



**LifeKeeper<sup>®</sup> for Linux v6**  
ClearCase Recovery Kit  
Administration Guide

October 2006

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# ClearCase Recovery Kit Administration Guide

## Introduction

LifeKeeper for Linux ClearCase Recovery Kit provides fault resilient protection for ClearCase VOB and View storage locations including storage for replicated VOBs, ClearCase Registry files, Storage and Return Bays used in non-managed Multisite synchronization, and the ClearCase Release Area. The LifeKeeper for Linux ClearCase Recovery Kit does not provide protection for Multisite managed synchronization. This kit enables a failure on a primary ClearCase server to be recovered on a designated backup server without significant lost time or human intervention.

## Document Contents

This guide contains the following topics:

- [LifeKeeper Documentation](#). Provides a list of LifeKeeper for Linux documentation and where to find it.
- [Recovery Kit Requirements](#). Describes the hardware and software necessary to properly setup, install, and operate the ClearCase Recovery Kit. Refer to the *LifeKeeper for Linux Planning and Installation Guide* for specific instructions on how to install or remove LifeKeeper for Linux software.
- [ClearCase Recovery Kit Overview](#). Provides a brief description of the ClearCase Recovery Kit's features and functionality.
- [Configuring ClearCase for Use With LifeKeeper](#). Describes the key parts of the ClearCase configuration that affect LifeKeeper.
- [Configuration Changes Post Resource Creation](#). Provides information about tasks that may be required after your ClearCase resources are created.
- [ClearCase Configuration Examples](#). Provides examples of typical ClearCase configurations and the steps to configure your ClearCase resources.
- [LifeKeeper Configuration Tasks](#). Describes the tasks for creating and managing your ClearCase resource hierarchies using the LifeKeeper GUI.
- [ClearCase Troubleshooting](#). This section provides a list of informational and error messages with recommended solutions.

## 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*

- *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)

# Requirements

Your LifeKeeper configuration must meet the following requirements **prior** to the installation of the ClearCase Recovery Kit. Please see the *LifeKeeper for Linux Planning and Installation Guide* for specific instructions regarding the configuration of your LifeKeeper hardware and software.

## Hardware Requirements

- **Servers.** The Recovery Kit requires two or more servers configured in accordance with the requirements described in the *LifeKeeper for Linux Planning and Installation Guide*. See the *Release Notes* for supported Linux distributions.
- **Data Storage.** The ClearCase Recovery Kit can be used in conjunction both with shared storage and with replicated storage provided by the LifeKeeper Data Replication product. It can also be used with network-attached storage (NAS).

## Software Requirements

- **LifeKeeper software.** You must install the same version of LifeKeeper software and any patches on each server.
- **LifeKeeper IP Recovery Kit.** You must have the same version of the LifeKeeper IP Recovery Kit on each server.
- **LifeKeeper NFS Server Recovery Kit.** You must have the same version of the LifeKeeper NFS Server Recovery kit on each server. Note: Depending on the ClearCase configuration and what is protected this kit may not be required. This kit is only required when protecting local VOB and View storage locations (storage is not on a NAS device) or when protecting the ClearCase Release Area.
- **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.
- **ClearCase software.** IBM Rational ClearCase must be ordered separately from IBM. Each server in the cluster must be installed with the same IBM Rational ClearCase components (e.g. each server must have Multisite installed if protecting Multisite shipping services).

## Recovery Kit Installation

Please refer to the *LifeKeeper for Linux Planning and Installation Guide* for specific instructions on the installation and removal of the LifeKeeper for Linux software.

## ClearCase Recovery Kit Overview

IBM Rational ClearCase is an application that provides a comprehensive solution for software configuration management and distributed development. The ClearCase Recovery Kit enables LifeKeeper to protect ClearCase Server Hosts performing the following functions: Registry Server, Release Area, VOB (replicated and non-replicated) and View storage and Multisite Shipping Services for non-managed synchronization for parallel software development. While ClearCase provides other services such as License Server Host and MultiSite managed synchronization for parallel software development, this release of LifeKeeper ClearCase Recovery Kit does not protect these additional services. These other ClearCase services may coexist on a LifeKeeper server protecting other ClearCase services but the failure of a server will not switch these functions over to the backup server, which could cause ClearCase to fail. For example, if the License Server functions reside on the primary server and that server fails, then ClearCase will be unable to run because of the inability to obtain a license from the License Server.

The ClearCase Recovery Kit provides a mechanism to recover protected ClearCase services from a failed primary server onto a backup server. LifeKeeper can detect failures either at the server level (via a heartbeat) or resource level (by monitoring the ClearCase daemons) so that control of the protected ClearCase services are transferred to a backup server.

Rational ClearCase requires several network wide resources: License Server Host (1 or more), Registry Server Host (1 plus an optional backup), a Release Host, and a Registry Region. Additionally, the configuration can contain a number of Client Hosts as well as Server Hosts. The function of these systems and what LifeKeeper protects are described in the following paragraphs.

**License Server Host** – Most functions in ClearCase must have a valid license to perform the requested task. The ClearCase License Server performs the role of allocating a license when requested by a ClearCase command. It also ensures that it does not exceed the maximum number of licenses allowed as defined in the *license.db* file. This server must be highly available. Because ClearCase uses the MAC address of the primary network interface card as part of its license validation method, LifeKeeper will not be able to protect this ClearCase service. As an alternative, ClearCase does allow multiple license servers within the enterprise to prevent license server access from being a single point of failure.

**Registry Server Host** – The ClearCase Registry Server holds the databases used to determine the locations of the network's ClearCase data structures. This information is stored in files in the directory */var/adm/rational/clearcase/rgy*. This server must also be highly available and can be protected by LifeKeeper to ensure its availability.

