# LifeKeeper® for Linux

Informix Recovery Kit v6.1 Administration Guide

February 2011

# Table of Contents

# Informix Recovery Kit Administration Guide

Informix® Dynamic Server software provides database integrity through its high performance logging, rollback, and checkpointing facilities. Informix Dynamic Server delivers an industry-proven transaction engine for mission critical applications while providing an upgrade path to the Internet. Capable of supporting thousands of concurrent users, Informix Dynamic Server delivers maximum reliability, availability, and scalability to power the largest transaction processing systems. The LifeKeeper® for Linux Informix Recovery Kit provides an easy way to add LifeKeeper fault-resilient protection for Informix resources and applications. Together, Informix Dynamic Server and LifeKeeper supply increased availability to database-based computing services because a failure of the primary database server can be recovered on a designated backup server without significant lost time or human intervention.

Throughout the rest of this document, all references to Informix software will be related to the Informix Dynamic Server product.

## Document Contents

This guide explains the following topics:

- **LifeKeeper Documentation.** A list of all the LifeKeeper for Linux documentation and where the information is available.
- **Requirements.** Before you can install and set up the recovery software, your server must meet certain hardware and software requirements. You should refer to the *LifeKeeper for Linux Planning and Installation Guide* for specific instructions on how to install or remove the LifeKeeper Informix Recovery Kit.
- **Configuring Your Recovery Kit.** To ensure that your LifeKeeper configuration provides the protection and flexibility you require, you need to be aware of the configuration rules. To appropriately plan your configuration, you must understand your network configuration, interface selection, user system setup, hierarchy options and the Informix configuration tasks. In addition to planning your configuration, this section also includes configuration examples and the specific tasks required to configure your Recovery Kit.
- **Troubleshooting.** This section provides a list of informational and error messages with recommended solutions.

## LifeKeeper Documentation

The following LifeKeeper product documentation is available from SIOS Technology Corp.:

- *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 optional LifeKeeper Recovery Kits, is available on the SIOS Technology Corp. website at:

http://us.sios.com/support

# Requirements

Before attempting to install or remove the LifeKeeper Informix Recovery Kit, you must understand the hardware and software requirements and the installation and removal solutions.

## Kit Hardware and Software Requirements

Before installing and configuring the LifeKeeper Informix Recovery Kit, be sure that your configuration meets the following requirements:

- **Servers.** The Recovery Kit requires two or more _supported_ computers configured in accordance with LifeKeeper requirements described in the *LifeKeeper Online Product Manual* and the *LifeKeeper Release Notes*, which are shipped with the product media.
- **Shared Storage.** Informix databases must reside on shared disk in a LifeKeeper environment.
- **LifeKeeper software.** You must install the same version of LifeKeeper software and any patches on each server. Please refer to the *LifeKeeper Release Notes* and *Online Product Manual* for specific LifeKeeper requirements.
- **LifeKeeper IP Recovery Kit.** This kit is needed only if the Informix executables will be located on a shared disk or if the Informix server will be accessed from a remote server. If either condition exists, you must have the same version of this Recovery Kit on both the primary and backup servers.
- **IP network interface.** Each server requires at least one Ethernet TCP/IP-supported network interface. In order for IP switchover to work properly, user systems connected to the local network should conform to standard TCP/IP specifications.
  **Note:** Even though each server requires only a single network interface, you should use multiple interfaces for a number of reasons: heterogeneous media requirements, throughput requirements, elimination of single points of failure, network segmentation, and so forth.
- **TCP/IP software.** Each server also requires the TCP/IP software.
- **Informix software.** Each server must have Informix Dynamic Server software installed and configured prior to configuring LifeKeeper and the LifeKeeper Informix Recovery Kit. The same version should be installed on each server. Consult the *LifeKeeper Release Notes* or *your* sales representative for the latest release compatibility and ordering information.

You should refer to the *LifeKeeper for Linux Planning and Installation Guide* for specific instructions on how to install or remove the LifeKeeper Informix Recovery Kit.

# Configuring Informix with LifeKeeper

This section contains information you should consider before you start to configure Informix and examples of typical LifeKeeper Informix configurations.

Please refer to your *LifeKeeper Online Product Manual* for instructions on configuring your LifeKeeper Core resource hierarchies.

# Using Informix with Raw I/O

If you plan to use Informix with Raw I/O devices, you must install the LifeKeeper Raw I/O Recovery Kit from the LifeKeeper Core CD. You must also properly set up the Raw I/O devices prior to use. See [Appendix: Setting Up Informix on Raw I/O](#) for instructions.

# Specific Configuration Considerations for Informix

Planning LifeKeeper and Informix configurations before installing and configuring the LifeKeeper Informix Recovery Kit and Informix software ensures that the LifeKeeper configuration provides the protection and flexibility required for your installation. The following sections can help you plan your configuration to support fault resilience for your Informix resources and applications:

- Database Instance Components
- Configuration Rules

Refer to the Informix documentation for guidelines on tuning the database engine for data integrity and performance. In particular, the tuning for memory caching and checkpointing frequency can be critical to optimizing the application for fault resilience. For example, the checkpoint interval *[CKPTINTVL]* determines the number of database transactions that have not been committed to disk and, therefore, would be lost during a system failure.

## Database Instance Components

When reviewing the configuration rules and examples, visualize the database instance as three components:

- DBMS Commands/Files
- Configuration Files
- Informix Database

### DBMS Commands/Files

INFORMIXDIR is the environment variable providing the full path to the Informix directory containing the set of executable commands and files needed to run the DBMS system. LifeKeeper uses $INFORMIXDIR to find the configuration file, *$ONCONFIG*.

**Note:** INFORMIXDIR and ONCONFIG must be set in the personal initialization file (i.e., *.profile*, *.bash_profile*) for the Informix user on all the servers before you create the hierarchy. This file is specific to the shell that is being used by the Informix user.

The database must be up and running.

All Informix logins must add and export these variables from their personal initialization file.

### Configuration File

Informix requires a configuration file that identifies the database, its location, and other specific parameters used in database operations. This file is assigned to the environment variable ONCONFIG, which specifies the Informix configuration file located in *$INFORMIXDIR/etc*. If you do not specify a name for the configuration file during the Informix setup, Informix uses

*onconfig* by default as the name. Multiple database instances require unique ONCONFIG file names.

When ONCONFIG files are on non-shared disks, it is best to create the ONCONFIG file on one server, using the Informix utility **onmonitor**. Then copy (using **rcp**, for example) the file to the *$INFORMIXDIR/etc* directory on the other server. Using the Linux utilities, **chown** and **chgrp**, set the *owner* and *group* for the files you have copied to *informix*.

The ONCONFIG file contains many variables that can affect system performance; however, it is important to understand the following six variables in the context of a LifeKeeper protected server:

- **ROOTNAME**. The name of the root *dbspace*. The default value is *rootdbs*.

- **ROOTPATH**. The full path to the location of the *dbspace* (database). The database must be on a shared disk. For each database instance, the ROOTPATH must be unique for each hierarchy. With the database on a file system, the path must be of the form */mount point/directories/ROOTNAME*. For example, if the ROOTNAME is *parts* and is located directly under the mount point */dbase* then the ROOTPATH is */dbase/parts*. The ROOTPATH parameter must be identical for all servers in the protected hierarchy. LifeKeeper uses this information to locate the mount point to re-establish access to the database following a switchover.

