



# **LifeKeeper<sup>®</sup> for Linux v6**

## Planning and Installation Guide

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To maintain the quality of our publications, we need your comments on the accuracy, clarity, organization, and value of this book.

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# Planning and Installation Guide

## Document Overview

The LifeKeeper for Linux Planning and Installation Guide contains information on how to plan and install your LifeKeeper environment. In addition to providing the necessary steps for setting up your server, storage device, and network components, it includes details for configuring your LifeKeeper graphical user interface (GUI).

Once you have completed the steps in this guide, you will be ready to configure your LifeKeeper resources. The *LifeKeeper Online Product Manual* and recovery kit Administration Guides provide the information you need to complete your LifeKeeper configuration.

## Structure of this Document

LifeKeeper for Linux planning and installation information is presented in the following chapters and appendices:

- Chapter 1, [Planning Your LifeKeeper Environment](#), provides complete details on how to plan a LifeKeeper for Linux cluster environment, including verifying and documenting your server specifications, mapping server communications and connections, determining storage and adapter requirements, and determining requirements for LifeKeeper recovery kits and optional software.
- Chapter 2, [Setting Up Your LifeKeeper Environment](#), provides complete details to assist in setting up the components of your LifeKeeper environment., including tips for installing your Linux operating system, instructions for connecting and configuring your servers and shared storage, methods for verifying your network configuration, instructions for creating switchable IP addresses, and information on installing your database application(s).
- Chapter 3, [Installing LifeKeeper](#), provides complete details on how to install the LifeKeeper software, including directions for using the LifeKeeper Installation Support CD, installing LifeKeeper core software and recovery kits, details for starting LifeKeeper and information regarding the setup of communication paths.
- Chapter 4, [LifeKeeper GUI Overview](#), provides an overview of the GUI server and client components.
- Chapter 5, [Configuring the LifeKeeper GUI Server](#), provides complete details on how to configure the LifeKeeper server for GUI administration. It includes instructions for installing java, starting the GUI server, configuring GUI users, and other administration tasks.
- Chapter 6, [Running the LifeKeeper GUI](#), provides details on how to configure and run the LifeKeeper GUI locally or remotely, on either Windows or Linux operating systems.

- Chapter 7, [Configuring Other LifeKeeper Components](#), provides configuration steps to take before putting your applications under LifeKeeper protection, and instructions for accessing the Online Product Manual.
- Appendix A - [Linux Installation Tips for LifeKeeper](#), provides tips for installing your Linux operating system for use with LifeKeeper.
- Appendix B – [Troubleshooting](#), provides helpful information for troubleshooting various components of the LifeKeeper software.

## LifeKeeper Documentation

The following is a list of LifeKeeper related information available from SteelEye Technology, Inc.:

- *LifeKeeper for Linux Release Notes*
- *LifeKeeper for Linux Online Product Manual* (available from the Help menu within the LifeKeeper GUI)
- *LifeKeeper for Linux Planning and Installation Guide*

This documentation, along with documentation associated with other LifeKeeper recovery kits, is available online at [www.steeleye.com/support/documentation](http://www.steeleye.com/support/documentation).

## System Requirements

LifeKeeper requires that each server in the cluster have the following components installed and operating properly:

- Linux operating system (see the *LifeKeeper Release Notes* for a list of supported Linux distributions).
- Disk arrays and storage adapters (SCSI or Fibre Channel) if you are using shared storage.
- Ethernet TCP/IP-supported network interface card(s) for LAN-based cluster heartbeat(s)
- Memory. See the *LifeKeeper Release Notes* for minimum memory requirements for LifeKeeper. Note: Additional memory (beyond that required for LifeKeeper) is required to run user applications.
- Disk space. See the *LifeKeeper Release Notes* for minimum memory requirements for LifeKeeper, recovery kits, and optional software.
- Application software to be protected by LifeKeeper.
- Perl (normally included in the Linux installation).
- Public domain korn shell (pdksh). This is normally included on the Linux installation media, but not installed by default.
- GUI platform. The LifeKeeper GUI is targeted for any platform that provides full JDK 1.3 support. See the *LifeKeeper Release Notes* for GUI platform and browser requirements.

For a complete list of hardware and software requirements and versions, see the *LifeKeeper Release Notes* document.

Also, before installing LifeKeeper, be sure that you have completed the planning and hardware configuration tasks described in this document.

## Technical Notes

Refer to the *LifeKeeper Release Notes* that accompanied your software for technical notes and restrictions pertaining to this software. You can find the most up-to-date version of the *LifeKeeper Release Notes* on the web at <http://www.steeleye.com/support/documentation>. We encourage you to check this web page periodically for updates that may be of assistance to you.

# Chapter 1

## Planning Your LifeKeeper Environment

This chapter will assist you in defining your LifeKeeper for Linux cluster environment, therefore enabling you to successfully achieve your high availability goals quickly and effectively.

The major sections of this chapter are:

[Verifying and Documenting Server Specifications](#)

[Mapping Communications and Connections for All Servers](#)

[Storage and Adapter Requirements](#)

[Recovery Kits and Optional Software Requirements](#)

### Verifying Server Specifications

Ensure that you have the correct version and/or capacity of the following components:

- Linux
- TCP/IP
- Small Computer System Interface (SCSI) and Fibre Channel (FC) adapters
- Disk arrays
- Memory
- Disk space
- LifeKeeper Graphical User Interface (GUI) platforms and browsers
- Power Requirements. To maximize the availability of your LifeKeeper servers, it is strongly recommended that you use Uninterruptible Power Supplies (UPSs), or at a minimum, separate the electrical sources to your servers.

See the *Release Notes* included with the LifeKeeper for Linux media for specifications on these components.

## Mapping Server Configurations

Document your server configuration using the following guidelines:

1. Determine the server names, processor types, memory and other I/O devices for your configuration. When you specify a backup server, you should ensure that the server you select has the capacity to perform the processing should a failure occur on the primary server.
2. Determine your communications connection requirements.



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**Important:** Potentially, clustered configurations have two types of communications requirements: cluster requirements and user requirements.

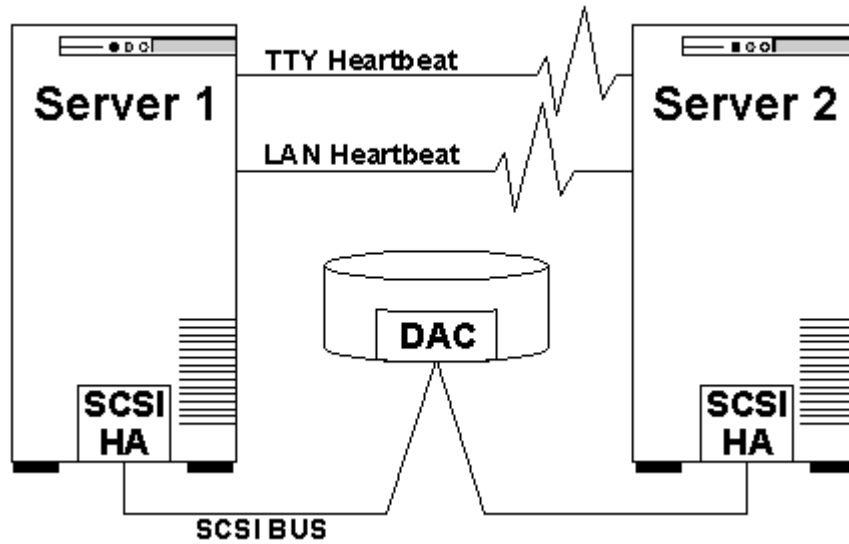
- **Cluster** - A LifeKeeper cluster requires at least two communication paths (also called “comm paths” or “heartbeats”) between servers. This redundancy helps avoid “split-brain” scenarios due to communication failures. Two separate LAN-based (TCP) comm paths using dual independent subnets are recommended, and at least one of these should be configured as a private network. Using a combination of TCP and TTY is also supported. A TTY comm path uses an RS-232 null-modem connection between the servers’ serial ports.

Note that using only one comm path can potentially compromise the ability of systems in a LifeKeeper cluster to communicate with each other. If a single comm path is used, and the comm path fails, then LifeKeeper hierarchies may try to come into service on multiple systems simultaneously. This is known as a false failover or a “split-brain” scenario. In the “split-brain” scenario, each server believes it is in control of the application and thus may try to access and write data to the shared storage device. To resolve the split-brain scenario LifeKeeper may cause servers to be powered off or rebooted or leave hierarchies out-of-service to assure data integrity on all shared data. Additionally, heavy network traffic on a TCP comm path can result in unexpected behavior, including false failovers and the failure of LifeKeeper to initialize properly.

- **User** - We recommend that you provide alternate LAN connections for user traffic - that is, a separate LAN connection than the one used for the cluster heartbeat. However if two TCP comm paths are configured (as recommended), one of those comm paths can share the network address with other incoming and outgoing traffic to the server.
3. Identify and understand your shared resource access requirements. Clusters that use shared storage can utilize either shared SCSI buses or Fibre Channel loops. Because LifeKeeper locks resources to one server, you must ensure that only one server requires access to all locked resources at any given time. LifeKeeper device locking is done at the Logical Unit (LUN) level. For active/active configurations, each hierarchy must access its own unique LUN. All hierarchies accessing a common LUN must be active (in-service) on the same server.

4. Determine your shared memory requirements. Remember to take into account the shared memory requirements of third-party applications as well as those of LifeKeeper when configuring shared memory and semaphore parameters. See the *Tuning* section of the *LifeKeeper Release Notes* for LifeKeeper's shared memory requirements.

### Sample Configuration Map for LifeKeeper Pair



This sample configuration map depicts a pair of LifeKeeper servers sharing a disk array subsystem where, normally, Server 1 runs the application(s) and Server 2 is the backup, or secondary server. In this case, there is no contention for disk resources because one server at a time reserves the entire disk storage space of the disk array. The disk array controller is labeled “DAC,” and the SCSI host adapters (parallel SCSI, Fibre Channel, etc.) are labeled “SCSI HA.”

A pair of servers is the simplest LifeKeeper configuration. When you plan a cluster consisting of more than two servers, your map is even more critical to ensure that you have the appropriate connections between and among servers. For example, in a multi-directional failover configuration, it is possible to define communications paths within LifeKeeper when the physical connections do not exist. Each server must have a physical communication path to every other server in the cluster in order to provide cascading failover capability.

## Storage and Adapter Requirements

Determine your storage and host adapter requirements using the following guidelines:

**Storage Devices** - Based on your application's data storage requirements, you will need to determine the type and number of data storage devices required by your configuration. Your shared files should reside on a disk array subsystem (Redundant Array of Inexpensive Disks, or RAID). LifeKeeper supports a number of hardware RAID peripherals for use in LifeKeeper configurations. See the *LifeKeeper Release Notes* for a list of the supported peripherals.



Consider the following issues when planning the configuration of your storage devices:

- LifeKeeper manages resources at the physical disk or Logical Unit (LUN) level, making the resources on each physical disk or LUN available to only one server in the configuration at a time. As a result, it is a good idea to plan disk allocations before you begin to configure LifeKeeper. For example, each hierarchy in active/active configurations must access its own unique LUN, so a minimum of two LUNs is required for a two node active/active configuration.
- Some model-specific issues and hardware configuration details are maintained in the LifeKeeper configuration documents at [www.steeleye.com/support/documentation](http://www.steeleye.com/support/documentation).

**Adapters** - Based upon the type of configuration and the number of peripherals, determine the types and number of SCSI or Fibre Channel Host Adapters required. It is important that any adapter you choose be supported by LifeKeeper, as well as by your Linux distribution so that there is a driver available. Refer to the *LifeKeeper Release Notes* for a list of supported host adapters. For reference purposes, you should add the host adapter specifications to your configuration map.

## Recovery Kit and Optional Software Requirements

Each of the LifeKeeper recovery kits has requirements that you should consider in planning and connecting all the components of your LifeKeeper cluster. See the Administration Guide for each recovery kit for helpful information.

**IP Recovery Kit** - The IP Recovery Kit is a package included on the LifeKeeper for Linux Core CD. This recovery kit provides the ability to recover an IP address from a failed primary server to a backup server, or to move IP addresses between a failed NIC card in a server to another NIC card in that same server, thus allowing failover of user sessions. The *IP Recovery Kit Administration Guide* is available on the web at [www.steeleye.com/support/documentation](http://www.steeleye.com/support/documentation). In particular, you should consult the section of that guide entitled *Configuring TCP/IP with LifeKeeper*.

**Optional Recovery Software** - For specific details, see the *Specific Configuration Considerations* section in each recovery kit Administration Guide. The Administration Guides are available on the web under [www.steeleye.com/support/documentation](http://www.steeleye.com/support/documentation).



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The following kits are currently available. Additional recovery kits may become available between LifeKeeper releases. Check the SteelEye Technology, Inc. web site at [www.steeleye.com](http://www.steeleye.com) for the latest list of available recovery kits

- Apache Web Server Recovery Kit
- ClearCase Recovery Kit
- DB2 Recovery Kit
- DRBD Recovery Kit
- Device Mapper Multipath (DMMP) Recovery Kit
- IBM Subsystem Device Driver (SDD) Recovery Kit
- Informix Recovery Kit
- Logical Volume Manager (LVM) Recovery Kit
- MySQL Recovery Kit
- Network Attached Storage (NAS) Recovery Kit
- NFS Server Recovery Kit
- Oracle Recovery Kit
- PostgreSQL RDBMS Recovery Kit
- Powerpath Recovery Kit
- Samba Recovery Kit
- Sendmail Recovery Kit
- Sendmail Advanced Message Server (SAMS) Recovery Kit
- Sendmail Mailcenter Recovery Kit
- SAP Recovery Kit
- SAP DB / MaxDB Recovery Kit
- Software RAID (md) Recovery Kit
- Sybase ASE Recovery Kit
- VMware ESX Server Virtual Machine Recovery Kit
- WebSphere MQ Recovery Kit
- SteelEye Data Replication

## Chapter 2

# Setting Up Your LifeKeeper Environment

Now that you have determined your requirements and mapped your LifeKeeper configuration, you can start setting up the components of your LifeKeeper environment.