**Release Host** – The Release Host serves as the network wide housing area that provides storage for the entire ClearCase product distribution, e.g., executable files, configuration files, and online documentation. This host is essentially a file server. ClearCase provides a link install type, which creates symbolic links to the Release Area via NFS mount points. Thus, it must be highly available if an install with links has been selected. LifeKeeper can protect the ClearCase Release Host.

**Client Host** – A Client Host is a system that runs the ClearCase client programs that constitute the user-level interface to ClearCase. This interface includes **cleartool**, **checkout**, etc. A Client Host by itself does not require protection by LifeKeeper.

**Server Host** – A Server Host stores ClearCase data such as VOB (replicated and non-replicated) and View storage directories and shipping information for ClearCase Multisite synchronization

operations for replicated VOBs. ClearCase Server processes execute on these hosts, as needed, communicating with client programs through remote procedure calls. Because of the storage directories and server processes, LifeKeeper protection is required on these hosts via the use of NFS resource hierarchies for local storage and IP resource hierarchies for storage on NAS devices. Only LifeKeeper File System resources are required to protect ClearCase Multisite storage and return bays used in non-managed synchronization operations.

In a ClearCase configuration a host can perform one or more of the above functions. So you can have a system that is the License Server Host, Registry Server Host, Release Host and a Client and Server Host.

Configuring servers to perform multiple functions will create problems when attempting to protect the services noted above via LifeKeeper. For example, having a License Server also act as the Registry Server limits what can be protected because the kit cannot shift the license function from one server to the other because of the dependency on the MAC address as noted before. Additionally, to perform a manual switchover of the Registry functions requires stopping ClearCase on the primary server, removing the file system resource protecting the Registry directory and switching it over to the backup server, stopping ClearCase if it is running on the backup server and then restarting it. Because there is no way to tell the **albd\_server** process to re-read its configuration information, you must stop and restart ClearCase to let it know it is no longer the Registry Server or that it has now taken on that function. To protect the services noted above, LifeKeeper will require modifications to the ClearCase Registry specifically related to host names and resource paths. These restrictions and Registry changes will be discussed later in this document.

## ClearCase Resource Hierarchies

A typical ClearCase hierarchy will be comprised of a ClearCase resource. It may also consist of zero or more file system resources, zero or more IP resources, and zero or more NFS resources. The exact makeup of the hierarchy depends on what is being protected. If Registry Services or storage and return bays for Multisite non-managed synchronization are being protected, then there will be one or more file system resources. If VOB (replicated or non-replicated) and/or View storage is protected that is not on a NAS device, then there will be one or more NFS resources. If the storage is on a NAS device, then there will be one or more IP resources. The IP and NFS resources used in the ClearCase resource hierarchy must exist prior to the creation of the ClearCase resource. For more information and examples see [Appendix A](#).

## Configuring ClearCase for Use With LifeKeeper

There are a number of ClearCase configuration considerations that need to be made before attempting to create LifeKeeper for Linux ClearCase resource hierarchies. These changes are required to make the path to ClearCase resources (VOB storage, Registry, Release Area) highly available via the use of virtual IP addresses and associated system names in DNS. ClearCase services are provided by a number of daemon processes. The main services being, **albd\_server** and **lockmgr**, which the ClearCase Application Recovery Kit will monitor. The **lockmgr** process is only monitored if the installed version of ClearCase uses it. To provide a highly available ClearCase Application, a number of configuration changes are required.

The need for these changes can be illustrated via the following example. A standard ClearCase installation requires a host to be designated as the Registry Server, *nodeR*. When ClearCase is installed on *nodeR*, a number of files are created in the directory */var/adm/rational/clearcase/rgy* that act as the repository of information for the operation of ClearCase. When other systems are installed, they are setup to contact *nodeR* via the setting in */var/adm/rational/clearcase/rgy/rgy\_hosts.conf*. If *nodeR* fails, then the ClearCase Registry is no longer accessible and the client cannot perform any ClearCase related commands, such as checking out a file for edit. If a backup Registry was defined then someone with root access must switch the client machine to point to the backup. If *nodeR* is clustered with another server, *nodeB*, then access to the Registry from a client can be made highly available via the following configuration changes

1. Place the directory */var/adm/rational/clearcase/rgy* on a shared disk (via the use of shared storage, NAS devices or via data replication) so that either system in the cluster can have access to the data.
2. Designate a name (*nodeZ*) and virtual IP address (1.1.1.1) that can float between *nodeR* and *nodeB* (the virtual name and address must be in DNS).
3. Create a LifeKeeper IP resource using the new IP address as well as the creation of a LifeKeeper File System resource that protects the Registry directory.
4. Edit the *rgy\_hosts.conf* file on the client and alter the name from *nodeR* to *nodeZ*. Perform the same edit on the Registry Server and any other servers installed with ClearCase.

Now if *nodeR* fails, LifeKeeper will detect the failure and migrate both the IP and File System resource to *nodeB* such that a client accessing the Registry on virtual *nodeZ* via IP address 1.1.1.1 will now find it transparently on *nodeB* without any intervention on the part of an administrator.

A similar configuration change will be required for VOB (replicated or non-replicated)\_and View storage locations. When creating a VOB or View with storage on a local system you have the option of specifying the host, global path to the storage area and the local path to the storage area or letting ClearCase determine it. If you let ClearCase determine that information, it creates paths using the real system name (from **uname -n** output). For a cluster with names of *nodeA* and *nodeB* creating storage on *nodeA* and letting ClearCase determine values will lead to a host name of *nodeA* and paths starting as */net/nodeA/...*

As was done in the Registry example above we need to use a virtual system name and IP address in DNS for the host name and path entries during creation of the storage area that can float between the servers in the cluster. So if virtual *nodeZ* with IP address 2.2.2.2 is designated to float between servers in the cluster the VOB creation would use **-host nodeZ, -gpath /net/nodeZ...** and **-hpath /net/nodeZ...** to allow the storage to float between the servers in the

cluster. Note that the storage area must reside on storage that each server in the cluster can access (shared, via a NAS device or via data replication). To limit the configuration changes to the ClearCase Registry for an existing ClearCase installation that has correctly defined paths, the current server name could be used for the virtual name which would then require a change to the real system server name (if `uname -n` currently returns `nodeA`, make that the virtual name and simply change the real name to return `nodeZ` on a `uname -n` call).