- **MSGPATH**. Informix maintains log files and uses this variable to define the path to those files. If the database resides in a file system on a shared disk, the path should be to a file in the same file system. If it is a local file, after a switchover, the log information will be written to the same file name on the backup server. The MSGPATH should be unique for each instance of Informix.

- **SERVERNUM**. For each ONCONFIG file, corresponding to a unique database instance, SERVERNUM must be set to a unique number. It is suggested that you start with 0 and increase the number by 1 for each new ONCONFIG file. The value cannot exceed 255.

- **DBSERVERNAME**. For each ONCONFIG file, corresponding to a unique database instance, DBSERVERNAME must be set to a unique name. DBSERVERNAME should bear some relationship to the name of the ONCONFIG file. For example, if DBSERVERNAME is *on1*, then ONCONFIG could be *onconfigon1*.

- **SHMBASE.** Start of shared memory. If you are bringing up more than one instance of Informix, this should be different for each instance.

### Informix Database

The third component in the Informix Recovery Kit is the database itself, as configured or described by the configuration file that resides in what Informix calls **dbspace**. Refer to the Informix documentation for a complete discussion on the Informix database.

## General Informix Configuration Rules

To ensure a successful installation, observe the following rules when planning and installing Informix on LifeKeeper protected servers:

- **Matching uids and gids**. There must be a user and a group named *informix* on each server and the numeric *user ids* and the numeric *group ids* must match across all servers.

- **Database location**. For LifeKeeper purposes, the database must reside on shared media, SCSI or Fibre Channel, disks or disk arrays, connected to each server in the LifeKeeper cluster.

- **Single ONCONFIG file**. There must be one and only one ONCONFIG file for each database instance. You may have multiple database instances.
- **Database instance profile**. For the LifeKeeper Informix Recovery Kit to work properly, all user prompts in the Informix database instance personal initialization file (i.e., *.profile, .bash_profile*) must be removed. The file cannot be interactive.
- **SQL Hosts file**. This file must be configured. If INFORMIXDIR is on the local drive, the file uses the server name. If the executables are on a shared disk, the file must use an IP address. The IP address must be under LifeKeeper protection as a dependent of the Informix hierarchy. Refer to the *Creating a Resource Dependency* section in the *IP Recovery Kit Administration Guide* for further information.

# Configuration Examples

The following figures illustrate examples of both active/standby and active/active Informix configurations in a LifeKeeper environment.

The examples in this section show how Informix database instances can be configured on local and shared disks. Each diagram shows the relationships between the type of configuration and the Informix parameters **INFORMIXDIR** and **ONCONFIG**. Each configuration also adheres to the configuration rules and requirements described in this configuration guide that ensure compatibility between the Informix configuration and the LifeKeeper software.

This section first describes the configuration requirements and then provides these configuration examples:

- Active/Standby
- Active/Active

The examples in this section are only a sample of the configurations you could establish, but understanding these configurations and adhering to the configuration rules will help you define and set up workable solutions for your computing environment.

## Configuration Requirements

Each of the examples involves one or two databases: **databaseA** and **databaseB**. The Database Tag names are arbitrary names that describe these databases in a LifeKeeper configuration. The words *on* and *from*, and the system identifier that follows, provide clarification but are not required.

To understand the configuration examples, keep these configuration requirements in mind:

- **LifeKeeper hierarchy.** When performing LifeKeeper administration, the primary server refers to the location where the Informix instance is currently running. System administration takes place on this server when creating a LifeKeeper hierarchy. For the configuration examples, the primary server is Server 1 and the backup or alternate server is Server 2.
- **Database on shared disk.** In order for the LifeKeeper Informix Recovery Kit to function properly, the database must always be on a shared disk. If the database is on a file system, the file system must be mountable from the servers.
- **Shared disk locked by one server.** Shared storage resources that are under LifeKeeper protection are reserved for use by one server. This is done using SCSI reservations. If the shared device is a disk array, an entire LUN is reserved; if a shared device is a disk, then the

entire disk is reserved. This prevents inadvertent corruption of the data by other servers in the cluster. When a server fails, the highest priority backup server breaks the old reservation and establishes its own reservation, locking out all other servers.

- **$INFORMIXDIR location.** Depending upon the configuration, $INFORMIXDIR may either be on the shared disk or on a non-shared local disk. If it is on a shared disk, it may be on the same file system as the database or it could be on a different file system. If it is on a file system on the shared disk, the file system must be mountable from both servers in the LifeKeeper pair.

**Note:** The tables associated with each configuration illustration provide examples of the appropriate information that would be entered in the Create Resource Hierarchy wizard on the primary server (Server 1) and Extend Resource Hierarchy wizard to the backup server (Server 2). For additional detail on what information to enter into the wizards, refer to the LifeKeeper Configuration Tasks section later in this guide. These tables can be a helpful reference when configuring your Recovery Kit.

## Active/Standby Configurations

This section provides two active/standby configuration examples. In these configurations, Server 1 is considered active because it has exclusive access to the database. Server 2 does other processing. If Server 1 fails, Server 2 gains access to the database and LifeKeeper re-establishes the database operations.