The major sections of this chapter are:

[Installing the Linux OS and Associated Communication Packages](#)

[Connecting Servers and Shared Storage](#)

[Configuring Shared Storage](#)

[Verifying Network Configuration](#)

[Creating Switchable IP Address](#)

[Installing and Setting Up Database Applications](#) (if applicable).

**Note:** Although it is possible to perform some setup tasks in a different sequence, this list is provided in the recommended sequence.

## Installing the Linux OS and Associated Communications Packages

Before attempting to install the LifeKeeper for Linux software, you must first ensure that your Linux operating system is successfully installed and operational. Please see the Linux installation instructions provided with your distribution of Linux for complete installation details. Additionally, reference [Appendix A :Linux Installation Tips for LifeKeeper](#) in this guide for helpful tips to assist you with installing your operating system for use with LifeKeeper.

**Note:**

- It is possible to install Linux *after* connecting and configuring your shared storage, but it may be simpler to have Linux installed and running before introducing new peripheral devices.
- The LifeKeeper for Linux Installation Support CD provides a set of installation scripts designed to perform user-interactive system setup tasks that are necessary before LifeKeeper can be installed on your system. See the [Using the LifeKeeper Installation Support CD](#) section later in this guide for instructions on setting up your Linux environment using the LifeKeeper Installation Support CD.

## Connecting Servers and Shared Storage

If you are planning to use LifeKeeper in a non-shared storage environment, then you may skip this and the following section. If you are using LifeKeeper in a data replication (mirroring) environment, see the *SteelEye Data Replication for Linux Administration Guide*. If you are using LifeKeeper in a network attached storage environment, see the *LifeKeeper Network Attached Storage Recovery Kit Administration Guide*.

Once Linux is installed, you should set the host adapter and shared peripheral addressing. Refer to the documentation accompanying your adapter and storage device for specific details.

## Configuring Shared Storage

LifeKeeper configurations may use the facilities of shared Small Computer System Interface (SCSI) host adapters and shared disk hardware to switch resources from a failed server to a designated backup server. A Fibre Channel Storage Area Network (SAN) may also be used to switch resources from a failed server to a designated backup server.

Perform the following tasks before creating disk-based application resource hierarchies that enable LifeKeeper to provide failover protection.

1. Partition disks and LUNs. Because all disks placed under LifeKeeper protection must be partitioned, your shared disk arrays must now be configured into logical units, or LUNs. Use your disk array management software to perform this configuration. You should refer to your disk array software documentation for detailed instructions.

**Note:**

- If you are using the SteelEye **arrayscan** utility to probe all LUNs (the default on Red Hat, Miracle Linux, and TurboLinux), and there is only 1 logical unit (LUN) on your shared disk array available, that particular vendor and model of disk array may not be included in the **arrayscan** utility templates file `/etc/array/templates`. See the [Shared Storage Configuration Troubleshooting](#) section in Appendix B for additional information.
  - Remember that LifeKeeper locks its disks at the LUN level. Therefore, one LUN may be adequate in an Active/Standby configuration, but if you are using an Active/Active configuration, then you must configure at least two separate LUNs, so that each hierarchy can access its own unique LUN.
2. Verify that both servers recognize the shared disks (for example, using the **fdisk** command). If Linux does not recognize the LUNs you have created, then LifeKeeper will not either.
  3. Create file systems on your shared disks from the system you plan to use as the primary server in your LifeKeeper hierarchy. Refer to the Linux documentation for complete instructions on the administration of file systems.

## Verifying Network Configuration

It is important to ensure that your network is configured and working properly *before* you install LifeKeeper. There are several tasks you should do at this point to verify your network operation:

1. From each server, ping the local server, and ping the other server(s) in the cluster. If the ping fails, then do the necessary troubleshooting and perform corrective actions before continuing.
2. If your server has more than one network adapter, you should configure the adapters to be on different subnets. If the adapters are on the same subnet, TCP/IP cannot effectively utilize the second adapter.
3. Ensure that *localhost* is resolvable by each server in the cluster. If DNS is not implemented, edit the */etc/hosts* file and add an entry for the *localhost* name. This entry can list either the IP address for the local server, or it can list the default entry (127.0.0.1). If *localhost* is not resolvable, the LifeKeeper GUI may not work.
4. If DNS is implemented, verify the configuration to ensure the servers in your LifeKeeper cluster can be resolved using DNS.
5. Ensure each server's hostname is correct and will not change after LifeKeeper is installed. If you later decide to change the hostname of a LifeKeeper system, you should follow these steps *on all servers in the cluster*.

- a. Stop LifeKeeper on all servers in the cluster using the command:

```
$LKROOT/bin/lkstop
```

- b. Change the server's hostname using the Linux **hostname** command.
- c. Before continuing, you should ensure that the new hostname is resolvable by each server in the cluster (see the previous bullets).
- d. Run the following command on every server in the cluster to update LifeKeeper's hostname. (Refer to **lk\_chg\_value(1M)** for details.)

```
$LKROOT/bin/lk_chg_value -o oldhostname -n newhostname
```

- e. Start LifeKeeper using the command:

```
$LKROOT/bin/lkstart.
```

## Creating Switchable IP Address

A switchable IP address is a “virtual” IP address that can be switched between servers. It is separate from the IP address associated with the network interface card of each server. Applications under LifeKeeper protection are associated with the switchable IP address. Then, if there is a failure on the primary server, that IP address “switches” to the backup server.

If you plan to configure resource hierarchies for switchable IP addresses, you must do the following on each server in the cluster:

- Verify that the computer name is correct and will not be changed.

- Verify that the switchable IP addresses are unique using the ping command.
- Edit the `/etc/hosts` file to add an entry for each switchable IP address.

Refer to the LifeKeeper for Linux IP Recovery Kit Administration Guide for additional information.

## Installing and Setting Up Database Applications

If your environment includes a protected database application such as Oracle, Informix, DB2, or MySQL, you should install the application using the documentation provided with the database. Ensure that the database is on a shared file system and that the configuration files are on a shared file system. The executables may either be on each local or a shared file system.

Although it is possible to install your application *after* LifeKeeper is installed, you should test the application to ensure it is configured and operating properly before placing it under LifeKeeper protection. Please reference the specific LifeKeeper database recovery kit administration guides for additional installation and setup considerations.

## Chapter 3 Installing LifeKeeper

If you have completed the steps in the previous sections, [Planning Your LifeKeeper Environment](#) and [Setting Up Your LifeKeeper Environment](#), you should be ready to install the LifeKeeper software on each server in your cluster.

The major sections of this chapter are:

[LifeKeeper Core Software Package](#)

[LifeKeeper Recovery Kits and Optional Software Packages](#)

[Using the LifeKeeper Installation Support CD](#)

[Installing the LifeKeeper Software](#)

[Verifying LifeKeeper Installation](#)

[Starting LifeKeeper](#)

[Setting Up TTY Communication Paths](#) (if implementing a TTY heartbeat)

[Related LifeKeeper Administration Tasks](#)

### LifeKeeper Core Software Packages

The LifeKeeper for Linux CD includes a core package cluster containing the following software packages:

- LifeKeeper (**steeleye-*lk***). The LifeKeeper core package provides recovery software for core system components, such as memory, CPUs, the operating system, the SCSI disk subsystem, and file systems.
- LifeKeeper GUI (**steeleye-*lkGUI***). The LifeKeeper GUI package provides a graphical user interface for LifeKeeper administration and monitoring.
- Online Product Manual (**steeleye-*lkHLP***). The LifeKeeper Online Product Manual package provides online product information that is HTML-based and accessed from a web browser. The manual includes product feature information and instructions for the LifeKeeper administration tasks.
- IP Recovery Kit (**steeleye-*lkIP***). The LifeKeeper IP Recovery Kit provides switchover software for automatic recovery of IP addresses.
- Raw I/O Recovery Kit (**steeleye-*lkRAW***). The LifeKeeper Raw I/O Recovery Kit provides support for applications that use raw i/o to bypass kernel buffering.

- **CCISS Recovery Kit (steeleye-**lkCCISS**)**. The LifeKeeper CCISS Recovery Kit provides support for HP devices using the CCISS block driver. This optional software package is located on the LifeKeeper Installation Support CD, and should only be installed if your cluster includes HP ProLiant servers that have shared storage using the CCISS block driver.
- **IPS/ServeRAID Recovery Kit (steeleye-**lkIPS**)**. The LifeKeeper IPS/ServeRAID Recovery Kit provides support for IBM ServeRAID controllers. This optional software package is located on the LifeKeeper Installation Support CD, and should only be installed if your cluster includes IBM servers with ServeRAID controllers connected to IBM EXP300 external storage.
- **Man Pages (steeleye-**lkMAN**)**. The LifeKeeper Man Page package provides reference manual pages for the LifeKeeper product.

## LifeKeeper Recovery Kits and Optional Software Packages

- **Database Recovery Kits (steeleye-**lkORA**, steeleye-**lkINF**, steeleye-**lkSQL**, steeleye-**lkDB2**, steeleye-**lkSAPDB**, steeleye-**lkSYBASE**, steeleye-**lkPGSQL**)**. These LifeKeeper recovery kits provide resource definition and switchover software for Oracle, Informix, MySQL, DB2, SAP DB, Sybase, and PostgreSQL, respectively.
- **Apache Web Server Recovery Kit (steeleye-**lkAPA**)**. This LifeKeeper recovery kit provides resource definition and recovery software for automatic switchover of the Apache web server processes and modules including SSL, perl, and php.
- **NFS Server Recovery Kit (steeleye-**lkNFS**)**. This LifeKeeper recovery kit provides resource definition and recovery software for automatic switchover of NFS exported files systems.
- **Network Attached Storage Recovery Kit (steeleye-**lkNAS**)**. This LifeKeeper recovery kit provides resource definition and recovery software for clients that have mounted an exported file system from an NFS server or Networked Attached Storage (NAS) device in the cluster.
- **SAP Recovery Kit (steeleye-**lkSAP**)**. This LifeKeeper recovery kit protects SAP application environment resources, including Netweaver support.
- **Mail Recovery Kits (steeleye-**lkSEN**, steeleye-**lkSAM**, steeleye-**lkMAILCENTER**)**. These LifeKeeper recovery kits provide resource definition and recovery software for the Sendmail Advanced Message Server (SAMS), Sendmail Switch processes, mailboxes, and mail queues, or Sendmail Mailcenter.
- **Samba Recovery Kit (steeleye-**lkSMB**)**. This LifeKeeper recovery kit provides resource definition and recovery software for Samba file and print shares on a Linux server existing in a heterogeneous network environment.
- **LVM Recovery Kit (steeleye-**lkLVM**)**. This recovery kit provides the ability to build File System or other application resources on logical volumes that are created using the Logical Volume Manager (LVM).
- **SteelEye Data Replication (steeleye-**lkDR**)**. This package provides resource definition and recovery software for network RAID devices (synchronous mirrors).
- **VMware ESX Server Virtual Machine Recovery Kit (steeleye-**lkVMWARE**)**. This recovery kit protects VMware ESX Server virtual machines.

- WebSphere MQ Recovery Kit (**steeleye-lkMQ**). This LifeKeeper recovery kit protects WebSphere MQ queue managers including the command server, the listener and the persistent queue manager data.

Additional recovery kits are available for the LifeKeeper for Linux product. For a complete, up-to-date list of available recovery kits and optional software, visit SteelEye's website at: [www.steeleye.com](http://www.steeleye.com).

## Using the LifeKeeper Installation Support CD

The LifeKeeper for Linux Installation Support CD provides a set of installation scripts designed to perform user-interactive system setup tasks that are necessary before LifeKeeper can be installed on your system. The Installation Support CD identifies what Linux distribution you are running and, through a series of questions you answer, installs various packages required to ensure a successful LifeKeeper installation. It also installs a licensing utilities package which provides utilities for obtaining and displaying the host ID of your server. Host IDs are used to obtain a valid license key for running LifeKeeper.

Refer to the Installation Support CD README file and the *LifeKeeper for Linux Release Notes* for additional information.

### Note:

- If you are using a Red Hat or SuSE distribution, make sure you have installed the public domain korn shell (**pdksh**) package before inserting the Installation Support CD.
- The CD-ROM directory to mount varies by Linux distribution. On Red Hat it is usually */mnt/cdrom*. On SuSE it is usually */cdrom*.
- If your server is not set up to automatically mount the CD-ROM drive, you can mount it using one of the following commands:

**mount /mnt/cdrom** (Red Hat), or

**mount /cdrom** (SuSE), or

**mount /dev/cdrom**

1. Insert the Installation Support CD into the CD-ROM Drive.
2. Change to the CDROM directory and type **sh setup**.

**Note:** If you are using a Caldera Linux distribution environment, you may need to change your default mount options first in order to run the setup script. To do this, edit */etc/fstab* and modify the **mntops** to remove “user” or mount it explicitly, using the **mount** command.

3. Text will appear explaining what is going to occur during the installation procedure. You will now be asked a series of questions, where you will answer “y” for Yes or “n” for No. The type and sequence of the questions are dependent on your Linux distribution.

Read each question carefully to ensure a proper response. It is recommended that you answer **Yes** to each question in order to complete all the steps required for a successful LifeKeeper Installation.