Making use of virtual server names and IP addresses requires the use of the ClearCase `alternate_hostnames` file located in `/var/adm/rational/clearcase/config` directory. In this file are listed all of the names the system is known by. Using the Registry protection example from above the primary server would have `nodeR` and `nodeZ`, and the backup server would have `nodeB` and `nodeZ`. Also requiring changes related to the virtual server names and IP addresses is the file `/var/adm/rational/clearcase/rgy/rgy_hosts.conf`. This file points to the Registry Host Server and will need to be modified on all systems running ClearCase to switch the name from the real host name to the virtual host name (`nodeR` to `nodeZ` in the above example).

If snapshot views are used, then the storage and database directories must be co-located on the same file system. ClearCase only stores the location of the database files and not the View Storage in the Registry. Co-location solves this problem and ensures that LifeKeeper is protecting both directories.

A server performing ClearCase Multisite shipping services in a non-managed mode must have the storage and return bays on shared file systems (shared storage, network attached storage, replicated storage). Additionally, information on storage and return bays, notification programs and receipt handler programs must be synchronized on all servers in the clusters. So if `nodeA` defines the following in `/var/adm/rational/clearcase/config/shipping.conf`:

```
NOTIFICATION-PROGRAM /opt/rational/clearcase/bin/notify
STORAGE-BAY -default /storage_bays/shipping
RETURN-BAY -default /storage_bays_return
RECEIPT-HANDLER -default /opt/rational/clearcase/config/scheduler/tasks/sync_receive
```

then the `shipping.conf` file on `nodeB` must have the same entries. If classes are used for the storage, return and receipt handler entries then they must also be replicated. When the ClearCase resource instance is created a File System resource instance is created for each unique storage and return bay. Because of the need to protect the bays in case of a failure, ClearCase Multisite shipping servers cannot be clustered together in an active/active configuration.

Auto-starting ClearCase at system boot should be disabled on all systems where LifeKeeper is protecting ClearCase services. This is recommended because the file systems and NFS shares needed by ClearCase will not be mounted and exported until LifeKeeper is started.

See [Appendix A](#) in this document for more detailed configuration examples for both existing ClearCase configurations and those installing ClearCase for the first time with LifeKeeper in mind.

# ClearCase Configuration Restrictions

The configurations listed below may or may not be protected by LifeKeeper:

- ClearCase License Server Host cannot be protected. The License Server function cannot be switched to another server in the cluster because the ClearCase licensing method depends on the MAC address of the network interface card. It is recommended that this service be moved to another host that does not require ClearCase services to be protected by LifeKeeper if the current server also has services to be protected (like VOB or View storage).
- Although not specifically restricted, widely distributed VOB and View storage areas on a server should be avoided to reduce the size of the ClearCase resource hierarchy. It is recommended that storage for VOBs and Views reside in common areas on the server and not be distributed to many different locations. In order to protect the storage areas LifeKeeper must see the area as shareable between servers in the cluster (via shared storage, NAS devices or data replication). A large number of unique storage locations do not lend themselves to meeting this requirement.
- Again although not specifically restricted an Active/Active configuration in which one server is protecting the Registry Server Host combined with other ClearCase protected services should be avoided because in order to switch the Registry functions from one server in the cluster to the other requires stopping and restarting ClearCase.
- Protection of the Release Area in an existing ClearCase configuration will not be supported unless configuration changes are made on the Release Host. In order to protect the Release Area for link installs and still have access to it after a failover, it must be set up using a virtual system name and IP address that can be switched between servers in the cluster. For example, if we set up and use the virtual name *nodeZ*, then when a link install is performed it must be via the virtual name of *nodeZ* and not the regular name of *nodeA*. Existing installations using link installs would be accessing via *nodeA* and not *nodeZ*. In order to protect the Release Area, the real server name must be changed such that the existing name can float between the servers in the cluster. In other words *nodeA* is now the virtual name that can float between the systems and *nodeZ* becomes the release system name. For more information on the configuration changes required see [Appendix A](#).
- Although not a configuration restriction, it must be noted that recovery time for a view that has been started on a server when the storage location resides on a different server can take 5 to 10 minutes or longer if the server with the storage location is rebooted or fails and the storage is switched over to another server (this is a ClearCase issue and not a LifeKeeper induced problem).
- Storage locations for multiple alternate host names should not resolve down to the same local path. For example, if you have *nodeA*, *nodeB* and *nodeC* in the *alternate\_hostnames* file you should not define storage locations of */net/nodeB/export/view* and */net/nodeC/export/view* as these both resolve to a local path of */export/view*. Because */export/view* needs to be protected by a LifeKeeper NFS resource hierarchy which has a child IP resource that must match an entry in the *alternate\_hostnames* file, it becomes a problem on how to match if more than one host is involved. This becomes even more of an issue in an Active/Active configuration when two NFS resources attempt to protect the same exported path on one server.

- To protect the View Storage location and thus the View private files in a snapshot view requires that the View root and View Storage be co-located. The method used to store location information in the ClearCase Registry stores information for the View root only. No information exists in the Registry to assist in locating the View Storage. By co-location of the View root and storage, the storage area including View private files can be protected.
- The ClearCase Kit currently understands only standard NFS mount points for global paths for VOB and View storage. Specifically it understands paths that start with */net*, */hosts* or */nfs*.
- As noted previously in this document, clustering shipping servers in an active/active configuration is not supported. An active/active configuration with a shipping server and a non-shipping server such as a VOB server is supported as long as the VOB server has ClearCase Multisite installed.