**Figure 1. Active/Standby Configuration Example 1**
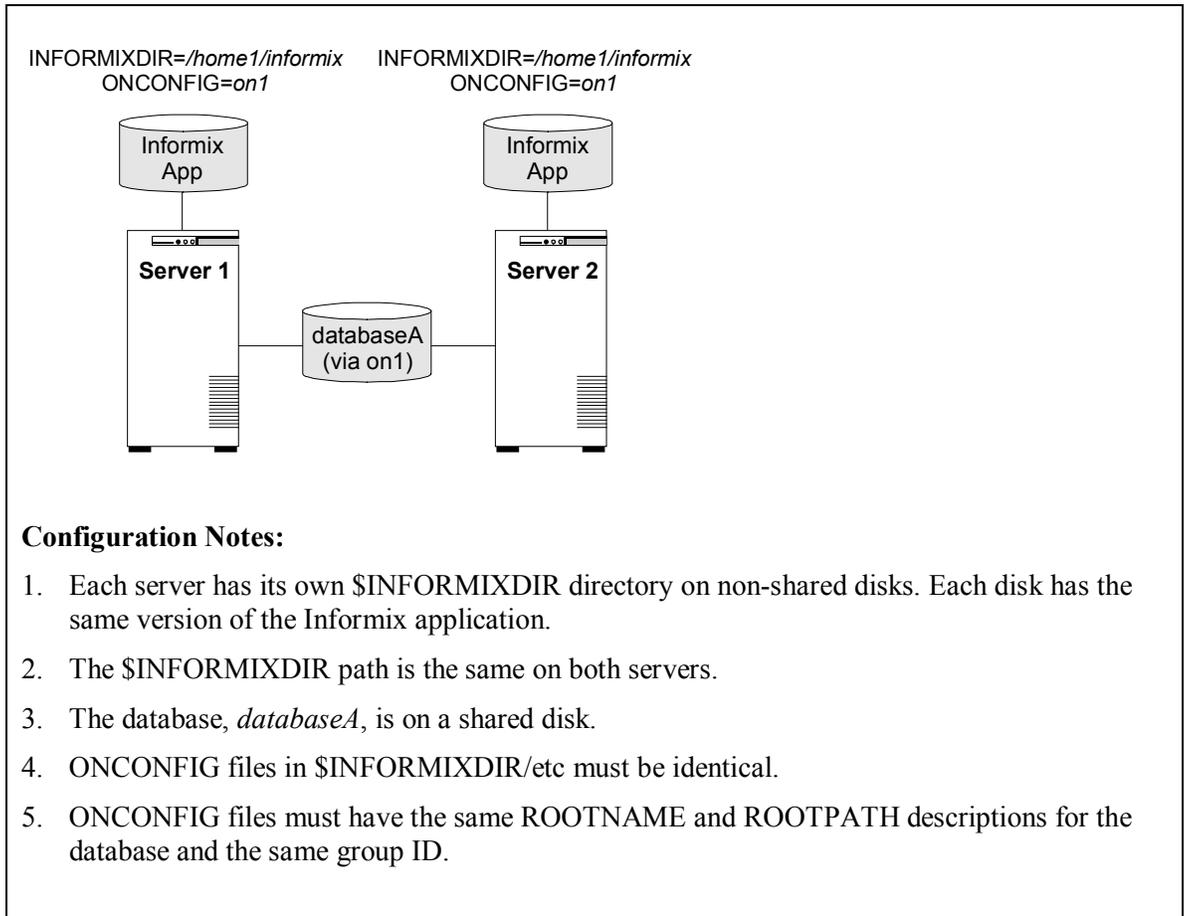


**Configuration Notes:**

1. Each server has its own $INFORMIXDIR directory on non-shared disks. Each disk has the same version of the Informix application.

2. The $INFORMIXDIR path is the same on both servers.

3. The database, *databaseA*, is on a shared disk.

4. ONCONFIG files in $INFORMIXDIR/etc must be identical.

5. ONCONFIG files must have the same ROOTNAME and ROOTPATH descriptions for the database and the same group ID.

### Creating a resource hierarchy on Server 1:

| | |
|---|---|
| Server: | Server1 |
| Informix Configuration File: | on1 |
| Informix Directory: | /home1/informix |
| Database Tag: | databaseA-on-server1 |

### Extending the resource hierarchy to Server 2:

| | |
|---|---|
| Template Server: | Server1 |
| Tag to Extend: | databaseA-on-server1 |

| | |
|---|---|
| Target Server: | Server2 |
| Target Priority: | 10 |
| Informix Directory: | /home1/informix |
| Database tag: | databaseA-on-server2 |

**Figure 2. Active/Standby Configuration Example 2**

INFORMIXDIR=*/shr1/informix*
ONCONFIG=*on1*

Server 1

databaseA
(via on1)

Server 2

**Configuration Notes:**

1.  Both servers use the $INFORMIXDIR directory on a shared disk.

2.  The $INFORMIXDIR path is the same on both servers.

3.  The database, *databaseA*, is on a shared disk.

4.  Only one (1) $INFORMIXDIR and one (1) ONCONFIG file exist.

5.  Server 2 can not access to files and directories on the shared disk while Server 1 is active.

6.  $INFORMIXDIR can be on the same shared disk as the database or on separate disks.

7.  This configuration requires you to have a LifeKeeper protected IP address. This will be used in the *sqlhost* file.

**Creating a resource hierarchy on Server 1:**

| | |
|---|---|
| Server: | Server1 |
| Informix Configuration File: | on1 |
| Informix Directory: | /shr1/informix |
| Database Tag: | databaseA-on-server1 |

**Extending the resource hierarchy to Server 2:**

| | |
|---|---|
| Template Server: | Server1 |
| Tag to Extend: | databaseA-on-server1 |
| Target Server: | Server2 |
| Target Priority: | 10 |
| Informix Directory: | /shr1/informix |
| Database tag: | databaseA-on-server2 |

## Active/Active Configurations

An active/active configuration consists of two or more servers actively running a different database instance, with each serving as a backup for the other. The databases must be on different shared physical devices.

$INFORMIXDIR can be on non-shared or shared disks depending upon the configuration requirements. For example, multiple database instances on either of the servers using a common $INFORMIXDIR require $INFORMIXDIR to be on non-shared disks. If the $INFORMIXDIR directories are on shared disk, they must be on separate shared disks.

This section provides three active/active configuration examples:

- Databases on shared resources and multiple instances of $INFORMIXDIR on non-shared resources (Figure 3).
- Databases on shared resources and a single instance of $INFORMIXDIR on non-shared resources (Figure 4).
- Databases on shared resources and the appropriate $INFORMIXDIR instance on the same shared resource (Figure 5).

**Note:** For clarity, multiple database instances on one server using a common $INFORMIXDIR are not illustrated.

**Figure 3. Active/Active Configuration Example 1**



**Configuration Notes:**

1. Both servers use $INFORMIXDIR directory on non-shared disks. Each disk has the same version of the Informix application.

2. The $INFORMIXDIR path is the same on both servers.

3. The databases, *databaseA* and *databaseB*, are on shared disks.

4. Both ONCONFIG files must exist in each server's *$INFORMIXDIR/etc* directory.

5. ONCONFIG files must have the same ROOTNAME and ROOTPATH descriptions for the databases and the same group IDs.

6. Initially, Server 1 runs *databaseA* and Server 2 runs *databaseB*. In a switchover situation, one server can run both databases.

7. SHMBASE must be different in case of a failover.


**Creating the first resource hierarchy on Server 1:**

| | |
|---|---|
| Server: | Server1 |
| Informix Configuration File: | on1 |
| Informix Directory: | /home1/informix |
| Database Tag: | databaseA-on-server1 |


**Extending the first resource hierarchy to Server 2:**

| | |
|---|---|
| Template Server: | Server1 |
| Tag to Extend: | databaseA-on-server1 |
| Target Server: | Server2 |

| | |
|---|---|
| Target Priority: | 10 |
| Informix Directory: | /home1/informix |
| Database tag: | databaseA-on-server2 |

**Creating the second resource hierarchy on Server 2:**

| | |
|---|---|
| Server: | Server2 |
| Informix Configuration File: | on2 |
| Informix Directory: | /home2/informix |
| Database Tag: | databaseB-on-server2 |

**Extending the second resource hierarchy to Server 1:**

| | |
|---|---|
| Template Server: | Server2 |
| Tag to Extend: | databaseB-on-server2 |
| Target Server: | Server1 |
| Target Priority: | 10 |
| Informix Directory: | /home2/informix |
| Database tag: | databaseB-on-server1 |