**Note:** The Installation Support CD may install kernel modules to support shared storage devices or the optional Data Replication (v4.4), NFS, CCISS, and IPS/ServeRAID Recovery Kits. If the kernel module installation does not complete properly, refer to [Manual Installation of Kernel Modules](#) in Appendix B: Troubleshooting.

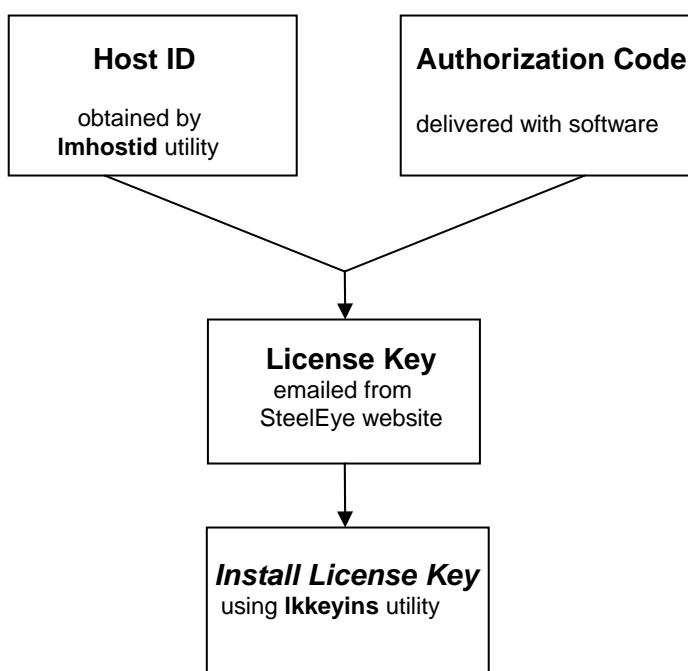
4. The last item in the setup script is the installation of the LifeKeeper licensing utilities. See the next section [Obtaining and Installing the License Key](#) for details.
5. After you have answered all the questions posed by the setup script, it should inform you that the installation was successful.
6. Finally, you will be required to reboot your system in order to boot the new kernel that was just installed before installing the LifeKeeper rpm packages from the LifeKeeper Core CD.

**Note:** Trace information for execution of the setup scripts is saved in `/var/log/LK_install.log`.

## Obtaining and Installing the License Key

LifeKeeper v4.4.0 or later requires a unique license key for each server for the Core and each optional recovery kit. The license key is a run-time license, which means that you can install LifeKeeper without it, but the license must be installed to before you can successfully start and run LifeKeeper.

The Installation Support script installs the Licensing Utilities package which obtains and displays the host ID of your server. The host ID, along with the authorization code which was provided with your LifeKeeper Core software, is used to obtain permanent license keys required to run LifeKeeper. The process is illustrated below.



**Note:** Each software package requires a license key for each server. For example, if your LifeKeeper cluster consists of two servers and you plan to install one recovery kit on each, you will probably have four authorization codes - two for each LifeKeeper Core and two for each recovery kit. However, some kits may provide multiple resource types that require more than one license key.

Perform the following steps to obtain and install your license key for *each server* in the LifeKeeper cluster:

1. **Get your host ID.** Make note of the host ID displayed by the licensing utility in the Installation Support setup script. (If you need to obtain your host ID again at a later time, you may do so using the command `$LKROOT/bin/lmhostid`.)
2. **The setup script will ask if you want to install your license keys now.**
  - Answering **Yes** will start the `lkkeyins` utility. You will be prompted for a license key which must be obtained by following steps 3 and 4 below.
  - Answering **No** will end the setup script. You can install the license keys later by running the command `$LKROOT/bin/lkkeyins`. (Do this after completing steps 3 and 4 below.)
3. **Ensure you have your LifeKeeper authorization code.** If you obtained your LifeKeeper Core software via CD, the authorization code is printed on the envelope containing the CD.
4. **Obtain your license keys at [www.steeleye.com/support](http://www.steeleye.com/support).** Click on the License Key link. After logging in you will be prompted to enter your host ID *and* authorization code for each software license needed. Immediately after providing the necessary information, your license keys will be emailed to you, each in a separate email.

**Note:** The license key may be a long string. Therefore, if you receive the email on the LifeKeeper server, you may **Edit-Copy** each license key and then paste it when prompted by the license key utility (see the following step). Otherwise, we recommend that you save the license keys in a text file (each key on a separate line) and copy the file to the LifeKeeper server. The license keys can be read directly from the file by the `lkkeyins` utility.
5. **Install the license key.** If you answered **Yes** in step 2 above, the `lkkeyins` utility will have started automatically. If you answered **No** in step 2 above, you can now run `$LKROOT/bin/lkkeyins`.

You may enter the license key using one of the following methods:

  - Enter a filename containing the license key obtained by email
  - Cut and paste the string from the email file
  - Type the string manually (least desirable option)

After entering the first license key, press **Enter**, and you will be prompted for another license key. Continue entering license keys, and when all have been entered, press **Enter** a second time. You should see the message:

```
LifeKeeper license key installation was successful!
```
6. **Repeat on additional servers.** Run the Installation Support setup script and install additional license keys on the other server(s) in the cluster using the same procedure.

## Primary Network Interface Change May Require New License Key

The host ID used by the license key utility is obtained from the LifeKeeper server's **primary** network interface card (NIC). LifeKeeper will check for a valid license key each time it starts. If your LifeKeeper server should require a NIC replacement in the future that would cause the host ID to change, then the next time LifeKeeper is stopped, you must obtain a new license key before starting LifeKeeper again. In this case, contact SteelEye customer support to obtain a new license key.

## Installing the LifeKeeper Software

Install the LifeKeeper software on *each* server in the LifeKeeper configuration. Each LifeKeeper server must have the packages necessary to support your configuration requirements, including any optional LifeKeeper recovery kit packages. The LifeKeeper Core is installed first, followed by the optional recovery software.

You can install LifeKeeper using any **rpm** supported graphical interface or through the command line. This section provides instructions on installing the core package cluster using:

- GnoRPM or kpackage graphical interfaces
- the **rpm** command from the command line - refer to the **rpm(8)** man page for complete instructions on using the rpm command

For more information on rpm software, you can go to the following web site: [www.rpm.org](http://www.rpm.org)

**Note:** These installation instructions assume that you are familiar with the Linux operating system installed on your servers.



---

### Important:

- Installing LifeKeeper on your shared storage is **not** supported. Each server should have its own copy installed on its local disk.
- By default, LifeKeeper packages are installed in the directory */opt/LifeKeeper*. Using this default directory is recommended. However, if you must relocate LifeKeeper, refer to the **rpm(8)** man page for detailed information on RPM relocation.
- If you relocate the LifeKeeper core package, you must relocate all LifeKeeper packages, including the distribution enabling packages and recovery kits, into the same directory as the core package. Use the **sh setup -d <dir>** command to relocate the distribution enabling packages.

**Note:** If the setup script has already been run, the distribution enabling package is installed and needs to be removed and reinstalled via the **sh setup -d <dir>** command in order to relocate the package.

- If you are re-installing the existing version of LifeKeeper, you should remove the old LifeKeeper packages first. A standard LifeKeeper installation requires that you redefine any existing resource hierarchies. If you wish to retain your current resource hierarchy definitions, refer to the *LifeKeeper Release Notes* and the [Upgrading LifeKeeper](#) section in this document for upgrade instructions.
- If you receive the following error message when you are installing LifeKeeper, you should run/re-run the setup script on the LifeKeeper Installation Support CD:

```
ERROR:  
Cannot find the $LKROOT/config/postinstall-hook file.  
Have you installed the LifeKeeper Distribution Enabling  
package?
```

### Installing the LifeKeeper Software using GnoRPM or kpackage

1. Insert the LifeKeeper for Linux CD into the CD-ROM drive. If auto-run is not turned on, open it manually or use the command line options.
2. If using GnoRPM, the GnoRPM window will appear on your monitor if you have auto-run for your CD-ROM turned on.

If using kpackage, then from the KDE menu, locate and then click on the kpackage icon, or run **kpackage** at the command prompt.

3. Because the LifeKeeper Core package is required to be installed before the other packages, select only the **steeleye-lk** package and install it first.

**Note:**

- If using kpackage, make sure the Check Dependencies box is checked.
  - For SuSE users: If you are using a version of kpackage *prior* to 2.0.1, you should uncheck the Use Scripts box due to a problem with the Use Scripts option that was fixed in 2.0.1.
4. Next, select the remaining LifeKeeper packages to install.
  5. Install optional LifeKeeper recovery kit packages from their individual CDs using the same procedure.

**Note:**

- Do not attempt to select the translation table file. RPM will not allow you to either highlight or add this file as part of the installation.
  - If using kpackage, make sure the Check Dependencies box is checked.
6. Repeat the above steps on all other servers in the cluster.

## Installing the LifeKeeper Software from the Command Line

1. Determine the mount point to your CD-ROM drive, and from the command line prompt, type

```
cd /mnt/cdrom/LifeKeeper/RPMS
```

where */mnt/cdrom* is your CD-ROM drive mount point.

2. At the next prompt, type

```
rpm -i <package name>.<architecture>.rpm
```

starting with the LifeKeeper Core package first (steeleye-lk-<LifeKeeper Version>), then the rest of the packages on the Core CD:

```
steeleye-lkGUI-<LifeKeeper Version>
```

```
steeleye-lkHLP-<LifeKeeper Version>
```

```
steeleye-lkIP-<LifeKeeper Version>
```

```
steeleye-lkMAN-<LifeKeeper Version>
```

Optional packages:

```
steeleye-lkRAW-<LifeKeeper Version>
```

**Note:** Although the instructions above indicate the correct sequence for installing the LifeKeeper packages, under Caldera, the **rpm -i \*** command will not install all the packages as you might think, but will leave off the last package in the subdirectory. A workaround would be to use **rpm -i steel\***.

3. You will see informational messages during the installation. If you receive no error messages before you get another prompt, the LifeKeeper packages have installed correctly.
4. Install the LifeKeeper Core CD on the other server(s) in the cluster using the same procedure.
5. Next, install LifeKeeper recovery kits and optional software packages from their individual CDs using the same procedure..

**Note:** For upgrade installations, you would use the **rpm -U** option in place of the **rpm -i** option. See the [Upgrading LifeKeeper](#) section later in this document for additional upgrade information.

## Verifying LifeKeeper Installation

You can verify that the LifeKeeper packages were installed correctly using one of the following three procedures:

- Using GnoRPM, select each package and click the **Verify** button.
- Using kpackage, select each package individually from the left pane, and then select the Properties tab in the right pane where the package information should appear.
- At the command line, enter the following:

```
rpm -V <package name>
```

**Note:** If the package is installed correctly, no output will be displayed by this command.

To perform a query from the command line, type

```
rpm -qi <package name>
```

**Note:** The expected output for this command is the package information.

## Starting LifeKeeper

When you have completed all of the verification tasks, you are ready to start LifeKeeper on *both* servers. This section provides information for starting the LifeKeeper server daemon processes. The LifeKeeper GUI application is launched using a separate command and is described in detail later in this section. LifeKeeper provides a command line interface that starts and stops the LifeKeeper daemon processes. These daemon processes must be running before you start the LifeKeeper GUI.

### Starting LifeKeeper Server Processes

If LifeKeeper is not currently running on your system, type the following command as the user root on *all* servers:

```
$LKROOT/bin/lkstart
```

Following the delay of a few seconds, a message similar to the following is displayed:

```
# /opt/LifeKeeper/bin/lkstart
steeleye-lk
3.1.3
Copyright (C) 2001 SteelEye Technology Inc.
LIFEKEEPER STARTING TO INITIALIZE AT: Tue Apr 18 14:43:03 EDT 2000
LifeKeeper is starting to initialize at Tue Apr 18 14:43:04 EDT
2000
LIFEKEEPER NOW RUNNING AT: Tue Apr 18 14:45:44 EDT 2000
```

**Note:** If you receive the following error message when you start LifeKeeper, you should install / re-install the LifeKeeper Installation Support CD:

```
ERROR:
Cannot find the $LKROOT/config/lkstart-hook file.
Have you installed the LifeKeeper Distribution Enabling package?
```

See the **LCD(1M)** man page by entering **man LCD** at the command line for details on the **lkstart** command.

## Setting Up TTY Communication Paths

If you plan to use a TTY communications (comm) path for a LifeKeeper heartbeat, you need to set up the physical connection for that heartbeat. Remember that multiple communication paths are required to avoid false failover due to a simple communications failure. A LAN-based (TCP) comm path should also be used.

Connect the TTY cable to the serial ports of each server to be used for the serial heartbeat.

1. Test the serial path using the **portio** command (see the **portio(1M)** man page by entering **man portio** for details on usage):

```
$LKROOT/bin/portio -r -p port -b baud
```

where

- **baud** is the baud rate selected for the path (normally 9600)
- **port** is the serial port being tested on Server 1, for example */dev/ttyS0*.
- Server 1 is now waiting for input from Server 2.

2. Run command **portio** on Server 2. On the second server in the pair, type the following command:

```
echo Helloworld | $LKROOT/bin/portio -p port -b baud
```

where:

- **baud** is the same baud rate selected for Server 1.
- **port** is the serial port being tested on Server 2, for example */dev/ttyS0*.

3. View the console. If the communications path is operational, the software writes “Helloworld” on the console on Server 1. If you do not see that information, perform diagnostic and correction operations before continuing with LifeKeeper configuration.