## Configuration Changes After Resource Creation

After creating a LifeKeeper ClearCase resource hierarchy it may be necessary to modify the resource hierarchy because of changes in the ClearCase configuration on the system. These changes include the addition or removal of storage locations for VOBs or Views, the addition or removal of the Registry Area, the addition or removal of storage or return bays, or the addition or removal of the Release Area. Some of these changes can be made without removing the resource hierarchy while others will require the deletion and recreation of the resource hierarchy. See below for the required steps for each type of change.

If additional storage locations are needed on file systems that are not currently part of the ClearCase resource hierarchy, they can be added without having to delete and recreate the hierarchy. To add new storage areas located on local storage devices simply perform the following:

1. Identify the storage device (shared or replicated storage device).
2. Perform the required device configuration (create the file system, add an entry to */etc/fstab* and mount the file system, add an entry to */etc/exports* and export the file system, and create the storage VOBs or Views on the new storage area).
3. Create the LifeKeeper NFS resource to protect the newly exported mount point. Use the same IP resource as the other NFS resources during the creation.
4. Make the newly created NFS resource a dependent child of the ClearCase resource. In the GUI select **Edit**, then **Resource**, then **Create Dependency** to start dependency creation of the NFS resource created in step 3. Select the **Server** and **Parent Resource Tag** for the ClearCase resource. Select the NFS Resource Tag from the **Child Resource Tag** drop down list and press **Next** and then press **Create Dependency** on the confirmation screen to add the NFS resource as a dependent resource in the ClearCase hierarchy.

For storage residing on a NAS device no additional changes to the resource hierarchy are required to add the new area. Simply follow the same procedures for setting up a VOB or View on a NAS device. The host used for the storage location should be the same as that used for prior storage locations on the NAS device so the IP resource is already part of the ClearCase resource hierarchy.

If a local VOB or View storage location is no longer required perform the following:

1. Identify the NFS export on which the storage location resides.
2. Determine if any other storage locations reside within the exported directory. If other storage locations reside on the share, no other action is required. If no other storage locations reside on the export, proceed to step 3.
3. Identify the LifeKeeper NFS resource that needs to be removed (you will need the resource tag). If this is the last child, simply delete the entire ClearCase resource hierarchy. If it is not the last child, proceed to step 4.
4. Remove the NFS resource as a child resource via dependency deletions. In the GUI select **Edit**, then **Resource**, then **Delete Dependency** to start dependency deletion of the NFS resource identified in step 3. Select the **Server** and the **Parent Resource Tag** that contain the NFS resource to be removed. Select the NFS resource tag from the **Child Resource Tag** drop down list and press **Next** and then press **Delete Dependency** on the confirmation screen to remove the NFS resource from the ClearCase resource hierarchy.

5. Delete the LifeKeeper NFS resource.

To update the resource hierarchy to remove storage residing on a NAS device does not require any updates. The IP resource used for other NAS storage is unaffected by the removal of the storage unless it is the last child resource. If it is the last child resource, then the ClearCase resource should be removed and not just an individual child.

If additional storage or return bays are needed on file systems that are not currently part of the ClearCase resource hierarchy, they can be added without having to delete and recreate the hierarchy. To add new areas simply perform the following:

1. Identify the storage device (shared, nas or replicated storage device).
2. Perform the required device configuration (create the file system, add an entry to */etc/fstab* and mount the file system).
3. Create the LifeKeeper File System resource to protect the newly created bay.
4. Make the newly created File System resource a dependent child of the ClearCase resource. In the GUI select **Edit**, then **Resource**, then **Create Dependency** to start dependency creation of the resource created in step 3. Select the **Server** and **Parent Resource Tag** for the ClearCase resource. Select the File System Resource Tag from the **Child Resource Tag** drop down list and press **Next** and then press **Create Dependency** on the confirmation screen to add the File System resource as a dependent resource in the ClearCase hierarchy.

If a storage or return bay is no longer required perform the following:

1. Identify the File System resource on which the bay resides.
2. Determine if any other storage locations reside within the directory. If other storage locations reside on the share, no other action is required. If no other storage locations reside on the export, proceed to step 3.
3. Identify the LifeKeeper File System resource that needs to be removed (you will need the resource tag). If this is the last child, simply delete the entire ClearCase resource hierarchy. If it is not the last child, proceed to step 4.
4. Remove the File System resource as a child resource via dependency deletions. In the GUI select **Edit**, then **Resource**, then **Delete Dependency** to start dependency deletion of the resource identified in step 3. Select the **Server** and the **Parent Resource Tag** that contain the file System resource to be removed. Select the resource tag from the **Child Resource Tag** drop down list and press **Next** and then press **Delete Dependency** on the confirmation screen to remove the File System resource from the ClearCase resource hierarchy.
5. Delete the LifeKeeper File System resource.

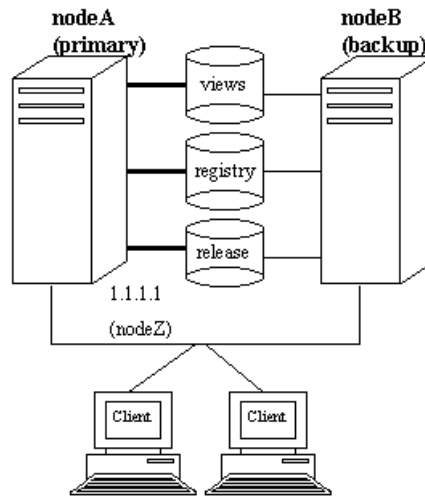
Adding or removing the Registry or Release Area requires the removal and recreation of the ClearCase resource.

## ClearCase Configuration Examples

This section contains definitions and examples of typical ClearCase configurations. Each example includes the configuration file entries that apply to LifeKeeper.