**Figure 4. Active/Active Configuration Example 2**
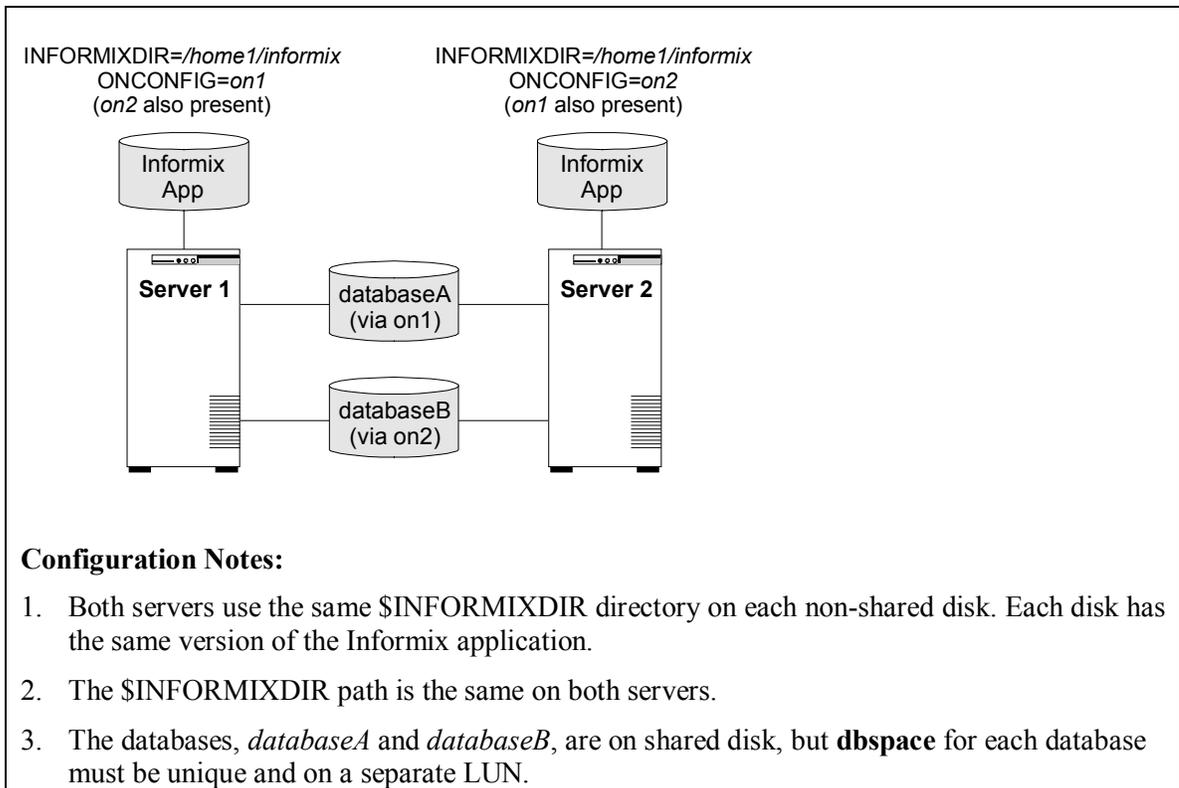


**Configuration Notes:**

1. Both servers use the same $INFORMIXDIR directory on each non-shared disk. Each disk has the same version of the Informix application.

2. The $INFORMIXDIR path is the same on both servers.

3. The databases, *databaseA* and *databaseB*, are on shared disk, but **dbspace** for each database must be unique and on a separate LUN.

4. Both ONCONFIG files (*on1* and *on2*) must exist in the *$INFORMIXDIR/etc* directory on both servers.

5. Initially, Server 1 runs *databaseA* and Server 2 runs *databaseB*. In a switchover situation, one server can run both databases.

6. This configuration requires you to have a LifeKeeper protected IP address. This will be used in the *sqlhost* file.

**Creating the first resource hierarchy on Server 1:**

| | |
|---|---|
| Server: | Server1 |
| Informix Configuration File: | on1 |
| Informix Directory: | /home1/informix |
| Database Tag: | databaseA-on-server1 |

**Extending the first resource hierarchy to Server 2:**

| | |
|---|---|
| Template Server: | Server1 |
| Tag to Extend: | databaseA-on-server1 |
| Target Server: | Server2 |
| Target Priority: | 10 |
| Informix Directory: | /home1/informix |
| Database tag: | databaseA-on-server2 |

**Creating the second resource hierarchy on Server 2:**

| | |
|---|---|
| Server: | Server2 |
| Informix Configuration File: | on2 |
| Informix Directory: | /home1/informix |
| Database Tag: | databaseB-on-server2 |

**Extending the second resource hierarchy to Server 1:**

| | |
|---|---|
| Template Server: | Server2 |
| Tag to Extend: | databaseB-on-server2 |
| Target Server: | Server1 |
| Target Priority: | 10 |
| Informix Directory: | /home1/informix |
| Database tag: | databaseB-on-server1 |

**Figure 5. Active/Active Configuration Example 3**



INFORMIXDIR=*/shr1/informix*
ONCONFIG=*on1*

Server 1 — databaseA (via on1) — Server 2

databaseB (via on2)

INFORMIXDIR=*/shr2/informix*
ONCONFIG=*on2*

**Configuration Notes:**

1. Both servers use $INFORMIXDIR directories on different shared disks.

2. The databases, *databaseA* and *databaseB*, are on shared disk, but **dbspace** for each database must be unique.

3. Both ONCONFIG files (*on1* and *on2*) must exist in the *$INFORMIXDIR/etc* directory on both servers.

4. Initially, Server 1 runs *databaseA* and Server 2 runs *databaseB*. In a switchover situation, one server can run both databases.

5. $INFORMIXDIR for *databaseA* and *databaseB* must all be on separate LUNs.

6. This configuration requires you to have a LifeKeeper protected IP address. This will be used in the *sqlhost* file.

**Creating the first resource hierarchy on Server 1:**

| | |
|---|---|
| Server: | Server1 |
| Informix Configuration File: | on1 |
| Informix Directory: | /shr1/informix |
| Database Tag: | databaseA-on-server1 |

**Extending the first resource hierarchy to Server 2:**

| | |
|---|---|
| Template Server: | Server1 |
| Tag to Extend: | databaseA-on-server1 |
| Target Server: | Server2 |
| Target Priority: | 10 |
| Informix Directory: | /shr1/informix |
| Database tag: | databaseA-on-server2 |

**Creating the second resource hierarchy on Server 2:**

| | |
|---|---|
| Server: | Server2 |
| Informix Configuration File: | on2 |
| Informix Directory: | /shr2/informix |
| Database Tag: | databaseB-on-server2 |

**Extending the second resource hierarchy to Server 1:**

| | |
|---|---|
| Template Server: | Server2 |
| Tag to Extend: | databaseB-on-server2 |
| Target Server: | Server1 |
| Target Priority: | 10 |
| Informix Directory: | /shr2/informix |
| Database tag: | databaseB-on-server1 |

# LifeKeeper Configuration Tasks

You can perform the following configuration tasks from the LifeKeeper GUI. The following four tasks are described in this guide, as they are unique to an Informix resource instance, and different for each Recovery Kit.

- Create a Resource Hierarchy. Creates an application resource hierarchy in your LifeKeeper cluster.
- Delete a Resource Hierarchy. Deletes a resource hierarchy from all servers in your LifeKeeper cluster.
- Extend a Resource Hierarchy. Extends a resource hierarchy from the primary server to a backup server.
- Unextend a Resource Hierarchy. Unextends (removes) a resource hierarchy from a single server in the LifeKeeper cluster.

The following tasks are described in the GUI Administration section within the *LifeKeeper Online Product Manual*, because they are common tasks with steps that are identical across all Recovery Kits.

- **Create a Resource Dependency.** Creates a parent/child dependency between an existing resource hierarchy and another resource instance and propagates the dependency changes to all applicable servers in the cluster.
- **Delete a Resource Dependency.** Deletes a resource dependency and propagates the dependency changes to all applicable servers in the cluster.
- **In Service.** Brings a resource hierarchy into service on a specific server.
- **Out of Service.** Takes a resource hierarchy out of service on a specific server.
- **View/Edit Properties.** View or edit the properties of a resource hierarchy on a specific server.

**Note:** Throughout the rest of this section, we explain how to configure your Recovery Kit by selecting certain tasks from the **Edit** menu of the LifeKeeper GUI. You can also select each configuration task from the toolbar. You may also right click on a global resource in the Resource Hierarchy Tree (left-hand pane) of the status display window to display the same drop down menu choices as the **Edit** menu. This, of course, is only an option when a hierarchy already exists.

