5

- troubleshooting 221

W

- wait queues 13

- Web browser

- requirement on HP-UX 56

- requirement on IRIX 59

- Web server

- supported 64

- web server for Java products 47

- WebSphere

- servlet_log and error_log files 232

- workload balance 42

- troubleshooting heavy

- workloads 224

- tuning 210



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