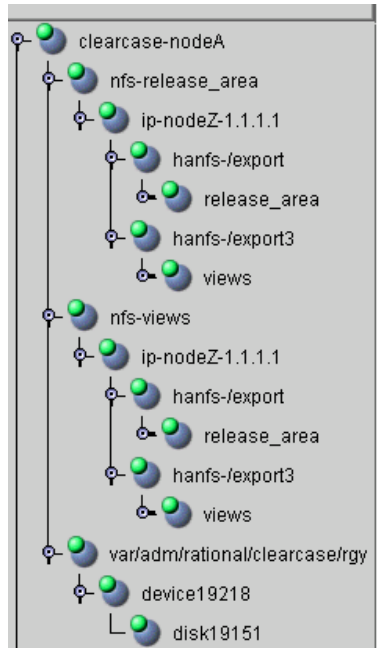
### Active/Standby Configuration with Local Storage

In the Active/Standby configuration, *nodeA* is the primary LifeKeeper server. It protects the ClearCase Registry, Release Area, and storage locations for Views (the system is a View Server). All storage resides on a shared array between the cluster servers. While *nodeB* may be handling other applications/services, it acts only as a backup for the ClearCase resources in LifeKeeper's context.



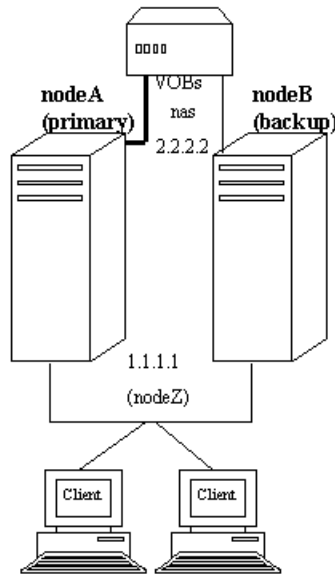
#### Configuration Notes

- The clients connect to the ClearCase servers using the DNS entry *nodeZ* designated to float between the servers in the cluster. The name uses the protected IP address (1.1.1.1).
- The *rgy\_hosts.conf* file on all ClearCase systems is set to *nodeZ*.
- The *alternate\_hostnames* file on *nodeA* (the primary server) contains the following entries: *nodeA* and *nodeZ* (one name per line in the file).
- The *alternate\_hostnames* file on *nodeB* (the backup server) contains the following entries: *nodeB* and *nodeZ*.
- The ClearCase resource hierarchy would look like the following:



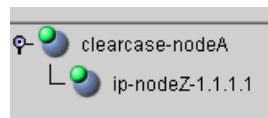
## Active/Standby Configuration with NAS Storage

In the Active/Standby configuration, *nodeA* is the primary LifeKeeper Server. It protects storage locations for VOBs. All storage is located on a NAS device. While *nodeB* may be handling other applications/services, it acts only as a backup for the ClearCase resources in LifeKeeper's context.



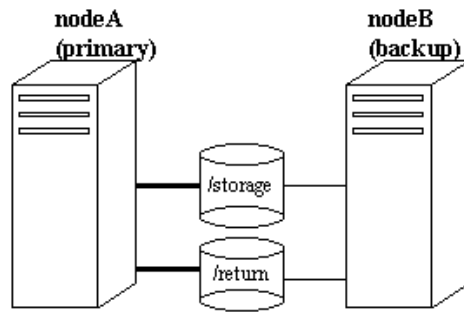
### Configuration Notes

- The clients connect to the ClearCase servers using the DNS entry *nodeZ* designated to float between the servers in the cluster. The name uses the protected IP address 1.1.1.1.
- The *rgy\_hosts.conf* file on all ClearCase systems is set to *nodeZ*.
- The *alternate\_hostnames* file on *nodeA* contains the following entries: *nodeA* and *nodeZ*.
- The *alternate\_hostnames* file on *nodeB* contains the following entries: *nodeB* and *nodeZ*.
- The ClearCase resource hierarchy would look like the following:



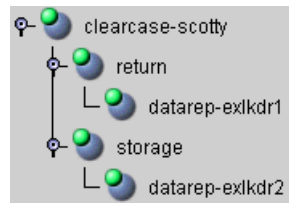
## Active/Standby Multisite Shipping Only Server with Local Storage

In the Active/Standby configuration, *nodeA* is the primary LifeKeeper server. It protects the ClearCase Multisite storage and return bays used in non-managed synchronization of replicated VOBs. No other ClearCase services are protected. All storage resides on a shared array between the cluster servers. While *nodeB* may be handling other applications/services, it acts only as a backup for the ClearCase resources in LifeKeeper's context.



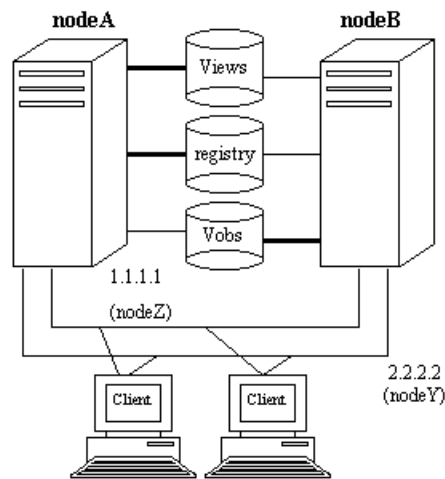
### Configuration Notes

- No special configuration is required for a Shipping Only server.
- The STORAGE-BAY and RETURN-BAY entries in the shipping.conf file are set to /storage and /return respectively using replicated storage.
- The ClearCase resource hierarchy looks like the following:



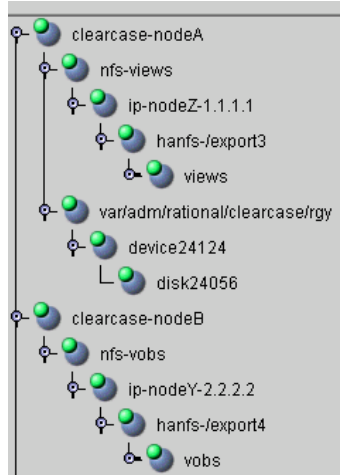
## Active/Active Configuration

In the Active/Active configuration below, both *nodeA* and *nodeB* are primary LifeKeeper servers for ClearCase resources. Each server is also the backup server for the other. In this example *nodeA* protects the shared storage array for Views and the Registry as the primary server. *nodeB* protects the shared storage array for VOBs as the primary server. Additionally, each server acts the backup for the other, which in this example means that *nodeB* is the backup for the protected View storage and Registry on *nodeA*, and *nodeA* is the backup for the protected VOB storage on *nodeB*.