You can also right click on a resource instance in the Resource Hierarchy Table (right-hand pane) of the status display window to perform all the configuration tasks, except *Creating a Resource Hierarchy*, depending on the state of the server and the particular resource.

## Creating an Informix Resource Hierarchy

To create a resource instance from the primary server, you should complete the following steps:

1. From the LifeKeeper GUI menu, select **Edit**, then **Server**. From the drop down menu, select **Create Resource Hierarchy**.

**IMPORTANT:** The Informix Application should be running when you create the resource.

A dialog box will appear with a drop down list box with all recognized Recovery Kits installed within the cluster. Select **Informix Database** from the drop down listing.
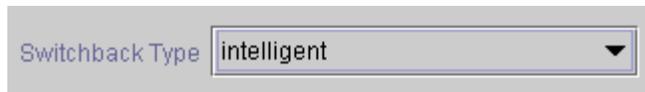
Select Recovery Kit | Informix Database ▼
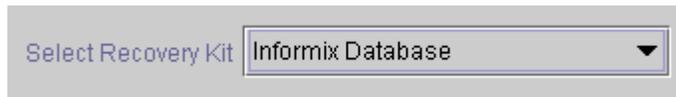
Click **Next** to proceed to the next dialog box.

When the **Back** button is active in any of the dialog boxes, you can go back to the previous dialog box. This is especially helpful should you encounter an error that might require you to correct previously entered information.

If you click **Cancel** at any time during the sequence of creating your hierarchy, LifeKeeper will cancel the entire creation process.

2.  Select the **Switchback Type.** This dictates how the Informix instance will be switched back to this server when it comes back into service after a failover to the backup server. You can choose either *intelligent* or *automatic*. Intelligent switchback requires administrative intervention to switch the instance back to the primary/original server. Automatic switchback means the switchback will occur as soon as the primary server comes back on line and reestablishes LifeKeeper communication paths.

Switchback Type | intelligent ▼

The switchback type can be changed later, if desired, from the General tab of the Resource Properties dialog box.

Click **Next** to proceed to the next dialog box.

3.  Select the **Server** where you want to place the Informix Database (typically this is referred to as the primary or template server). All the servers in your cluster are included in the drop down list box.

Server | fletch ▼

Click **Next** to proceed to the next dialog box.

4.  Select or enter the **Informix Configuration File.** This is the name of the *ONCONFIG* file in the *$INFORMIXDIR/etc* directory associated with this database instance. If the displayed name is not the one you assigned, enter the correct name.

Informix Configuration File | onconfig

Click **Next** to proceed to the next dialog box.

5.  Select or enter an **Informix Directory.** This is the full directory path name where the Informix application resides on the primary server, i.e. it is identical to $INFORMIXDIR.
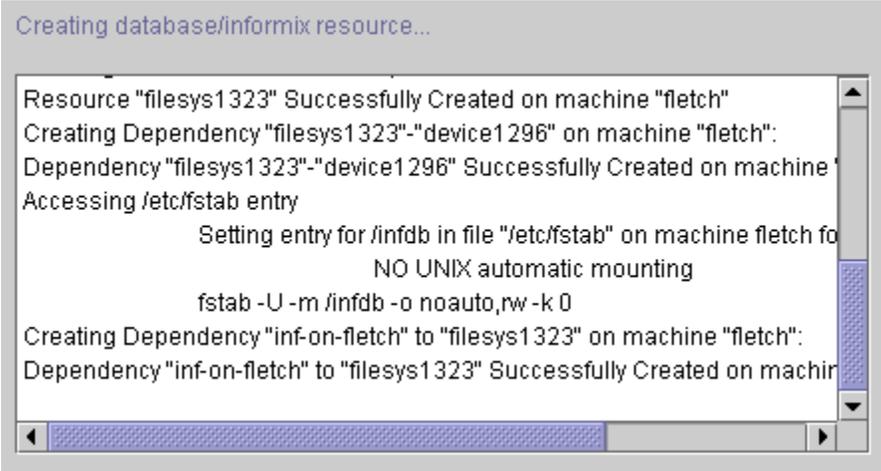
Informix Directory /opt/inf

Click **Next** to proceed to the next dialog box.

6. Select or enter the **Database Tag.** This is a tag name given to the Informix hierarchy. You can select the default or enter your own tag name.
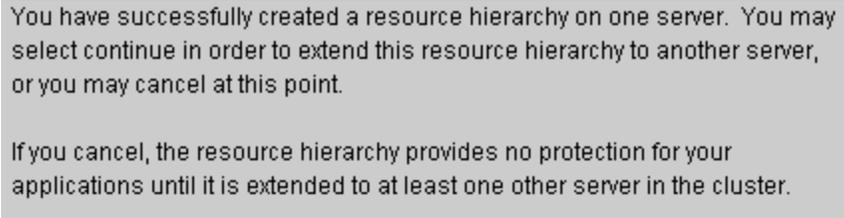
Database Tag inf-on-fletch

When you click **Next**, the Create Resource Wizard will create your Informix resource.

7. At this point, an information box appears and LifeKeeper will validate that you have provided valid data to create your Informix resource hierarchy. If LifeKeeper detects a problem, an ERROR will appear in the information box. If the validation is successful, your resource will be created.
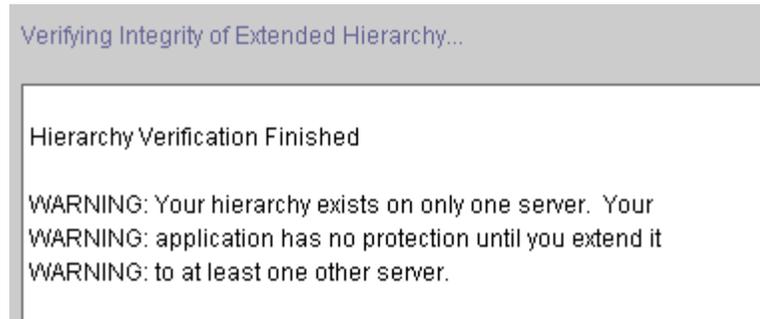
Creating database/informix resource...

Resource "filesys1323" Successfully Created on machine "fletch"
Creating Dependency "filesys1323"-"device1296" on machine "fletch":
Dependency "filesys1323"-"device1296" Successfully Created on machine "
Accessing /etc/fstab entry
        Setting entry for /infdb in file "/etc/fstab" on machine fletch fo
                NO UNIX automatic mounting
        fstab -U -m /infdb -o noauto,rw -k 0
Creating Dependency "inf-on-fletch" to "filesys1323" on machine "fletch":
Dependency "inf-on-fletch" to "filesys1323" Successfully Created on machin

Click **Next** to proceed to the next dialog box.

8. Another information box will appear explaining that you have successfully created an Informix resource hierarchy, and you must **Extend** that hierarchy to another server in your cluster in order to place it under LifeKeeper protection.

You have successfully created a resource hierarchy on one server. You may select continue in order to extend this resource hierarchy to another server, or you may cancel at this point.

If you cancel, the resource hierarchy provides no protection for your applications until it is extended to at least one other server in the cluster.

When you click **Continue**, LifeKeeper will launch the Pre- Extend Wizard that is explained later in this section.

If you click **Cancel** now, a dialog box will appear warning you that you will need to come back and extend your Informix resource hierarchy to another server at some other time to put it under LifeKeeper protection.

Verifying Integrity of Extended Hierarchy...