## Related LifeKeeper Administration Tasks

There are a few tasks related to LifeKeeper installation that you should know about for future reference. These tasks include [Stopping LifeKeeper](#), [Viewing LifeKeeper Processes](#), [Removing LifeKeeper](#) and [Upgrading LifeKeeper](#).

### Stopping LifeKeeper Server Processes

If you need to stop LifeKeeper, type the following command as *root* to stop it:

```
$LKROOT/bin/lkstop
```

This command halts all LifeKeeper daemon processes on the server being administered if they are currently running. Messages similar to the following are displayed:

```
# /opt/LifeKeeper/bin/lkstop
STOPPING LIFEKEEPER AT: Tue Apr 18 14:08:44 EDT 2000
/opt/LifeKeeper/bin/perform_action -G -t lk_linux-on-galahad -a
remove -- -m
LifeKeeper: Oracle database lk_linux shutdown started
LifeKeeper: Oracle database lk_linux successfully shutdown
/opt/LifeKeeper/bin/perform_action -G -t filesys5035 -a remove -- -
...
LifeKeeper: Flushing buffers on /dev/sdc2.
  ioctl.pl -f /dev/sdc2
LifeKeeper: Flushing buffers on /dev/sdc.
  ioctl.pl -f /dev/sdc
LifeKeeper: unlocking SCSI /dev/sdc
LifeKeeper: SCSI /dev/sdc successfully unlocked.
/opt/LifeKeeper/bin/perform_action -G -t homel-on-galahad -a
remove -- -m
/opt/LifeKeeper/bin/perform_action -G -t device4925 -a remove -- -
m
/opt/LifeKeeper/bin/perform_action -G -t ipeth0-172.17.100.247 -a
remove -- -m
LIFEKEEPER NOW STOPPED AT: Tue Apr 18 14:09:41 EDT 2000
```

### Viewing LifeKeeper Processes

To see a list of all LifeKeeper daemon processes currently running, type the following command:

```
ps -ef | grep LifeKeeper
```

An example of the output is provided below:

```
root  947  1  0 16:25 ?  00:00:00 /opt/LifeKeeper/bin/lcm
root  948  1  0 16:25 ?  00:00:00 /opt/LifeKeeper/bin/ttymonlcm
root  949  1  0 16:25 ?  00:00:00 /opt/LifeKeeper/bin/lcd
root  950  1  0 16:25 ?  00:00:00 /opt/LifeKeeper/bin/lkcheck
root  951  1  0 16:25 ?  00:00:00 /opt/LifeKeeper/bin/lkscsid
root 1104  1  0 16:26 ?  00:00:00 /opt/LifeKeeper/bin/lk_logmgr -1
```

**Note:** There are additional GUI Server daemon processes that run in addition to the core LifeKeeper daemon processes shown above. See the section entitled [Viewing LifeKeeper GUI Server Processes](#) later in this document for a list of the processes associated with the GUI Server.

## Removing LifeKeeper Software

You can uninstall the LifeKeeper packages in a Linux environment using any **rpm** supported graphical interface or through the command line. This section provides detailed instructions on uninstalling LifeKeeper using GnoRPM, the kpackage utility, or the **rpm** command from the command line - refer to the **rpm(8)** man page for complete instructions on using the **rpm** command

For information on rpm software, you can go to the following web site: <http://www.rpm.org/>.



---

**IMPORTANT:** Below are requirements for removing LifeKeeper software.

1. **Move applications.** Before you remove LifeKeeper software, you should verify that you do not have applications requiring LifeKeeper protection on the server. You should never remove LifeKeeper from a server where an application resource hierarchy is in service. Removing LifeKeeper removes all configuration data, such as equivalencies, resource hierarchy definitions, and log files.
2. **Start LifeKeeper.** LifeKeeper recovery kits may require LifeKeeper to be running when you remove the recovery kit software. If it is not running, the removal process cannot remove the resource instances from other LifeKeeper servers in the cluster, which would leave the servers in an inconsistent state.
3. **Remove all packages.** If you remove the LifeKeeper core, you should first remove other packages that depend upon LifeKeeper, for example, LifeKeeper recovery kits. It is recommended that before removing a LifeKeeper recovery kit, you first remove the associated application resource hierarchy.

**Note:** It is recommended that before removing recovery kit software, first remove any associated hierarchies from that server. You may do this using the Unextend Resource configuration task. If you remove a LifeKeeper recovery kit package without unextending the existing hierarchies, any of the corresponding resource hierarchies currently defined and protected by this recovery kit will automatically be deleted from your system. The general rule is: You should never remove the recovery kit from a server where the resource hierarchy is in-service. This will corrupt your current hierarchies, and you will need to recreate them when you reinstall the recovery kit.

### Removing LifeKeeper Software using GnoRPM or kpackage

1. Bring up the GnoRPM or kpackage window.
2. Select the package you want to uninstall. As stated earlier, **if you remove the LifeKeeper core, you should first remove other packages that depend upon LifeKeeper, for example, any LifeKeeper recovery kits.**

3. Click **Uninstall**.
4. Remove the LifeKeeper package on the other server(s) in the cluster using the same procedure.

### Removing LifeKeeper Software from the Command Line

To remove LifeKeeper packages from a server, use the **rpm -e <package name>** command. Refer to the **rpm(8)** man page for complete instructions on using the **rpm** command.

For example, to remove the LifeKeeper core package, enter the following command:

```
rpm -e steeleye-lk
```

### Removing Distribution Enabling Packages

After removing the LifeKeeper packages, the distribution-specific enabling package installed by the setup script on the LifeKeeper Installation Support CD should be removed. Depending on your Linux distribution, that package name is **steeleye-lk<Linux Distribution>**, for example:

```
steeleye-lkRedHat  
steeleye-lkCaldera  
steeleye-lkSuSE  
steeleye-lkMiracleLinux
```

You can use any of the methods listed above to remove this package.

### Upgrading LifeKeeper

LifeKeeper for Linux may be upgraded to future releases while preserving existing resource hierarchies. Review this information carefully to ensure that you use the best upgrade procedure for your environment, and minimize application downtime. **Beta Customers should use the latest upgrade instructions included in the *LifeKeeper Release Notes* to upgrade from Beta Software to final versions of LifeKeeper for Linux.**

1. If you are upgrading a LifeKeeper cluster with only two nodes, proceed directly to step 2. If you are upgrading a LifeKeeper cluster with greater than two nodes, switch all applications away from the server to be upgraded now. Do this manually or by setting the LifeKeeper shutdown strategy to switchover, which causes the applications to be switched when LifeKeeper is stopped or the server is shut down.
2. If necessary, upgrade the Linux operating system before upgrading LifeKeeper. It is recommended that you unextend all resources from a server that is to be upgraded prior to performing the operating system upgrade.
3. Upgrade your LifeKeeper distribution enabling packages using the LifeKeeper Installation Support CD. To upgrade the LifeKeeper distribution enabling packages, insert the LifeKeeper Installation Support CD, change to the CD-ROM directory and execute **sh setup**. If your server is not setup to automatically mount the CD-ROM drive, you will need to mount it explicitly, using the **mount** command, before running the **setup** script.

4. To upgrade LifeKeeper, insert the LifeKeeper for Linux Core CD and use any install interface that supports Red Hat Package manager (RPM).

Details for using **GnoRPM** and the **rpm** command are provided below:

- **Upgrading via GnoRPM** - When the CD is inserted, the GnoRPM window will appear automatically if auto-run is turned on. Otherwise, it will need to be started manually. Click on the **Install** button. From the Install window, click **Add**. Select the appropriate LifeKeeper and recovery kit packages to upgrade on that server from the Add Packages window. Click **Add**, and close the window. From the Install window, click **Upgrade**. A progress dialog will appear confirming that the packages are being upgraded.
- **Upgrading via Command Line** - When the CD is inserted, enter the command change directories to `/mnt/cdrom/LifeKeeper/RPMS`, and use **ls** to view the packages. Select the appropriate LifeKeeper and recovery kit packages to upgrade on that server, and enter **rpm -U <package name>** from the command line for each package. You will see informational messages confirming that the packages are being upgraded.

**Note:** RPM performs an upgrade by installing the desired package, and then erasing the older version of the package. In some cases, it may be necessary to use the force option to upgrade packages that are nearly identical (e.g. upgrading from the evaluation version of the LifeKeeper for Linux product).

5. After upgrading, stop and restart the LifeKeeper GUI in order to load the updated GUI client.
6. If you are upgrading a LifeKeeper cluster with greater than two nodes, switch all applications back to the upgraded server.
7. Repeat this procedure for each server in the LifeKeeper cluster to be upgraded.

**Note:** With LifeKeeper GUI v5.2.0, the GUI server is not compatible with earlier versions of LifeKeeper GUI clients, because of security enhancements used to implement the roles. Earlier versions of the GUI client will be unable to connect to LifeKeeper GUI server version 5.2.0. Version 5.2.0 GUI clients are able to connect to earlier server versions, although these earlier servers will not be able to support non-administrative user roles until they are upgraded.

Keep this in mind during rolling upgrades, where resources are moved in and out of service from one server to the next in order to minimize application down time. During rolling upgrades all the versions of the LifeKeeper GUI in a cluster are not the same until the upgrade of the each server in the cluster is complete. If you are doing a rolling upgrade to LifeKeeper version 5.2.0, always run the GUI client from one of the servers that has already been upgraded.

## Upgrading Sendmail

LifeKeeper protected Sendmail hierarchies must be unextended before upgrading the Linux operating system. If symbolic links are used for the message queue (`/var/spool/mqueue`), and the receiving directory (`/var/spool/mail`), the operating system upgrade removes these links. They will need to be recreated after the upgrade is completed.

## Upgrading Apache

Upgrading a LifeKeeper protected Apache application as part of upgrading the Linux operating system requires that the default server instance be disabled on startup.

If your configuration file (*httpd.conf*) is in the default directory (*/etc/httpd/conf*), the operating system upgrade will overwrite the configuration file. Therefore, you should make a copy of the file before upgrading and restore the file after upgrading. Also see the *Specific Configuration Considerations for Apache Web Server* section in the *Apache Web Server Recover Kit Administration Guide*.

**CAUTION:** The same version and release of LifeKeeper must be installed on all systems in a cluster. In general, different versions and/or releases of LifeKeeper are not compatible. For situations other than rolling upgrades LifeKeeper should not be started when a different version or release is resident and running on another system in the cluster.

## Chapter 4

# LifeKeeper GUI Overview

The LifeKeeper GUI uses Java technology to provide a graphical user interface to LifeKeeper and its configuration data. Since the LifeKeeper GUI is a client/server application, a user will run the graphical user interface on a client system in order to monitor or administer a server system where LifeKeeper is running. The client and the server components may or may not be on the same system.

The major sections of this chapter are:

[GUI Server](#)

[GUI Client](#)

[LifeKeeper GUI Software Package](#)

### GUI Server

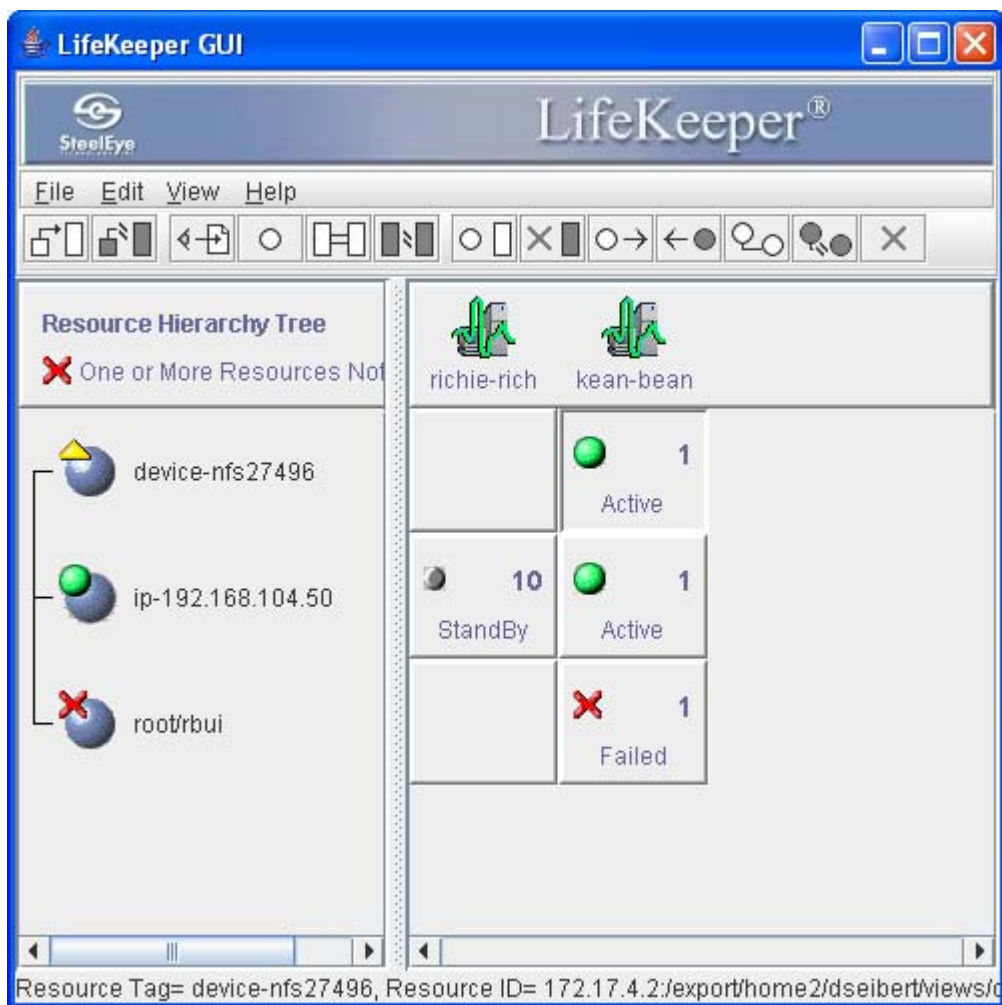
The LifeKeeper GUI server is initialized on each server in a LifeKeeper cluster at system startup. It communicates with the LifeKeeper core software via the Java Native Interface (JNI) and with the LifeKeeper GUI client using Hypertext Transfer Protocol (HTTP) and Remote Method Invocation (RMI).