### Configuration Notes

- The clients connect to the ClearCase Servers using the DNS entries *nodeZ* and *nodeY* designated to float between the servers in the cluster. The names use protected IP addresses 1.1.1.1 and 2.2.2.2, respectively.
- The *rgy\_hosts.conf* file on all ClearCase systems is set to *nodeZ*.
- The *alternate\_hostnames* file on *nodeA* contains the following entries: *nodeA*, *nodeY*, and *nodeZ*.
- The *alternate\_hostnames* file on *nodeB* contains the following entries: *nodeB*, *nodeY* and *nodeZ*.
- When the ClearCase resources for *nodeA* are brought in-service on *nodeB*, ClearCase must be stopped and restarted for the **albd\_server** process to understand it is now providing access to the Registry.
- The ClearCase resource hierarchy would look like the following:



## ClearCase Configuration Steps

This section provides steps to configure your ClearCase resources.

1. Plan your ClearCase configuration. This includes the following:
  - Determine what ClearCase services to protect, e.g., all services on the server including VOB and/or View storage, Registry, and Release Area, Multisite storage and return bays or protect just VOB and/or View storage and/or Multisite storage and return bays.
  - Determine the permanent and virtual server name(s) to be used in the cluster and ensure DNS has been updated to contain all the names and IP addresses. A ClearCase Multisite shipping only server does not require a virtual name and IP address.
  - If the ClearCase Registry is to be protected, ensure it is located on a LifeKeeper shared resource (shared storage, replicated storage or NAS device).
  - Determine the location of the ClearCase License Server (the ClearCase Kit cannot protect this service so it should be located on a standalone server).
  - Determine the changes required to the Release Area *site.dat* file as well as the changes required to the Registry if adding this kit to an existing ClearCase installation.

Consideration should be given to the type of configuration (Active/Standby vs. Active/Active). It is recommended that if you are protecting the Registry Server in an Active/Active configuration that the non-Registry server protects only VOB storage. The reason for this recommendation is that the cleanup that occurs when taking a ClearCase resource out of service will terminate active views on the server, which will occur when the resource protecting the Registry Server fails over.

2. Set up your ClearCase configuration file(s) based on the plan made in step 1. This includes the *rgy\_hosts.conf* file on already installed systems and the *site.dat* file on the Release Host used in installing future systems. See “[Configuring ClearCase for Use with LifeKeeper](#)” and [Appendix A](#) for a discussion of the changes required for LifeKeeper ClearCase hierarchies.
3. Create protected IP addresses under LifeKeeper for the virtual server names noted above. The virtual server names must match the host names used in the Registry and when updating the *rgy\_hosts.conf* file. (Refer to the *LifeKeeper for Linux IP Recovery Kit Administration Guide* for details on setting up IP resources.) Once created, test the protected IP addresses by pinging them from a number of clients and servers.
4. Create LifeKeeper NFS resources for each local (non-NAS) storage area used for VOBs and Views as well as the Release Area. Ensure that the correct IP resource is used with the NFS hierarchy (if the path is */net/nodeZ/export* make sure that IP resource used resolves to *nodeZ*).
5. For existing ClearCase installations, update the Registry with the new host names, global and local paths. See [Appendix A](#) for more details on the changes required. Before making changes, backup the Registry. Once the changes are complete, test access to VOB data.
6. Create the ClearCase resource hierarchies in LifeKeeper to protect the Registry, Release Area, and Storage Areas as needed. If ClearCase Multisite storage and return bays are to be protected, no action is required to create the File System resource needed to protect these areas as the create of the ClearCase resource will automatically create File System resource if needed.
7. Again test access to the VOB data while the ClearCase hierarchies are ISP on the primary server.



# LifeKeeper Configuration Tasks

You can perform all LifeKeeper for Linux ClearCase Recovery Kit administrative tasks via the LifeKeeper Graphical User Interface (GUI). The LifeKeeper GUI provides a guided interface to configure, administer, and monitor ClearCase resources.

## Overview

The following tasks are described in this guide, as they are unique to a ClearCase resource instance and different for each Recovery Kit.

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

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

- **Create Dependency** - Creates a child dependency between an existing resource hierarchy and another resource instance and propagates the dependency changes to all applicable servers in the cluster.
- **Delete Dependency** - Deletes a resource dependency and propagates the dependency changes to all applicable servers in the cluster.
- **In Service** - Activates a resource hierarchy.
- **Out of Service** - Deactivates a resource hierarchy.
- **View/Edit Properties** - View or edit the properties of a resource hierarchy.

**Note:** Throughout the rest of this section, configuration tasks are performed using the **Edit** menu. You can also perform most of these tasks:

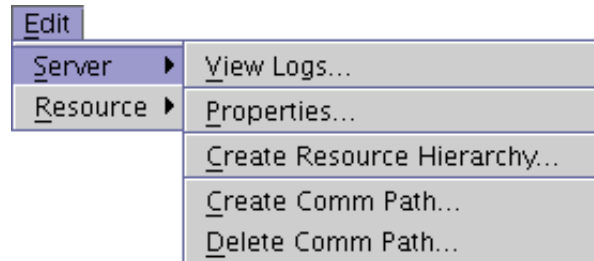
- from the toolbar
- by right clicking on a global resource in the left pane of the status display
- by right clicking on a resource instance in the right pane of the status display

Using the right-click method allows you to avoid entering information that is required when using the **Edit** menu.