Hierarchy Verification Finished

WARNING: Your hierarchy exists on only one server. Your
WARNING: application has no protection until you extend it
WARNING: to at least one other server.

9. Click **Done** to exit.

## Deleting a Resource Hierarchy

To delete a resource hierarchy from <u>all</u> the servers in your LifeKeeper environment, complete the following steps:

1. From the LifeKeeper GUI menu, select **Edit**, then **Resource**. From the drop down menu, select **Delete Resource Hierarchy**.

2. Select the name of the **Target Server** where you will be deleting your Informix resource hierarchy.

   **Note:** If you selected the Delete Resource task by right clicking from the right pane on an individual resource instance, or from the left pane on a global resource where the resource is on only one server this dialog box will not appear.

   Target Server  [fletch                    ▼]
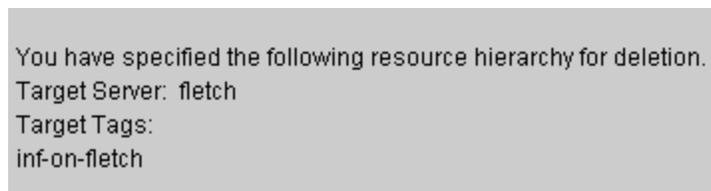
   Click **Next**.

3. Select the **Hierarchy to Delete**. Identify the resource hierarchy you wish to delete, and highlight it.

   **Note:** If you selected the Delete Resource task by right clicking from either the left pane on a global resource or the right pane on an individual resource instance, this dialog will not appear.
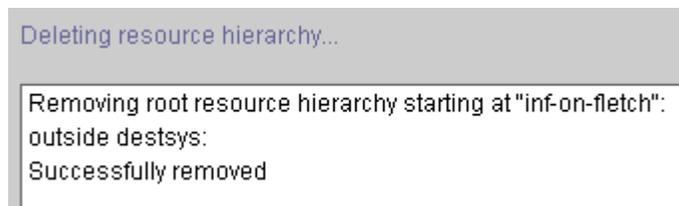
Hierarchy to Delete

inf-on-fletch

Click **Next**.

4.  An information box appears confirming your selection of the target server and the hierarchy you have selected to delete.

You have specified the following resource hierarchy for deletion.
Target Server:  fletch
Target Tags:
inf-on-fletch

Click **Delete** to delete your resource and proceed to the final dialog box.

5.  Another information box appears confirming that the Informix resource was deleted successfully.

Deleting resource hierarchy...

Removing root resource hierarchy starting at "inf-on-fletch":
outside destsys:
Successfully removed

6.  Click **Done** to exit out of the Delete Resource Hierarchy menu selection.

## Extending Your Hierarchy

After you have created a hierarchy, you will want to extend that hierarchy to another server in the cluster. There are three possible scenarios to extend your resource instance from the template server to a target server. The first scenario is when you "Continue" from creating the resource into extending that resource to another server. The second scenario is when you enter the Extend Resource Hierarchy task from the edit menu as shown below. The third scenario is when you right click on an unextended hierarchy in either the left or right hand pane. Each scenario takes you through the same dialog boxes (with a few exceptions, which are clearly detailed below).

1. If you are entering the Extend wizard from the LifeKeeper GUI menu, select **Edit**, then **Resource**. From the drop down menu, select **Extend Resource Hierarchy**. This will launch the Extend Resource Hierarchy wizard.

2. The first dialog box to appear will ask you to select the **Template Server** <u>where your Informix resource hierarchy is currently in service</u>. It is important to remember that the **Template Server** you select now and the **Tag to Extend** that you select in the next dialog box represent an *in service* resource hierarchy. An error message will appear if you select a resource tag that is not in service on the template server you selected. The drop down box in this dialog provides the names of all the servers in your cluster.

   **Note:** If you are entering the Extend Resource Hierarchy task immediately following the creation of an Informix resource hierarchy, <u>this dialog box will not appear</u>, since the wizard has already identified the template server in the create stage. This is also the case when you right-click on either the Informix resource icon in the left hand pane or right-click on the Informix resource box in the right hand pane the of the GUI window and choose *Extend Resource Hierarchy*.

   | Template Server | fletch ▼ |
   |---|---|

   It should be noted that if you click the **Cancel** button at any time during the sequence of extending your hierarchy, LifeKeeper will cancel the extension process to that particular server. However, if you have already extended the resource to another server, that instance will continue to be in effect until you specifically unextend it.

   For example, let's say you have created your resource on Server 1 and extended that resource to Server 2. In the middle of extending the same resource to Server 3, you change your mind and click on the **Cancel** button inside one of the dialog boxes. This will cancel only your action to extend the resource to Server 3, not the extension you created to Server 2. If you want to remove Server 2 from this hierarchy, you must unextend the resource from Server 2.
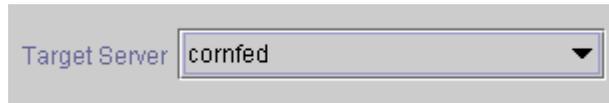
   Click **Next**.

3. Select the **Tag to Extend**. This is the name of the Informix instance you wish to extend from the template server to the target server. The wizard will list in the drop down list box all the resources that you have created on the template server, which you selected in the previous dialog box.

   **Note:** Once again, if you are entering the Extend Resource Hierarchy task immediately following the creation of an Informix resource hierarchy, <u>this dialog box will not appear</u>, since the wizard has already identified the tag name of your Informix resource in the create stage. This is also the case when you right-click on either the Informix resource icon in the left hand pane or on the Informix resource box in the right hand pane of the GUI window and choose *Extend Resource Hierarchy*.

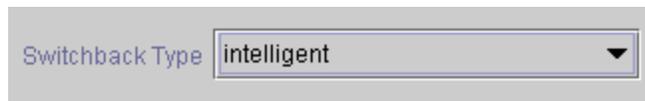   | Tag to Extend | inf-on-fletch ▼ |
   |---|---|

   Click **Next**.

4. Select the **Target Server** where you are extending your Informix resource hierarchy. The drop down box provides the names of the servers in your cluster that are not already in the selected hierarchy.

Target Server | cornfed ▼

Click **Next**.

5. Select the **Switchback Type.** This dictates how the Informix instance will be switched back to this server when it comes back into service after a failover to the backup server. You can choose either *intelligent* or *automatic*. Intelligent switchback requires administrative intervention to switch the instance back to the primary/original server. Automatic switchback means the switchback will occur as soon as the primary server comes back on line and reestablishes LifeKeeper communication paths.

Switchback Type | intelligent ▼

The switchback type can be changed later, if desired, from the General tab of the Resource Properties dialog box.

Click **Next**.

6. Select or enter a **Template Priority**. This is the priority for the Informix hierarchy on the server where it is currently in service. Any unused priority value from 1 to 999 is valid, where a lower number means a higher priority (1=highest). The extend process will reject any priority for this hierarchy that is already in use by another system. The default value is recommended. **Note:** This selection will appear only for the initial extend of the hierarchy.

Click **Next**.

7. Select or enter the **Target Priority**. This is the priority for the new extended Informix hierarchy relative to equivalent hierarchies on other servers. Any unused priority value from 1 to 999 is valid, indicating a server's priority in the cascading failover sequence for the resource. A lower number means a higher priority (1=highest). Note that LifeKeeper assigns the number "1" to the server on which the hierarchy is created by default. The priorities need not be consecutive, but no two servers can have the same priority for a given resource.

Target Priority | 10 ▼

Click **Next**.