### GUI Clients

LifeKeeper ships with two clients that can connect to the GUI server: an application client that is designed to run on Linux systems, and a web client that can be run from any system that can connect to ports 81 and 82 of all servers in the cluster.

Both LifeKeeper clients include the same graphical components:

- Pop-up server and resource context menus provide access to server- and resource-related actions.
- The menu bar provides access to all LifeKeeper GUI actions.
- The toolbar provides quick access to many LifeKeeper actions.
- The status window displays a graphical representation of the servers connected in the cluster, resource hierarchies, and the status of resources and servers.
- The message bar at the bottom of the window displays processing information to the user.



## The LifeKeeper GUI Software Package

The LifeKeeper GUI is included in the **steeleye-lkGUI** software package, which is bundled with the LifeKeeper Core Package Cluster. The **steeleye-lkGUI** package:

- installs the LifeKeeper GUI application client.
- installs the LifeKeeper GUI Server and modifies */etc/inittab* to include the GUI server.
- installs the LifeKeeper administration web server, mhttpd, and modifies */etc/inittab* to include the web server. Note: The LifeKeeper administration web server is configured to use port 81, which should be different from any public web server.
- installs a Java policy file in *\$LKROOT/htdoc/*, which contains the minimum permissions required to run the LifeKeeper GUI application client. The LifeKeeper GUI application client uses the *java.policy* file in this location for access control.

- prepares LifeKeeper for GUI administration.

If you have been following the task sequence so far in this guide, then you have already installed the LifeKeeper GUI package. You can enter the command **rpm -q steeleye-lkGUI** to verify that this package is installed. You should see output that resembles the following if the GUI package is installed:

```
steeleye-lkGUI-<LifeKeeper Version>
```

## Chapter 5

# Configuring the LifeKeeper GUI Server

Before continuing, you should ensure that the LifeKeeper GUI package has been installed on the LifeKeeper server(s).

The major sections of this chapter are:

[Configuring the LifeKeeper Server for GUI Administration](#)

[LifeKeeper GUI Server Administration Tasks](#)

### Configuring the LifeKeeper Server for GUI Administration

Perform the following steps to configure the LifeKeeper server(s) for GUI Administration.

1. Install Java. The Java Runtime Environment (JRE) or the Java Software Development Kit (JDK) must be installed on *each* server.

**Note:** You may have installed the JRE when running the setup script on the Installation Support CD; if not, you may run the setup script on the Installation Support CD and opting only to install the JRE. (See [Using the LifeKeeper Installation Support CD](#) earlier in this guide for more information.) The JRE, which consists of the Java virtual machine, the Java platform core classes, and supporting files, is the minimum required to run the LifeKeeper GUI Server. See the *Technical Notes: GUI Configuration* section in the *LifeKeeper Release Notes* for the required Java platform version and URL to access the download if you do not have the LifeKeeper Installation Support CD.

**Note:** By default, the LifeKeeper GUI server expects the JRE on each server to be installed in the directory `/usr/java/j2re1.4.2_04/`. If this is not found, it will look in the directory `/usr/java/j2sdk1.4.2_04/` for a Java Software Development Kit (JDK). If you want to use a JRE or JDK in another directory location, you must edit the PATH in the LifeKeeper default file `/etc/default/LifeKeeper` to include the directory containing the java interpreter, java.exe. If LifeKeeper is running when you edit this file, you should stop and restart the LifeKeeper GUI server to recognize the change. Otherwise, the LifeKeeper GUI will not be able to find the Java command.

2. Start the LifeKeeper GUI Server. If the LifeKeeper GUI Server is not running, type the following command as root on each server:

**`$LKROOT/bin/lkGUIserver start`**

This command starts all LifeKeeper GUI Server daemon processes on the server being administered if they are not currently running. A message similar to the following is displayed.

```
# Installing GUI Log
# LK GUI Server Startup at:
# Mon May 8 14:14:46 EDT 2006
# Setting up inittab entries
# LifeKeeper GUI Server Startup completed at:
# Mon May 8 14:14:46 EDT 2006
```

**Note:** Once the GUI Server has been started following an initial installation, starting and stopping LifeKeeper will start and stop all LifeKeeper daemon processes including the GUI server. See the subsequent section, LifeKeeper GUI Server Administration Tasks for information on viewing and stopping the GUI server processes.

3. Configure GUI Users. There are three classes of GUI users, with different permissions for each.
  1. Users with *Administrator* permission throughout a cluster can perform all possible actions through the GUI.
  2. Users with *Operator* permission on a server can view LifeKeeper configuration and status information, and can bring resources into service and take them out of service on that server.
  3. Users with *Guest* permission on a server can view LifeKeeper configuration and status information on that server.

The GUI server must be invoked as root. During installation of the GUI package, an entry for the root login and password is automatically configured in the GUI password file with Administrator permission, allowing root to perform all LifeKeeper tasks on that server via the GUI application or web client. If you plan to allow users other than root to use LifeKeeper GUI clients, then you need to configure LifeKeeper GUI users.

The best practice is to always grant permissions on a cluster-wide basis. It is possible to grant permissions on a single-server basis, but that is confusing to users, and makes it impossible to perform administrative tasks.

User administration is performed through the command line interface, using `lkpasswd`, as described below. Unless otherwise specified, all commands require you to enter the user's password twice. They take effect on the user's next login, or when the GUI server is restarted, whichever comes first. Each user has a single permission on a given server. Previous permission entries are deleted if a new permission is specified on that server.

- To grant a user *Administrator* permission for the LifeKeeper GUI, type the following command:

**`/opt/LifeKeeper/bin/lkpasswd -administrator <user>`**

- To grant a user *Operator* permission for the LifeKeeper GUI, type the following command:  
**`/opt/LifeKeeper/bin/lkpasswd -operator <user>`**
- To grant a user *Guest* permission for the LifeKeeper GUI, type the following command:  
**`/opt/LifeKeeper/bin/lkpasswd -guest <user>`**
- To *change* the password for an existing user without changing their permission level, type the following command:  
**`/opt/LifeKeeper/bin/lkpasswd <user>`**
- To *prevent* an existing user from using the LifeKeeper GUI, type the following command:  
**`/opt/LifeKeeper/bin/lkpasswd -delete <user>`**

This command does not require password entry.

**Note:** These commands update the GUI password file only on the server being administered. You should repeat the command on all servers in the LifeKeeper cluster.

After completing the above tasks, you can run the LifeKeeper GUI as an application on your LifeKeeper server.

## LifeKeeper GUI Server Administration Tasks

### Stopping the LifeKeeper GUI Server

If the LifeKeeper GUI Server is running, type the following command as *root* to halt all LifeKeeper GUI Server daemon processes on the server being administered:

**`$LKROOT/bin/lkGUIserver stop`**

The following messages are displayed:

```
# LifeKeeper GUI Server Shutdown at:  
# Fri May 19 15:37:27 EDT 2006  
# Removing inittab entries  
# LifeKeeper GUI Server Shutdown Completed at:  
# Fri May 19 15:37:28 EDT 2006
```

## Viewing LifeKeeper GUI Server Processes

To verify that the LifeKeeper GUI Server is running, type the following command:

```
ps -ef | grep runGuiSer
```

You should see output similar to the following:

```
root    2805    1  0  08:24 ?        00:00:00 sh /opt/LifeKeeper/  
bin/runGuiSer
```

To see a list of the other GUI Server daemon processes currently running, type the following command:

```
ps -efw | grep S_LK
```

You should see output similar to the following:

```
root    769    764  0 Oct16 ?          00:00:00 /usr/jre1.2.2/  
bin/i386/green_threads/rmiregistry -J-DS_LK=true 82  
  
root    819    764  0 Oct16 ?          00:00:00 /usr/jre1.3.1/  
bin/i386/green_threads/java -DS_LK=true -0ss3m -ss3m  
-Dcom.steeleye.Li
```

## Chapter 6 Running the LifeKeeper GUI

You can run the LifeKeeper GUI:

- on a LifeKeeper server in the cluster and/or
- on a remote system outside the cluster.

The major sections of this chapter are:

[Running the GUI on a LifeKeeper Server](#)

[Running the GUI on a Remote System](#)

[Java Security Policy](#)

[Browsers and the Java Plug-In](#)

### Running the GUI on a LifeKeeper Server

The simplest way to run the LifeKeeper GUI is as an application on a LifeKeeper server. By doing so you are, in effect, running the GUI client and server on the same system.

1. After configuring the LifeKeeper server for GUI Administration, you can run the GUI as an application on the server by entering the following command as root:

```
$LKROOT/bin/lkGUIapp
```

or, select the LifeKeeper GUI icon from the GNOME or KDE desktop.

2. The **lkGUIapp** script sets the appropriate environment variables and starts the application. As the application is loading, an application identity dialog or splash screen for LifeKeeper appears.
3. After the application is loaded, the LifeKeeper GUI appears and the Cluster Connect dialog is automatically displayed. Enter the Server Name you wish to connect to, followed by the login and password.
4. Once a connection to the cluster is established, the GUI window displays a visual representation and status of the resources protected by the connected servers. The GUI menus and toolbar buttons provide administration functions.

### Adding the LifeKeeper GUI Icon to the Desktop Toolbar

You may choose to launch the LifeKeeper GUI from the Linux Gnome or KDE desktops. In this manner, the LifeKeeper GUI is run like any other desktop application. Additionally, you may want to add the LifeKeeper GUI icon to your desktop toolbar. Perform the following steps to add the LifeKeeper GUI as an icon on your desktop toolbar.

**Note:** The location of the System menu may vary depending on the Linux distribution you are using.

If you are using Gnome:

1. Select **System** on the Footprint desktop menu.
2. Right click on **LifeKeeper GUI**.
3. Select **Add this launcher to panel**.

The icon should now appear on the desktop toolbar.

If you are using KDE:

1. On the **K** desktop menu, select **Panel**, then **Add Application**.
2. Select **System**, then **LifeKeeper GUI**.

The icon should now appear on the desktop toolbar.

## Running the GUI on a Remote System

You may administer LifeKeeper from a Linux, Unix or Windows system outside the LifeKeeper cluster by running the LifeKeeper GUI as a Java applet. Configuring and running the GUI in this environment is described below.

### Configuring the GUI on a Remote System

In order to run the LifeKeeper GUI on a remote Linux, Unix or Windows system, your browser must provide full JDK 1.3 support. Refer to the *LifeKeeper Release Notes* for information on the supported platforms and browsers for the LifeKeeper GUI.

1. If you are running the LifeKeeper GUI as an applet, you need to create a user policy file in your home directory if one does not already exist. The user policy file should specify the minimum permissions required to run the LifeKeeper GUI.
  - The **simplest way to create a user policy file** with the minimum permissions required to run the LifeKeeper GUI is to copy the LifeKeeper GUI policy file located in *\$LKROOT/htdoc/java.policy* to your home directory and rename it *.java.policy* (note there is a leading dot in the file name that is required). On a Windows system, you can copy the LifeKeeper GUI policy file by opening the file *http://<server name>:81/java.policy* (where <server name> is the host name of a LifeKeeper server), and saving it as *.java.policy* in your home directory. If you need to determine the correct location for a user policy file, enable the Java Console using the Java Control Panel, and start the LifeKeeper GUI as an applet. The home directory path for the user policy file will be displayed in the Java Console.
  - If you already have a user policy file, you can add the required entries specified in *\$LKROOT/htdoc/java.policy* on a LifeKeeper server into the existing file using a simple text editor. See the [Java Security Policy](#) section for further information.

2. You must set your browser security parameters to low. This generally includes enabling of Java and Java applets. Since there are several different browsers and versions, the instructions for setting browser security parameters are covered in the section [Setting Browser Security Parameters for the GUI Applet](#) later in this guide.

**Note:** It is important to use caution in visiting external sites with low security settings.

3. When you run the GUI for the first time, if you are using Netscape or Internet Explorer and your system does not have the required Java plug-in, you will be automatically taken to the appropriate web site for downloading the plug-in. See the *LifeKeeper Release Notes* for the required Java Plug-in version and URL to access the download.

## Running the GUI on a Remote System

After you have completed the tasks described above, you are ready to run the LifeKeeper GUI as a Java applet on a remote system.

1. Open the URL, `http://<server name>:81`, for the LifeKeeper GUI web page (where <server name> is the name of the LifeKeeper server). The web page contains the LifeKeeper splash screen and applet. When the web page is opened, the following actions take place:
  - the splash screen is displayed
  - the applet is loaded
  - the Java Virtual Machine is started
  - some server files are downloaded
  - the applet is initialized

Depending upon your network and system configuration, these actions may take up to 20 seconds. Typically, browsers provide some minimal status as the applet is loading and initializing.

If everything loads properly, a **Start** button should appear in the applet area. If the splash screen does not display a **Start** button or you suspect that the applet failed to load and initialize, refer to the [Applet Troubleshooting](#) section, or see the [GUI Network-Related Troubleshooting](#) sections later in Appendix B of this guide.

2. When prompted, click **Start**. The LifeKeeper GUI appears and the **Cluster Connect** dialog is automatically displayed. Once a Server has been entered and connection to the cluster established, the GUI window displays a visual representation and status of the resources protected by the connected servers. The GUI menus and toolbar buttons provide LifeKeeper administration functions.