## Creating a ClearCase Resource Hierarchy

After you have completed the necessary setup tasks, use the following steps to define the ClearCase resource hierarchy.

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



The *Create Resource Wizard* dialog box will appear with a drop down list box displaying all recognized Recovery Kits installed within the cluster.

2. Select **ClearCase Services** and click **Next**.
3. You will be prompted to enter the following information. When the **Back** button is active in any of the dialog boxes, you can go back to the previous dialog box. This is helpful should you encounter an error requiring you to correct previously entered information. You may click **Cancel** at any time to cancel the entire creation process.

Field	Tips
Switchback Type	Choose either <i>intelligent</i> or <i>automatic</i> . This dictates how the ClearCase instance will be switched back to this server when the server comes back up after a failover. The switchback type can be changed later from the General tab of the Resource Properties dialog box. <b>Note:</b> The switchback strategy should match that of the NFS, IP or File System resource to be used by the ClearCase resource. If they do not match the ClearCase resource, creation will attempt to reset them to match the setting selected for the ClearCase resource.
Server	Select the <b>Server</b> on which you want to create the hierarchy.

Services To Protect	Select the ClearCase services to protect on the system. Select "All" to protect VOB and View storage as well as the Registry and Release Area if they reside on the system. Select "Storage" to protect only VOB and View storage locations on the system.
---------------------	--

Protect Release Area	Select “Yes” or “No” to protect the ClearCase Release Area should it exist on this server.  <b>Note:</b> This dialog box is only displayed when protecting “All” ClearCase services on the system. The default is “No.” If ClearCase has been installed using links back to the Release Area then select “Yes” to ensure LifeKeeper protects the Release Area.
Release Area Host	Select the host used for links to the Release Area. The list of choices is built from the values in the <i>alternate_hostnames</i> file.  <b>Note:</b> This dialog box is only displayed when protecting the Release Area.
Release Area Location	Select the path for the Release Area.  <b>Note:</b> This dialog box is only displayed when protecting the Release Area.
Protect Shipping Bays	Select “Yes” or “No” to protect ClearCase Multisite storage or return bays.  <b>Note:</b> This dialog box is only displayed when the ClearCase Multisite has been installed on the server.
Root Tag	Either select the default root tag offered by LifeKeeper, or enter a unique name for the resource instance on this server. The default is <i>clearcase-servername</i> . You may use letters, numbers and the following special characters: - _ . /

4. Click **Create**. The *Create Resource Wizard* will then create your ClearCase resource hierarchy. LifeKeeper will validate the data entered. If LifeKeeper detects a problem, an error message will appear in the information box.
5. An information box will appear indicating that you have successfully created a ClearCase resource hierarchy, and you must extend that hierarchy to another server in your cluster in order to achieve failover protection. Click **Next**.
6. Click **Continue**. LifeKeeper will then launch the *Pre-Extend Wizard*. Refer to Step 2 under Extending a ClearCase Hierarchy (below) for details on how to extend your resource hierarchy to another server.

## Extending a ClearCase Hierarchy

This operation can be started from the **Edit** menu, or initiated automatically upon completing the **Create Resource Hierarchy** option, in which case you should refer to Step 2 below.

1. On the **Edit** menu, select **Resource**, then Extend Resource Hierarchy. The *Pre-Extend Wizard* appears. If you are unfamiliar with the Extend operation, click **Next**. If you are familiar with the LifeKeeper **Extend Resource Hierarchy** defaults and want to bypass the prompts for input/confirmation, click **Accept Defaults**.

2. The *Pre-Extend Wizard* will prompt you to enter the following information.  
**Note:** The first two fields appear only if you initiated the Extend from the **Edit** menu.

Field	Tips
Template Server	Enter the server where your ClearCase resource is currently in service.
Tag to Extend	Select the ClearCase resource you wish to extend.
Target Server	Enter or select the server you are extending to.
Switchback Type	Select either <i>intelligent</i> or <i>automatic</i> . The switchback type can be changed later, if desired, from the General tab of the Resource Properties dialog box. <b>Note:</b> Remember that the switchback strategy must match that of the dependent resources to be used by the ClearCase resource.
Template Priority	Select or enter a priority for the template hierarchy. Any unused priority value from 1 to 999 is valid, where a lower number means a higher priority (the number 1 indicates the highest priority). The extend process will reject any priority for this hierarchy that is already in use by another system. The default value is recommended. <b>Note:</b> This selection will appear only for the initial extend of the hierarchy.
Target Priority	Either select or enter the priority of the hierarchy for the target server.
Root Tag	LifeKeeper will provide a default tag name for the new ClearCase resource instance on the target server. The default tag name is the same as the tag name for this resource on the template server. If you enter a new name, be sure it is unique on the target server. You may use letters, numbers and the following special characters: - _ . /

3. After receiving the message that the pre-extend checks were successful, click **Next**.
4. Depending upon the hierarchy being extended, LifeKeeper will display a series of information boxes showing the Resource Tags to be extended, which cannot be edited. Click **Extend**.
5. After receiving the message "Hierarchy extend operations completed" click **Next Server** to extend the hierarchy to another server, or click **Finish** if there are no other extend operations to perform.
6. After receiving the message "Hierarchy Verification Finished", click **Done**.

## Unextending a ClearCase Hierarchy

To remove a resource hierarchy from a single server in the LifeKeeper cluster, do the following:

1. On the **Edit** menu, select **Resource**, then **Unextend Resource Hierarchy**.
2. Select the **Target Server** where you want to unextend the ClearCase resource. It cannot be the server where the ClearCase resource is currently in service. (This dialog box will not appear if you selected the Unextend task by right clicking on a resource instance in the right pane.) Click **Next**.
3. Select the ClearCase hierarchy to unextend and click **Next**. (This dialog will not appear if you selected the Unextend task by right clicking on a resource instance in either pane).
4. An information box appears confirming the target server and the ClearCase resource hierarchy you have chosen to unextend. Click **Unextend**.
5. Another information box appears confirming that the ClearCase resource was unextended successfully. Click **Done** to exit the Unextend Resource Hierarchy menu selection.