8. An information box will appear explaining that LifeKeeper has successfully checked your environment and that all the requirements for extending this Informix resource have been met. If there were some requirements that had not been met, LifeKeeper would not allow you to select the **Next** button, and the **Back** button would be enabled.

```
Executing the pre-extend script...

Checking existence of extend and canextend scripts
Building independent resource list
Checking extendability for inf-on-fletch

Pre Extend checks were successful
```

If you click **Back**, you can make changes to your resource extension according to any error messages that may appear in the information box.

If you click **Cancel** now, you will need to come back and extend your Informix resource hierarchy to another server at some other time to put it under LifeKeeper protection.

When you click **Next**, LifeKeeper will launch you into the Extend Resource Hierarchy configuration task.

9. Select or enter the **Informix Directory**. This is the directory location where the Informix application is located on the backup or target server.

```
Informix Directory /opt/inf
```

Click **Next**.

10. Select or enter the **Database Tag.** The default is the same name as the template tag except "on" the target server name.

```
Database Tag  inf-on-cornfed
```

Click **Next** to proceed to the next dialog box.

11. An information box will appear verifying that the extension is being performed.

```
Extending resource hierarchy...

Setting switchback type for hierarchy
Creating equivalencies
LifeKeeper Admin Lock (inf-on-fletch) Released

Hierarchy successfully extended
LifeKeeper Application=Database on "cornfed".
LifeKeeper Database Resource Type=Informix on "cornfed".
Creating Resource Instance "inf-on-cornfed" with id "onconfig" on machine
Resource "inf-on-cornfed" Successfully Created on machine "cornfed"
```

Click **Next Server** if you want to extend the same Informix resource instance to another server in your cluster. This will repeat the Extend Resource Hierarchy operation.

If you click **Finish**, another dialog box will appear confirming LifeKeeper has successfully extended your Informix resource.

> Verifying Integrity of Extended Hierarchy...
>
> Examining hierarchy on cornfed
>
> Hierarchy Verification Finished

12. Click **Done** to exit from the Extend Resources Hierarchy menu selection.

**Note:** Be sure to test the functionality of the new instance on *both* servers.


## Unextending Your Hierarchy

1. From the LifeKeeper GUI menu, select **Edit**, then **Resource**. From the drop down menu, select **Unextend Resource Hierarchy**.

2. Select the **Target Server** where you want to unextend the Informix resource. It cannot be the server where Informix is currently in service.

    **Note:** If you selected the Unextend task by right clicking from the right pane on an individual resource instance this dialog box will not appear.

    > Target Server   | cornfed ▼ |
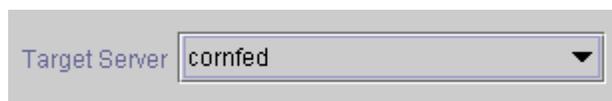
    Click **Next** to proceed to the next dialog box.

3. Select the Informix **Hierarchy to Unextend.**

    **Note:** If you selected the Unextend task by right clicking from either the left pane on a global resource or the right pane on an individual resource instance, this dialog will not appear.

    > Hierarchy to Unextend   | inf-on-cornfed ▼ |

    Click **Next** to proceed to the next dialog box.

4. An information box appears confirming the target server and the Informix resource hierarchy you have chosen to unextend.

You have specified the following resource hierarchy for unextend.
Target Server = cornfed
Target Tag = inf-on-cornfed

Click **Unextend**.

5. Another information box appears confirming that the Informix resource was unextended successfully.

Unextending resource hierarchy...

Hierarchy Unextend Manager Initializing
Checking Target Machine Communication Paths
LifeKeeper Admin Lock Flag (inf-on-cornfed) Established
Removing Equivalencies
Removing Resources and Associated Dependencies
LifeKeeper Admin Lock Flag (inf-on-cornfed) Released
Synchronizing LifeKeeper Databases
Unextend completed successfully

6. Click **Done** to exit out of the Unextend Resource Hierarchy menu selection.


# Testing Your Resource Hierarchy

You can test your Informix resource hierarchy by initiating a manual switchover. This will simulate a failover of a resource instance from the primary server to the backup server.


### Performing a Manual Switchover from the GUI

You can initiate a manual switchover from the LifeKeeper GUI by selecting **Edit**, then **Resource**, then finally **In Service** from the drop down menu. For example, an *in service* request executed on a backup server causes the application hierarchy to be placed in service on the backup server and taken out of service on the primary server. At this point, the original backup server is now the primary server and original primary server has now become the backup server.

If you execute the **Out of Service** request, the application is taken out of service without bringing it in service on the other server.


### Recovery Operations

When the primary server fails, the Informix Recovery Kit software performs the following tasks:

- Brings Informix into service on the backup server by bringing *in service* the logical interface on one of that server's physical network interfaces
- Mounts the file system on the shared disk on that server
- Starts the daemon processes related to Informix

Since session context is lost following recovery, after the recovery, Informix users must reconnect using exactly the same procedures they used to connect originally.

# Troubleshooting

This section provides a list of messages that you may encounter during the process of creating and extending a LifeKeeper Informix resource hierarchy, removing and restoring a resource, and, where appropriate, provides additional explanation of the cause of the errors and necessary action to resolve the error condition. Other messages from other LifeKeeper scripts and utilities are also possible. In these cases, please refer to the documentation for the specific script or utility. Messages in this section fall under these topics:

- Hierarchy Creation and Extend
- Hierarchy Restore and Remove

## Hierarchy Creation and Extend Errors

**"ERROR: Informix Database path must start with a /"**

Enter the valid Informix database path beginning with a "/".

**"ERROR: $InformixDir on $TargetSysName does not contain Informix"**

The Informix software was not found in the directory specified. Enter the correct path.

**"ERROR: $InformixDir on $TargetSysName does not exist"**

The Informix directory specified does not exist. Enter the correct path.

**"ERROR: $InformixDir/etc on $TargetSysName does not contain $config_file"**

The directory $InformixDir/etc does not contain the Informix configuration file specified. Make sure that the correct file name is enter and exist in the directory $InformixDir/etc.

**"*ERROR10* Create Informix Database dependency failure"**

During create hierarchy a dependency was not made. Check the log to see which dependency. Then solve any configuration problems with the dependent resource.

**"ERROR: Can not determine Informix dbspaces and chunks on $PRIMACH"**

LifeKeeper cannot determine the dbspaces and chunks for the Informix database. Check to see that the Informix configuration file is correct.

**"ERROR: Informix Database Instance Create on machine $PRIMACH failed."**

LifeKeeper was unable to create the Informix hierarchy. See log for additional error messages and troubleshooting information.

**"ERROR: Informix Database Instance Setstate on machine $PRIMACH failed."**

LifeKeeper is unable to set the state of the database instance. See the LifeKeeper log for additional troubleshooting information.

**"An error occurred during creation of LifeKeeper Resource Type=Informix on $PRIMACH."**

LifeKeeper was unable to create the type "Informix." See the LifeKeeper log for additional troubleshooting information.

**"ERROR: Informix Database Instance set switchback type on machine $PRIMACH failed."**

LifeKeeper was unable to set the switchback type for the Informix hierarchy. Try setting the switchback type manually.

**"ERROR73: Create file system hierarchy failure on $PRIMACH"**

LifeKeeper was unable to create the resource hierarchy for a file system the Informix depends on. See the LifeKeeper log for additional troubleshooting information.

**"ERROR: Create Informix Database file system dependency failure on $PRIMACH"**

LifeKeeper was unable to create a dependency for a file system that Informix depends on. See the LifeKeeper log for additional troubleshooting information.