**Note:** Some browsers add “Warning: Applet Window” to windows and dialogs created by an applet. This is normal and should be ignored.

## Java Security Policy

The LifeKeeper client application is dependent on Java's policy-based access control. When the client application is loaded, it is assigned permissions based on the security policy currently in effect. The policy, which specifies permissions that are available for code from various signers/locations, is initialized from an externally configurable policy file.

There is, by default, a single system-wide policy file and an optional user policy file. The system policy file, which is meant to grant system-wide code permissions, is loaded first, and then the user policy file is added to it. In addition to these policy files, the LifeKeeper GUI policy file may also be loaded.

### Location of Java Security Policy Files

The system policy file is by default located at:

`<JAVA.HOME>/lib/security/java.policy` (**Linux**)

`<JAVA.HOME>\lib\security\java.policy` (**Windows**)

**Note:** JAVA.HOME refers to the value of the system property named "JAVA.HOME," which specifies the directory into which the JRE or JDK was installed.

The user policy file is by default located at `<USER.HOME>\.java.policy`

**Note:** USER.HOME refers to the value of the system property named "user.home," which specifies the user's home directory. For example, the home directory on a sample Windows NT workstation for a user named Paul would be "paul.000".

For Windows systems, the user.home property value defaults to:

`C:\WINNT\Profiles\<USER>` (**on multi-user Windows NT systems**)

`C:\WINDOWS\Profiles\<USER>` (**on multi-user Windows 95/98 systems**)

`C:\WINDOWS` (**on single-user Windows 95/98 systems**)

The LifeKeeper GUI policy file is by default located at:

`$LKROOT/htdoc/java.policy` (**Linux**)

### Policy File Creation and Management

By default, the LifeKeeper GUI policy file is used when the LifeKeeper GUI is invoked as an application. If you are running the LifeKeeper GUI as an applet, you will need to create a user policy file in your home directory if one does not already exist. The user policy file should specify the minimum permissions required to run the LifeKeeper GUI, which are provided in the [Sample Java Policy File](#) section later in this guide.

A policy file can be created and maintained via a simple text editor, or via the graphical Policy Tool utility included with the Java Runtime Environment (JRE) or Java Development Kit (JDK). Using the Policy Tool saves typing and eliminates the need for you to know the required syntax of policy files. For information about using the Policy Tool, see the Policy Tool documentation at <http://java.sun.com/j2se/1.3/docs/tooldocs/tools.html>.

The **simplest way to create a user policy file** with the minimum permissions required to run the LifeKeeper GUI is to copy the LifeKeeper GUI policy file located in `$LKROOT/htdocs/java.policy` to your home directory and rename it `“java.policy”`.

On a Windows system, you can copy the LifeKeeper GUI policy file by opening the file `http://<server name>:81/java.policy` (where `<server name>` is the host name of a LifeKeeper server), and saving it as `“java.policy”` in your home directory.

If you need to determine the correct location for a user policy file, enable the Java Console using the Java Control Panel, and start the LifeKeeper GUI as an applet. The home directory path for the user policy file will be displayed in the Java Console.

### Granting Permissions in Policy Files

A permission represents access to a system resource. In order for a resource access to be allowed for an applet, the corresponding permission must be explicitly granted to the code attempting the access. A permission typically has a name (referred to as a “target name”) and, in some cases, a comma-separated list of one or more actions. For example, the following code creates a `FilePermission` object representing read access to the file named `abc` in the `/tmp` directory:

```
perm = new java.io.FilePermission("/tmp/abc", "read");
```

In this, the target name is `“/tmp/abc”` and the action string is `“read.”`

A policy file specifies what permissions are allowed for code from specified code sources. An example policy file entry granting code from the `/home/sysadmin` directory read access to the file `/tmp/abc` is:

```
grant codeBase "file:/home/sysadmin/" {  
    permission java.io.FilePermission "/tmp/abc", "read";  
};
```

## Sample Java Policy File

```
/*
 * Permissions needed by the LifeKeeper GUI. You may want to
 * restrict this by codebase. However, if you do this remember
 * that the recovery kits can have an arbitrary jar component
 * with an arbitrary codebase, so you'll need to alter the grant
 * to cover these as well.
 */
grant {
/*
 * Need to be able to do this to all machines in the
 * LifeKeeper cluster. You may restrict the network
 * specification accordingly.
 */
permission java.net.SocketPermission "*" , " accept,connect,resolve" ;
/*
 * We use URLClassLoaders to get remote properties files and
 * jar pieces.
 */
permission java.lang.RuntimePermission "createClassLoader" ;
/*
 * The following are needed only for the GUI to run as an
 * application (the default RMI security manager is more
 * restrictive than the one a browser installs for its
 * applets.
 */
//permission java.util.PropertyPermission "*" , "read" ;
//permission java.awt.AWTPermission "*" ;
//permission java.io.FilePermission "<<ALL FILES>>" , "read,execute" ;
};
```

## Browsers and the Java Plug-In

Whether you are using Netscape (Navigator 4.05 and later) or Internet Explorer (4.01 and later), the first time your browser attempts to load the LifeKeeper GUI, it will either automatically download the Java Plug-In software or redirect you to a web page to download and install it. From that point forward, the browser will automatically invoke the Java Plug-in software every time it comes across web pages that support the technology.

### Downloading the Java Plug-in

Java Plug-in software is included as part of the Java Runtime Environment (JRE) for Solaris, Linux, and Windows. Downloading the plug-in typically takes between three to ten minutes, depending on your network and system configuration size. The download web page provides more documentation and installation instructions for the JRE and Java Plug-in software.

**Note 1:** You should close and restart your browser after installing the plug-in and whenever plug-in properties are changed.

**Note 2:** Earlier versions of Java Plug-in software (e.g. Java Plug-in 1.1.x or 1.2.x) and Java Plug-in 1.3.x software cannot co-exist on the same system. When upgrading Java Plug-in software, it is recommended that users uninstall Java Plug-in 1.1.x or 1.2.x software before installing Java Plug-in 1.3.x software. Installing Java Plug-in 1.1.x or 1.2.x software after installing Java Plug-in 1.3.x software on the same system is not recommended.

## The Java Plug-In Control Panel

In order to use the control panel, you need to enable Javascript in your browser.

To open the Java Plug-In Control Panel on a Windows system, on the Start menu, point to **Programs**, then **Java Plug-In Control Panel**.

To open the Java Plug-In Control Panel on a Linux system, run `<your home account>/netscape/java/ControlPanel`. (Note that in later versions of the Java Plug-in for Unix, the Java Plug-In Control Panel may be installed at the system level.)

## Setting Browser Security Parameters for the GUI Applet

**WARNING: Be careful of other sites you visit with security set to low values.**

### Netscape Navigator and Netscape Communicator

1. From the **Edit** menu, select **Preferences**.
2. In the **Preferences** dialog box, double-click the **Advanced** Category.
3. Select the “Enable Java” and “Enable Java Script” options.
4. Click **OK**.

### Internet Explorer

The **most secure method** for using Internet Explorer is to add the LifeKeeper server to the Trusted Sites zone as follows:

1. From the **Tools** menu, click **Internet Options**.
2. Click the **Security** tab.
3. Select **Trusted Sites** zone and click **Custom Level**.
4. Under **Reset custom settings**, select **Medium/Low**, then click **Reset**.
5. Click **Sites**.
6. Enter the server name and port number for the LifeKeeper server(s) to which you wish to connect (for instance: `http://server1:81`).

An alternative, but possibly **less secure method** for using Internet Explorer is to do the following:

1. From the **Tools** menu, click **Internet Options**.
2. Select either **Internet** or **Local Intranet** (depending upon whether your remote system and the LifeKeeper cluster are on the same intranet).
3. Adjust the Security Level bar to **Medium** (for Internet) or **Medium-low** (for Local Intranet). These are the default settings for each zone.
4. Click **OK**.

## Chapter 7

# Configuring Other LifeKeeper Components

After LifeKeeper is installed and you have set up the LifeKeeper GUI, you are ready to configure the various LifeKeeper components. Configuration includes:

- Creating communication paths
- Configuring resource hierarchies
- Performing optional configuration tasks

Instructions for these configuration tasks are provided in the *LifeKeeper Online Product Manual*, in addition to extensive reference information.

Instructions for configuring the LifeKeeper recovery kits are provided by each recovery kit's Administration Guide.

## Accessing the Online Product Manual

The *LifeKeeper Online Product Manual* is included in the **steeleye-1kHLP** software package. The Product Manual is HTML-based and can be accessed from a web browser. It includes product feature information and instructions for LifeKeeper administration tasks. Once the Product Manual is installed, "help" topics are accessible from the Table of Contents in the Help menu of the LifeKeeper GUI. Context-sensitive Help is accessible from "Help" buttons within the GUI dialog boxes.

The Online Product Manual can be accessed outside the GUI by opening the following URL directly from your browser:

*http://<server name>:81/help/lksstart.htm*

**Note:** The Online Product Manual requires a web server for client browser communication. Installation of the LifeKeeper GUI will install and configure a public domain web server, **mhttpd**, using port 81.

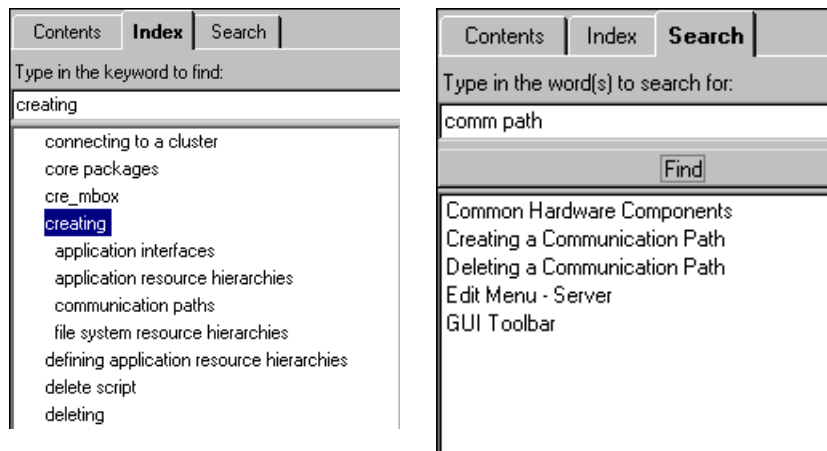
The Product Manual uses frames and is composed of a left and right pane.

## Left Pane

The left pane contains three tabs:

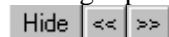
- The Contents tab is a Table of Contents with expandable books and individual “help” topics. To open/expand or close/collapse a book, double-click its title. To view a topic, click its title.
- The Index tab consists of a list of words and phrases. To view a topic or list of topics associated with a word or phrase in the index, double-click the word or phrase. Or enter the first characters of a word to jump directly to that section of the Index.
- The Search tab allows you to enter a word or phrase. Click Find to create a list of topics containing that text. To view a specific topic in the returned list, double-click on that topic.

The following figure shows sections of the **Index** and **Search** tabs.



## Right Pane

The right pane displays the individual topics. There are three buttons at the top of each topic:



Click the **<<** (**Previous**) and **>>** (**Next**) buttons that are located at the top of each topic to browse topics appearing in a predefined sequence. Topics may also contain links to related topics.

Click your browser’s **Back** button to go to the last topic viewed.

Click the **Hide** button to hide the left navigation pane if you want more viewing space for the topics; or, click the **Show** button to show the left navigation pane when it is in the hidden state.

When you jump from one topic to another via hyperlinks within topics, the Contents tab will be automatically updated to highlight your current topic.

## Appendix A: Linux Installation Tips for LifeKeeper

This Appendix contains distribution-specific guidelines tips for the installation of the Linux OS and supporting packages required by LifeKeeper. Please see the Linux installation instructions that accompany each of these distributions for complete installation instructions.

### Red Hat Linux Installation Tips

During the Linux installation, we recommend taking the following actions that will affect your LifeKeeper environment. The items below appear in the same sequence as they appear in the GnoRPM installation process; however, those actions not affecting LifeKeeper (for instance, keyboard configuration) are omitted.

- **Install Type:** Choose Custom so that you can specify disk partitions suited for LifeKeeper. At the Partitions screen, be sure to create the following partitions in addition to any others you create:
  - /boot (at least 16 MB, Type= Linux native)
  - swap (current Red Hat restriction is a maximum ~ 2GB, but this should be 2X memory size if possible)
  - / (root directory) - this should be equal to remaining disk space. If Linux detects enough room, it will automatically create the necessary additional directories.
- **Choose Partitions to Format:** We recommend selecting “Check for bad blocks while formatting” to eliminate the risk of data loss due to bad blocks in the future. Note that this can be a time-consuming task, depending upon the size and number of disks you have.
- **LILO Configuration:** When installing LILO (the Linux Loader), be sure to select Linear mode (or add “linear” to */etc/lilo.conf*), which is recommended when using SCSI disk drives.
- **Network Configuration:** If your network information is not available yet, you can enter the host name now, and then enter the additional network information later.

Note: If you need to change the hostname, you should do so *before* installing LifeKeeper if at all possible. If you need to change the hostname after installing LifeKeeper, see the section entitled [Verifying Network Configuration](#) for instructions.

- **Package Group Selection:** If you choose to select individual packages, be sure to include the following packages:
  - **Mail/WWW/Newstools:** may be necessary if you plan to use Sendmail
  - **Web Server:** select this if you intend to use the Apache (or some other) Web Server
  - **Development:** needed in the event that you must rebuild the kernel
  - **Kernel development:** needed in the event that you must rebuild the kernel
  - **Extra documentation:** helpful for re-building the kernel

- **X Configuration:** You should configure the X Server to provide support for the LifeKeeper GUI application. If necessary, customize the video card settings to get proper video resolution.



---

When running the LifeKeeper GUI application from a telnet session, you need to ensure that the GUI client is allowed to access the X Window Server on the LifeKeeper server. The LifeKeeper server must also be able to resolve the hostname or network address of the GUI client. When you telnet into the LifeKeeper server to run the LifeKeeper GUI application, the DISPLAY environment variable should contain the client's host name and display number. For example, if you telnet into a server named Server1 from a client named Client1, the DISPLAY environment variable should be set to Client1:0. When you run the LifeKeeper GUI application, it will try to send the output to the DISPLAY name for Client1. If Client1 is not allowed access to the X Window Server, the LifeKeeper GUI application will fail with an exception.

- **Red Hat Development/Tools/patch 2.5-10:** LifeKeeper requires that each server in the cluster have this patch installed. The patch is included on Red Hat installation media.
- **Installing Latest Ethernet Driver:** If you are using a 3-Com Ethernet card, it is recommended that you install the latest Ethernet driver available at <http://www.redhat.com/support>.
- **Installing the pdksh Package:** LifeKeeper has a dependency on the public domain korn shell (pdksh) package. You can install this package using GnoRPM by performing the following:
  1. Insert the Linux CD in the CD-ROM drive. The GnoRPM window will appear on your monitor if you have auto-run for your CD-ROM turned on. If auto-run is not turned on, start it manually or use the command line options.
  2. Click the **Install** button. The package manager will detect the Linux CD and open the Install Window.
  3. Click the **Add** button. The Add Packages window will open, displaying the Linux RPM packages.
  4. Select System Environment, then select Shells.
  5. Scroll to and select the pdksh package, then click **Add**.
  6. Close the Add Packages window.
  7. Click the **Install** button at the bottom of the Install window to begin the installation.
- **File System Labels:** The use of file system labels in */etc/fstab* will slow down **fsck** since it has to scan all partitions to determine what device a label refers to. The mapping of labels to partitions is not stored in the OS so every time an **fsck** is done it must open every partition. This impacts LifeKeeper due to the fact that LifeKeeper has reserved the partitions that it has in-service. Every time **fsck** is performed from another server in the cluster, it will try to open the reserved partitions, and this will cause the OS/driver to perform error handling. The current workaround for this problem is to *not* use labels. Red Hat 7.0 provides the option of using labels for the root file system. Users should not select this feature (or the monitor *fstab* feature) to make sure that the OS does not configure labels

## Caldera Installation Tips

- **LILO Configuration:** When installing LILO (the Linux Loader) on Caldera, there is no option to select linear mode, so “linear” must be added to the LILO configuration file, */etc/lilo.conf*, manually before rebooting. This is recommended when using SCSI disk drives.
- **Installation:** The Caldera eServer 2.3.1 installation may not complete successfully when installing from a SCSI CDROM attached to an Adaptec controller. Reference the *quickstart.txt* file included on the install media for additional information.



**Important:** The work around to this problem involves replacing the *aic7xxx.o* driver provided on the media with a working copy of the driver. To implement the work around you will need to perform the following:

1. Copy the boot flex image to a file
2. Modify the *initrd* to replace the included *aic7xxx.o* driver with a working *aic7xxx.o* driver
3. Copy the image back to a flex. Use this newly modified boot flex in the following installation procedure:
  - a. Insert the modified boot flex and reboot the system
  - b. The reboot will start and after a few seconds display the graphical “OpenLinux” boot screen with following messages:

```
Loading kernel ....._____Ok
Booting kernel ....._____Ok
Mounting modules floppy ...__Wait
```

When this last line appears, quickly eject the boot flex, insert the modules flex, and insert the install CDROM.

Another work around for this problem is to perform a network installation or use an IDE CDROM drive in place of the SCSI CDROM drive.

- **Kernel Update:** The following messages are displayed when applying kernel updates from the LifeKeeper Installation Support CD to the Caldera eServer 2.3.1 Linux kernel. Despite these messages, the installation of the kernel updates does complete successfully:

```
Do you wish to continue (answering "no" will abort setup) (y/n)
[y] ?
Upgrading linux-kernel-binary-2.2.14-3SteelEye.i386.rpm
linux-kernel-binary
#####
cp:
/lib/modules/2.2.14/*/sd.o: No such file or directory
Upgrade of "linux-kernel-binary-2.2.14-3SteelEye.i386.rpm" was
successful.
Upgrading linux-kernel-doc-2.2.14-3SteelEye.i386.rpm
linux-kernel-doc
```

```
#####
Upgrade of "linux-kernel-doc-2.2.14-3SteelEye.i386.rpm" was
successful.
Upgrading linux-kernel-include-2.2.14-3SteelEye.i386.rpm
linux-kernel-include
#####
Upgrade of "linux-kernel-include-2.2.14-3SteelEye.i386.rpm" was
successful.
Upgrading linux-source-common-2.2.14-3SteelEye.i386.rpm
linux-source-common
#####
Makefile not found in file index
package Makefile not found in the file index
...(lines deleted)...
package Makefile not found in file index
Upgrade of "linux-source-common-2.2.14-3SteelEye.i386.rpm" was
successful.
Upgrading linux-source-i386-2.2.14-3SteelEye.i386.rpm
linux-source-i386
#####
package Makefile not listed in file index
...(lines deleted) ...
package Makefile not listed in file index
Upgrade of "linux-source-i386-2.2.14-3SteelEye.i386.rpm" was
successful.
```

- **e100 ethernet driver:** After upgrading the Caldera 2.3.1 (2.2.14-9S) kernel with the 2.2.14-3 SteelEye kernel patches, the network does not come back up when the box is rebooted. The problem is that the new Caldera kernel in 2.3.1 now includes the e100 ethernet driver module (e100.o) and the Caldera installation process sets up the system to load that module at boot time. This module cannot be found when the system is rebooted with the SteelEye kernel patches.



---

**Important:** As a workaround, on Caldera 2.3.1 systems where the e100 module is set up to load (i.e. "e100" is in the */etc/modules/default* file) you can add the following line to */etc/modules.conf* to use the old driver.

```
alias eth0 eepr100
```

## SuSE Installation Tips

- **Kernel:** Must use the 2.2.18 or later kernel, because it contains the SteelEye patches.
- **LILO Configuration:** When installing LILO (the Linux Loader) on SuSE, you should select linear mode, so "linear" must be added to the LILO configuration file, */etc/lilo.conf*, manually before rebooting. This is recommended when using SCSI disk drives.
- **pdksh:** Must install pdksh RPM (not installed by default).

Appendix A:  
Linux Installation Tips for LifeKeeper

- **quota:** The NFS Server Recovery Kit uses **rquotad**, the rpc server which returns quotas for a user of a local file system which is mounted by a remotely over NFS. On SuSE, this daemon is provided by the "quota-1.70-263" package, which should be installed before using the NFS Server Recovery Kit.

## Appendix B: Troubleshooting

### Shared Storage Configuration Troubleshooting

**SYMPTOM:** Only 1 Logical Unit (LUN) on an external RAID is available.

**SOLUTION:** If you are using the SteelEye **arrayscan** utility to probe all LUNs (the default on Red Hat and TurboLinux), and there is only 1 logical unit (LUN) on your shared disk available, that particular vendor and model of the disk array may not be included in the **arrayscan** utility templates file. It may be necessary to add an additional entry to the `/etc/array/templates` file. The templates file contains lines like the following:

```
Vendor: Compaq      Model: .*
```

At system boot time, the **arrayscan** utility reads the templates file entries and attempts to match the Vendor and Model against the entries in `/proc/scsi/scsi`. If a match is found, the utility creates disk entries in `/proc/partitions` for all LUNs on the matching RAID device. Regular expressions are allowed in the templates file entries. Remember to edit the templates file on every system to which the shared array is attached. Once the templates file entry has been added, reboot the system so the change can take effect.

For systems that don't use **arrayscan** but for which LUN scanning is not enabled by default (like RedHat Advanced Server), LUN scanning can be enabled by adding the following line to the file `/etc/modules.conf` and rebuilding the initial ramdisk.

```
options scsi_mod max_scsi_luns=255
```

**SYMPTOM:** Running the LifeKeeper Installation Support setup script overwrites the version of the QLogic driver that is required for some storage and adapters.

**SOLUTION:** Some storage and adapter vendors support a different version of the QLogic driver than the version that is delivered with the LifeKeeper Installation Support CD. Whenever possible, SteelEye works with these vendors to certify their version of the QLogic driver. Refer to “Storage and Adapter Configuration” under the Technical Notes section of the *LifeKeeper Release Notes* for additional information.

The procedure for installing LifeKeeper when you are using a different version of the Qlogic driver than the version that is delivered with the LifeKeeper Installation Support CD is included below.

1. Verify driver is certified by SET for use with LifeKeeper (See the *LifeKeeper Release Notes*).
2. Run the LifeKeeper Installation Support setup script.
3. Reboot if necessary.
4. Follow instructions provided by the Storage vendor to install the Qlogic driver.

Note: In the case of the HP MSA1000, do not run the “msainstall utility” before making the driver. Use the **arrayscan** utility provided on the LifeKeeper for Linux Installation Support to scan for LUNs 1 through 7. (In order for the arrayscan utility to work correctly, LUN 0 for a device must be configured in the system.) For systems that don't use arrayscan but for which LUN scanning is not enabled by default (like RedHat Advanced Server), LUN scanning can be enabled by adding the following line to the file */etc/modules.conf* and rebuilding the initial ramdisk.

```
options scsi_mod max_scsi_luns=255
```

**SYMPTOM:** On a reboot, the Linux Kernel does not see the Fibre Connected Storage.

**SOLUTION:** The way fibre channel is designed to work is that once the host based adapter (HBA) is configured, any storage visible on the fibre ring will inform the HBA, and the HBA should then tell the host operating system that storage has been found. Unfortunately, there's no mechanism for the HBA to inform the Linux kernel that storage has been found. To work around this, the HBA initialization routines wait for a period of time before returning and allowing the kernel to begin scanning for storage. Unfortunately, if the storage becomes visible to the HBA after this period expires, the kernel will never see it.

This problem is very rare, and is usually triggered by a misconfigured or marginal Fibre Channel set up. However, if you think you have this problem, you can configure the storage manually after the kernel has booted by instructing the HBA to rescan. You can do this by executing the following commands:

```
echo "scsi add-single-device <n> 0 0 0" > /proc/scsi/scsi
```

```
echo "scsi add-single-device <n> 0 1 0" > /proc/scsi/scsi
```

where <n> is the scsi host number of your Fibre Channel HBA. The device will now show up in */proc/scsi/scsi*.

If necessary, you can add the above two lines to */etc/rc.d/rc.sysinit* (or its equivalent on non-Red Hat distributions) so that the HBA will always be forced to rescan the storage on boot. However, it is recommended that you should examine and fix the potential problems in your Fibre Channel set up instead.

## Manual Installation of Kernel Modules

The Installation Support CD may install kernel modules to support several optional LifeKeeper packages:

Module Name:	Used by:
HADR	Data Replication Recovery Kit (versions prior to v5.0)
HANFS	NFS Recovery Kit
cciss	CCISS Recovery Kit (shared storage support)
qla2x00	LifeKeeper Core (shared storage support)
cpqfc	LifeKeeper Core (shared storage support)
ips	IPS/ServeRAID Recovery Kit (shared storage support)

If for some reason one of these packages does not install correctly, you will receive the following error message:

```
The <module name> kernel modules have NOT been installed for this
kernel.
```

```
If you wish to use LifeKeeper with <module name>, you MUST do one of
two things:
```

```
(1) Apply the <module name> kernel source patches supplied and
recompile your kernel;
```

```
or
```

```
(2) Reboot your system with a different kernel and rerun setup to
install the binary <module name> RPMs for that kernel.
```

### Suggested Solution

If your kernel is not one of the kernels for which binary module RPMs are provided, you must apply the open source patches and rebuild your kernel. The following steps provide an example of how to do this:

1. Install the **<module name><LifeKeeper Version>.src.rpm** package from the LifeKeeper Installation Support CD. This will place a zipped tar file, *<modulename>.tar.gz*, in your rpm SOURCES directory.
2. Change to this directory and untar the zipped tar file. This should put several files in the SOURCES directory: either *<filename>.diff* or *<filename>.patch*
3. **For HADR:**
  - a) Patch */usr/src/<your-kernel>/drivers/block/nbd.c* with the *nbd.diff* file.
  - b) Patch */usr/src/<your-kernel>/drivers/md/raid1.c* with the *raid1.diff* file.
  - c) Since *nbd-server* is not a kernel module, there should be no need to patch it.
4. **For HANFS:** Patch */usr/src/<your-kernel>* with one of the *nfsd.diff* files (choose the one that applies without rejections).

5. **For driver patches:** Apply the *.patch* file that most closely matches the kernel being patched.
6. Rebuild your kernel and modules. For HA-NFS, make sure that you do a **make config** and reply **Y** to the question `Use filehandle aliasing?` Unless you set this option, the HANFS extensions will not be enabled.
7. Boot the rebuilt kernel.

## License Key Troubleshooting

The following error messages may be generated by LifeKeeper if there is a problem with the license key.

**ERROR MESSAGE:** “Error in obtaining LifeKeeper license key: Cannot find license file” *or* “No valid LifeKeeper license keys found.”

**SOLUTION:** LifeKeeper cannot run until a valid license key is installed. Follow the instructions in [Obtaining and Installing the License Key](#) to install your license key for each LifeKeeper server.