**"ERROR(50): Create Informix Database hierarchy failure"**

LifeKeeper was unable to create the Informix hierarchy. See the LifeKeeper log for additional troubleshooting information.

**"*ERROR20* Create Informix Database file system hierarchy failure"**

Unable to protect a file system that Informix depends on. See the LifeKeeper log for additional troubleshooting information.

**"*ERROR30* Create Informix file system hierarchy failure"**

Unable to protect a file system that Informix depends on. See the LifeKeeper log for additional troubleshooting information.

**"An error occurred during creation of LifeKeeper Application=Database on $MACH."**

LifeKeeper could not create the application of type "Database." See the LifeKeeper log for additional troubleshooting information.

**"An error occurred during creation of LifeKeeper Resource Type=Informix on $MACH."**

LifeKeeper could not create the application of type "Database." See the LifeKeeper log for additional troubleshooting information.

**"ERROR10: Create Informix Database instance (setstate) failure"**

Unable to set the state of the Informix hierarchy. See the LifeKeeper log for additional troubleshooting information.

**"ERROR20: Create Informix Database instance failure"**

Unable to create the Informix database hierarchy. See the LifeKeeper log for additional troubleshooting information.

**"ERROR: Informix Database $ is not on shared file system"**

The Informix database in not configured on a shared database. Please check you Informix configuration and place the database on a shared file system.

**"ERROR: Informix Database ROOTPATH can not be determined"**

The ROOTPATH for Informix cannot be determined. Please check you Informix configuration.

**"ERROR: Unable to determine status of Informix on $MACH"**

The state of the Informix database cannot be determined. Use the Informix tool *onmonitor* to troubleshoot the problem.

**"An error occurred while creating Informix database hierarchies."**

Unable to create the database hierarchy. See the LifeKeeper log for additional troubleshooting information.

**"ERROR: No INFORMIXDIR set in informix user environment"**

Set the environment variable INFORMIXDIR in the personal initialization file (i.e., *.profile*, *.bash_profile*).

**"ERROR: onconfig variable is incorrectly set in the environment"**

The configuration file set for the ONCONFIG variable in the personal initialization file (i.e., *.profile*, *.bash_profile*) does not match the name of the file given. Please enter the correct file name

**"ERROR: INFORMIX database for $CONFIG_FILE is not Running."**

Start the Informix database. It must be running on the primary system for hierarchy creation to succeed.

**"ERROR: Informix Database for $CONFIG_FILE is already in LifeKeeper on $MACH"**

The database specified in already under LifeKeeper protection. Please select another database.

**"ERROR: Informix Configuration file $ConfigFile already in use on $MACH"**

The configuration file (ONCONFIG) must be unique. Check you Informix configuration.

**"ERROR: Informix login does not exist on $MACH"**

The user "informix" has not been created. Please refer to the Linux System Administration Guide.

**"ERROR: Given onconfig file does not exist in any Informix directories on $MACH"**

The configuration file does not exist in $INFORMIXDIR/etc for any of the Informix installations.

**"ERROR: Informix Database on $MACH is not running"**

The Informix database on the specified machine is not running. Informix must be running on the primary system for hierarchy creation to succeed.

**"ERROR: Database path already in LifeKeeper on $MACH"**

The Informix database path is already under LifeKeeper protection. Please specify another database.

**"ERROR: $STAG already exists on machine $MACH"**

The given tag name is not unique. Please enter a unique tag name.

**"ERROR: No informix user"**

The user informix does not exist. Please refer to the Linux System Administration Guide.

**"ERROR: Invalid system for $DEV which is designated as shared on $PRIMACH!"**

The device name given is not shared with the server specified. Please specify the correct server.

**"ERROR: Invalid system for $FSNAME which is designated as shared on $PRIMACH!"**

The file system given is not shared with the server specified. Please specify the correct server.

**"ERROR: $CHUNKPATH is an Unknown file system or disk sector type for LifeKeeper."**

The path for the Informix chunk is not on a supported file system of disk sector type. Please refer to the *LifeKeeper Release Notes*.

# Hierarchy Restore and Remove Errors

### Bringing an Informix Resource In Service (Restore)

**"LifeKeeper: *ERROR* Informix database $DBPATH failed to go On-Line at <date>"**

LifeKeeper had problems starting the Informix database. Use the Informix utility "onmonitor" to try to start the database and trouble shoot the Informix configuration.

### Bringing an Informix Resource Out of Service (Remove)

**"LifeKeeper: *ERROR* Informix database $ID failed shutdown at <date>"**

LifeKeeper was unable to shutdown the Informix database. Use the Informix utility "onmonitor" to try to shutdown the database and trouble shoot the Informix configuration.

# Appendix: Setting Up Informix on Raw I/O

Use the following steps to create an Informix database that uses Raw I/O devices instead of files.

1. **Determine the number and size of raw devices**.  Determine the number and sizes of the chunks and dbspaces that you will need to create for your database.
2. **Configure the necessary number of Raw I/O devices**.  Configure Raw I/O by adding the raw device mappings to a system initialization file, (such as *boot.local* or *rc.local*) using the **raw** command. All Raw I/O devices must use the shared disk partitions.
3. **Configure ownership and permissions for the raw devices**.  Using the chown command, configure the appropriate permissions (a+rw), and ownership (chown informix:informix /dev/raw[0-9]).
4. **Activate the raw bindings**.  Activate the raw bindings by executing the file that contains the mappings (created in step 2).  Once the raw bindings have been activated, use the command **raw –qa** to query and verify device mappings.
5. **Configuring dbspaces on a Raw I/O device**.  A chunk represents the physical disk space, and a dbspace represents a set of chunks.  The IDS engine uses dbspaces when referencing the disk.  Users can create the rootdbs space on a raw device, or add additional dbspaces on a raw device.  In addition, raw device chunks can be added to existing dbspaces..
   a)     If the database rootdbs will use a raw device, edit the *onconfig* file to add the raw device as the value of the *ROOTDBS* parameter.
   b)     If creating new dbspaces to add to an existing Informix database, use the **onspaces** command line utility or the graphical **onmonitor** utility and follow the create dbspaces options.
   c)     If adding additional chunks to an existing Informix database dbspace,  use the **onspaces** command line utility or the graphical **onmonitor** utility.
6. **Verify Informix database access**.  After completion of all dbspaces and chunk space administration tasks, verify that the Informix database is accessible, and that any errors have been addressed.  If the database has not been started, use the **oninit** command to start the database.
7. **Protect the Informix database under LifeKeeper**.  Using the LifeKeeper GUI Create Resource Hierarchy menu item, create the Informix Resource Hierarchy.
8. **Remove raw bindings.**  Once the hierarchy has been protected under LifeKeeper protection, the raw bindings configured in the **boot.local** or **rc.local** scripts must be removed or commented out.  LifeKeeper will handle the activation and deactivation of raw devices from this point forward.
9. Verify switchover.  Verify switchover of the Informix Resource Hierarchy using raw devices to all servers in the cluster.  It is important that the permissions and ownership of the raw devices be the same throughout the cluster.

## Adding a Tablespace After Creating Hierarchy

If a dbspace is added on a Raw I/O device *after* the Informix hierarchy has been created in LifeKeeper, you must create a LifeKeeper Raw I/O hierarchy via the GUI and manually create a dependency between the Informix Resource (as parent) and the Raw I/O Resource (as child).