**ERROR MESSAGE:** “Error in obtaining LifeKeeper license key: Invalid host. The hostid of this system does not match the hostid specified in the license file”

**SOLUTION:** This message can occur when the primary Network Interface Card (NIC) has been replaced after the LifeKeeper license key was obtained. Contact SteelEye support to obtain a new license.

**ERROR MESSAGE:** “The evaluation license key for the LifeKeeper product on this system has expired.”

**SOLUTION:** You should do one of the following:

- Contact SteelEye Support to extend your evaluation license, or
- Contact your LifeKeeper reseller or sales representative to purchase a permanent license.

### Upgrading to a Permanent License

After obtaining a permanent license key to upgrade an evaluation or temporary license key, the permanent key may be installed by running the command `$LKROOT/bin/lkkeyins`.

## Upgrading to another Evaluation License

You may upgrade an evaluation or temporary license key with another evaluation or temporary license in order to extend your evaluation period. However, if the first key has not yet expired, LifeKeeper will continue to issue messages showing the expiration date of the first key until that date has passed. Following that date, the messages will reflect the expiration date of the updated key. If you wish to see the updated expiration date reflected in these messages immediately, you may remove the first license key by removing the earlier dated license key file from the directory `/var/LifeKeeper/license`.

## Java Plug-in Troubleshooting

**SYMPTOM:** Your browser doesn't find the Java Plug-in even though you've installed the Java Runtime Environment, including the Java Plug-in.,

**SOLUTION:** Be sure that the `NPX_PLUGIN_PATH` environment variable is set to the location of the Java Plug-in (the directory in which the `javaplugin.so` file is located). For example:

```
export NPX_PLUGIN_PATH=$JAVAHOME/jre/plugin/i386/ns4
```

where `$JAVAHOME` is the top-level directory of your Java Runtime Environment installation.

**Note:** If you are using Netscape 6, you will also need to create a symbolic link in the Netscape `plugins` directory to the path of the `libjavaplugin_oji.so` file. This file is located in `${JAVAHOME}/jre/plugin/i386/ns600/libjavaplugin_oji.so`.

```
cd ${NETSCAPE6}/plugins
```

```
ln -s ${JAVAHOME}jre/plugin/i386/ns600/libjavaplugin_oji.so
```

The Java Plug-in supports the Java 2 SDK, Standard Edition v1.3 security model. All applets are run under the standard applet security manager. See the Java Security FAQ <http://java.sun.com/sfaq> or [Setting Browser Security Parameters for the GUI Applet](#) for more information.

In some platform/browser combinations, the Java Plug-in software will affect the appearance and behavior of Java components in the LifeKeeper GUI such as the ScrollBar, ToolBar, or Menu components. In many of these situations, if you resize or iconify/de-iconify the window (i.e. force a repaint) as a workaround, the problem will go away.

## Applet Troubleshooting

**SYMPTOM:** The splash screen does not display a start button or you suspect that the applet failed to load and initialize.

**SOLUTION:**

1. Verify that the applet failed. Usually a message is printed somewhere in the browser window specifying the state of the applet. In Netscape and Internet Explorer, an icon may appear instead of the applet in addition to a text status message. Clicking this icon may bring up a description of the failure.

2. Verify that you have installed the Java Plug-in. If your problem appears to be Java Plug-in related, refer to the [Browsers and the Java Plug-in](#) section or the previous troubleshooting topic.
3. Verify that you have satisfied the browser configuration requirements, especially the security settings. Refer to [Setting Browser Security Parameters for the GUI Applet](#) for more information. If you do not find anything obviously wrong with your configuration, continue with the next few steps.
4. Open the Java Console. This is done in the following manner:
  - a. For Netscape and Internet Explorer, run the Java Plug-In Control Panel and select the option to show the console.
  - b. Reopen the URL, `http://<server name>:81` to start the GUI applet. If you have modified the Java Plug-In Control Panel, restart your browser.
  - c. Check the console for any messages. The messages should help you resolve the problem. If the problem appears to be network related, continue to the next section.

## GUI Server Troubleshooting

**SYMPTOM:** The LifeKeeper GUI uses ports 81 and 82 on each server for its administration web server and Java remote object registry. If another application is using the same ports, the LifeKeeper GUI will not function properly.

**SOLUTION:** These values may be changed by editing the following entries in the LifeKeeper default file `/etc/default/LifeKeeper`.

```
GUI_WEB_PORT=81
GUI_RMI_PORT=82
```

**Note:** These port values are initialized in the GUI server when it is started. If you alter them, you will need to stop and restart the GUI server. These values must be the same across all clusters to which you connect.

**SYMPTOM:** When starting the LifeKeeper GUI as an application, an error occurs indicating that you cannot connect to the X Window Server or that you cannot open the client DISPLAY name.

**SOLUTION:** Try the following:

1. Set the display variable using the host name or IP address. For example:

```
DISPLAY=Client1.somecompany.com:0
```

```
DISPLAY=172.17.5.74:0.
```

2. Use the **xhost** or **xauth** command to verify that the client may connect to the X Window Server on the LifeKeeper server.

3. Add a DNS entry for the client or add an entry for the client to the local hosts file on the LifeKeeper server. Verify communication with the client by pinging the client from the LifeKeeper server using its hostname or IP address.

## GUI Network-Related Troubleshooting

**SYMPTOM:** Long Connection Delays on Windows Platforms

**SOLUTION:** From Sun FAQ:

“Most likely, your host’s networking setup is incorrect. RMI uses the Java API networking classes, in particular `java.net.InetAddress`, which will cause TCP/IP host name lookups for both host to address mapping and address to hostname. On Windows, the lookup functions are performed by the native Windows socket library, so the delays are not happening in RMI, but in the Windows libraries. If your host is set up to use DNS, then this could be a problem with the DNS server not knowing about the hosts involved in communication, and what you are experiencing are DNS lookup timeouts. If this is the case, try specifying all the hostnames/addresses involved in the local file `\winnt\system32\drivers\etc\hosts` or `\windows\hosts`. The format of a typical host file is:

```
IPAddress Server Name  
e.g. :  
208.2.84.61 homer.somecompany.com homer
```

This should reduce the time it takes to make the first lookup.”

In addition, incorrect settings of the Subnet Mask and Gateway address may result in connection delays and failures. Verify with your Network Administrator that these settings are correct.

**SYMPTOM:** Running GUI over a Modem connection

When you connect to a network in which the servers reside via modem (using PPP or SLIP), your computer acquires a temporary IP number for its operation. This temporary number may not be the one your hostname maps to (if it maps to anything at all), so in this case you must tell the servers to communicate with you by IP alone. To do this, obtain your temporary IP number by opening your modem connection window. This number will be used to set the hostname property for the GUI client.

**SOLUTION:** To set the hostname for a browser with the Plug-in, open the Java Plug-In Control Panel, and set the hostname for the client by adding the following to “Java Run Time Parameters”:

```
-Djava.rmi.server.hostname=<MY_HOST>
```

For example:

```
-Djava.rmi.server.hostname=153.66.140.1
```

**SYMPTOM:** Primary Network Interface Down:

The LifeKeeper GUI uses Remote Method Invocation (RMI) to maintain contact between the GUI client and the GUI server. In nearly every case, contact is established over the primary network interface to the server. This means that if the server's primary Ethernet interface goes down, contact is lost and the GUI client shows that server state as Unknown.

The only solution to this problem is to bring the server's primary Ethernet interface up again. Additionally, due to limitations in RMI, this problem cannot be overcome by using a multi-homed server (server with multiple network interfaces).

**SYMPTOM:** NoRouteToHostException message generated during connection attempt.

A socket could not be connected to a remote host, because the host could not be contacted.

**SOLUTION:** Typically, this indicates that some link in the network between the local and remote server is down, or that the remote server is behind a firewall.

**SYMPTOM:** Unknown Host Exception message generated during connection attempt.

The LifeKeeper GUI Client and Server use Java RMI (Remote Method Invocation) technology to communicate. For RMI to work correctly, the client and server must use resolvable hostname or IP addresses. When unresolvable names, WINS names, or unqualified DHCP names are used, this causes Java to throw an UnknownHostException.

This error message may also occur under the following conditions:

- Server name does not exist. Check for misspelled server name.

- Misconfigured DHCP servers may set the fully qualified domain name of RMI servers to be the domain name of the resolver domain instead of the domain in which the RMI server actually resides. In this case, RMI clients outside the server's DHCP domain will be unable to contact the server because of the incorrect domain name.
- The server is on a network that is configured to use Windows Internet Naming Service (WINS). Hosts that are registered under WINS may not be reachable by hosts that rely solely upon DNS.
- The RMI client and server reside on opposite sides of a firewall. If your RMI client lies outside a firewall and the server resides inside of it, the client will not be able to make any remote calls to the server.

**SOLUTION:** When using the LifeKeeper GUI, the hostname supplied by the client must be resolvable from the server and the hostname from the server must be resolvable by the client. The LifeKeeper GUI catches this exception and alerts the user. If the client cannot resolve the server hostname, this exception is caught and Message 115 is displayed. If the server cannot resolve the Client hostname, this exception is caught and Message 116 is displayed. Both of these messages include the part of the Java exception, which specifies the unqualified hostname that was attempted.

Included in the following sections are some procedures that may be used to test or verify that hostname resolution is working correctly.

### From Windows

1. Verify communication with the Linux Server. From a DOS prompt, ping the target using the hostname:

**ping <TARGET\_NAME>**

For example;

**ping homer**

A reply listing the target's qualified hostname and IP address should be seen.

2. Verify proper configuration.
  - a. Check configuration of DNS or install a DNS server on your network.
  - b. Check the settings for ControlPanel->Network->Protocols->TCP/IP. Verify with your Network Administrator that these settings are correct.  
Note that the hostname in the DNS tab should match the name used on the local name server. This should also match the hostname specified in the GUI error message.
  - c. Try editing the hosts file to include entries for the local host and the LifeKeeper servers that it will be connected to.

On Windows 95/98 systems the hosts file is:

*%windir%\HOSTS* (e.g. *C:\WINDOWS\HOSTS*).

**Note:** On Windows 95/98, if the last entry in the hosts file is not concluded with a carriage-return/line-feed then the hosts file will not be read at all.

On Windows NT systems the hosts file is:

```
%windir%\System32\DRIVERS\ETC\HOSTS  
(for example, C:\WINNT\System32\DRIVERS\ETC\HOSTS).
```

For example, if my system is called HOSTCLIENT.MYDOMAIN.COM and uses the IP address 153.66.140.1, add the following entry to the hosts file:

```
153.66.140.1 HOSTCLIENT.MYDOMAIN.COM HOSTCLIENT
```

3. Try setting the hostname property to be used by the GUI client. To do this from a browser with the Plug-in, open the Java Plug-In Control Panel, and set the host name for the client by adding the following to “Java Run Time Parameters.”

```
-Djava.rmi.server.hostname=<MY_HOST>
```

4. Check for Microsoft network-related patches at [www.microsoft.com](http://www.microsoft.com).

### From Linux

1. Verify communication with the other server by pinging the target server from Linux using its hostname or IP address:

```
ping -s <TARGET_NAME>
```

For example:

```
ping -s homer
```

A reply listing the target’s qualified hostname should be seen.

2. Verify that *localhost* is resolvable by each server in the cluster using **ping** with its hostname or IP address. If DNS is not implemented, edit the */etc/hosts* file and add an entry for the *localhost* name. This entry can list either the IP address for the local server, or it can list the default entry (127.0.0.1).
3. Check that DNS is specified before NIS. DNS should be put before NIS in the hosts line of */etc/nsswitch.conf*, and */etc/resolv.conf* should point to a properly configured DNS server(s).
4. If DNS is not to be implemented or no other method works, edit the */etc/hosts* file to add an entry for the hostname.
5. Try setting the hostname property to be used by the GUI client. This will need to be changed for each administrator.

To do this from a browser with the Plug-in, open the Java Plug-In Control Panel and set the hostname for the client by adding the following to “Java Run Time Parameters”:

```
-Djava.rmi.server.hostname=<MY_HOST>
```

To do this from the HotJava browser, append the following to the hotjava command line:

```
-Djava.rmi.server.hostname=<MY_HOST>
```

For Example:

```
-Djava.rmi.server.hostname=153.66.140.1  
-Djava.rmi.server.hostname= homer.somecompany.com
```

**SYMPTOM:** Unable to Connect to X Window Server

When running the LifeKeeper GUI application from a telnet session, you need to ensure that the GUI client is allowed to access the X Window Server on the LifeKeeper server. The LifeKeeper server must also be able to resolve the hostname or network address of the GUI client.

When you telnet into the LifeKeeper server to run the LifeKeeper GUI application, the DISPLAY environment variable should contain the client's host name and display number. For example, if you telnet into a server named Server1 from a client named Client1, the DISPLAY environment variable should be set to Client1:0. When you run the LifeKeeper GUI application, it will try to send the output to the DISPLAY name for Client1. If Client1 is not allowed access to the X Window Server, the LifeKeeper GUI application will fail with an exception.

When starting the LifeKeeper GUI as an application, if an error occurs indicating that you cannot connect to the X Window Server or that you cannot open the client DISPLAY name, try the following:

**SOLUTION:**

1. Set the display variable using the host name or IP address. For example:

```
DISPLAY=Client1.somecompany.com:0  
DISPLAY=172.17.5.74:0.
```

2. Use the **xhost** or **xauth** command to verify that the client may connect to the X Window Server on the LifeKeeper server.
3. Add a DNS entry for the client or add an entry for the client to the local hosts file on the LifeKeeper server. Verify communication with the client by pinging the client from the LifeKeeper server using its hostname or IP address.