## Deleting a ClearCase Hierarchy

It is important to understand what happens to dependencies and protected services when a ClearCase hierarchy is deleted.

- **Dependencies:** Before removing a resource hierarchy, you may wish to remove the dependencies. Dependent file systems *will* be removed unless they are used in another hierarchy. Dependent IP and NFS resources will *not* be removed as long as the delete is done via the LifeKeeper GUI or the ClearCase delete script.
- **Protected Services:** If you take the ClearCase resource hierarchy out of service before deleting it, the ClearCase daemons will be stopped if no other ClearCase resource hierarchy is ISP on the system. If you delete a hierarchy while it is in service, the ClearCase daemons will continue running and offering services (without LifeKeeper protection) after the hierarchy is deleted.

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

1. On the **Edit** menu, select **Resource**, then **Delete Resource Hierarchy**.
2. Select the **Target Server** where you will be deleting your ClearCase resource hierarchy and click **Next**. (This dialog will not appear if you selected the Delete Resource task by right clicking on a resource instance in either pane.)
3. Select the **Hierarchy to Delete**. (This dialog will not appear if you selected the Delete Resource task by right clicking on a resource instance in the left or right pane.) Click **Next**.
4. An information box appears confirming your selection of the target server and the hierarchy you have selected to delete. Click **Delete**.
5. Another information box appears confirming that the ClearCase resource was deleted successfully.
6. Click **Done** to exit.

## Testing Your Resource Hierarchy

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

On the **Edit** menu, select **Resource**, then **In Service**. For example, an *In Service* request executed on a backup server causes the application hierarchy to be taken out of service on the primary server and placed in service on the backup 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.

## ClearCase Troubleshooting

Symptom	Possible Cause
Taking one ClearCase resource out of service takes all ClearCase resources out of service on the server.	This will occur in an Active/Active configuration when both instances are active on the same server and the ClearCase resource instance taken out of service protects the ClearCase Registry Services. As noted previously in this document ClearCase must be stopped and restarted to reset the role of the <b>albd_server</b> in regards to the Registry. Once the ClearCase resource instance that protects the Registry Services is back in service, then the other ClearCase resource instances taken out of service indirectly can be manually brought back in service.

## Error Messages

### Common Error Messages

Error Number	Error Message	Description
115000	Usage: "XXX"	The arguments specified for the selected command are incorrect. The XXX provides the proper usage for the command.
115002	Failure opening "XXX" on server "YYY": "ZZZ".	An attempt to open a file named "XXX" failed on the server "YYY". "ZZZ" represents the specific error that occurred during the open.
115003	Failed to find any VOB storage areas on alternate host name "XXX"	No VOBs storage areas were found for alternate host name "XXX."
115004	Failed to find any View storage areas on alternate host name "XXX"	No View storage areas were found for alternate host name "XXX."
115014	Errors occurred attempting to "XXX" ClearCase.	Errors occurred attempting to start or stop ClearCase during a restore, remove or recovery operation.
115029	No executable <b>cleartool</b> command found on server "nodeA".	Unable to find the ClearCase command " <b>cleartool</b> " or it does not have execute permission.

## Hierarchy Creation

Error Number	Error Message	Description
115001	The server "thing1" is acting as a ClearCase License Server Host, which can't be protected by selecting all services on the host.	Protect All Services on the system was selected and the server is acting as a ClearCase License Server Host and LifeKeeper can't protect that service. Select protection of VOB and/or View storage only.
111005	Failed to find any storage areas to protect on "XXX" or on any of its alternate host names.	Unable to find any defined VOB or View storage areas on server "XXX" for any of the alternate names the server is known by.
115006	The following ClearCase storage paths are not protected by LifeKeeper: "/VOB/storage"	VOB storage was found to reside in the directory /VOB/storage but the directory does not have a LifeKeeper NFS resource protecting it or a NFS resource exists but it does not contain an IP address matching the global path to the resource (NFS resource protects IP 1.1.1.1 but the global path for VOB storage states <i>nodeZ</i> which resolves to IP 1.1.1.5). Create a NFS resource to protect /VOB/storage or add the correct IP resource as a dependent of the NFS resource.
115007	The following IP addresses needed by ClearCase to protect NAS storage are not protected by LifeKeeper: "1.1.1.1"	VOB or View storage located on a NAS device needs to be protected on the server via an IP address that resolves to the name used in the ClearCase global path to the storage ( <i>/net/nodeZ</i> needs to resolve to 1.1.1.1).
115008	Either a LifeKeeper IP resource does not exist to protect the Registry Host name or the Registry file system is not shareable between servers in the cluster	Protect All was selected and the server is the ClearCase Registry Host Server. Either the required IP address is not protected by an IP resource or <i>/var/adm/rational/clearcase/rgy</i> does not reside on a shared file system (must be shared/fibre, replicated or on a NAS device).
115009	The directory "/export/2003.06.00/rhat_x86/clearcase" does not appear to be a Release Area. No " <i>site.dat</i> " configuration file or executable " <i>install_release</i> " script found.	The directory selected as the ClearCase Release Area does not appear to be a Release Area. The site configuration file <i>site.dat</i> is missing or the <i>install_release</i> file is either missing or not executable.

115010	The ClearCase Release Area is not protected by a LifeKeeper NFS Hierarchy.	The directory selected to contain the Release Area does not appear to be protected by a LifeKeeper NFS resource hierarchy with an IP resource that resolves to the selected release host.
115011	An unknown error has occurred while running "XXX" on server "YYY"	An unknown error occurred while running command "XXX" on server "YYY."
115012	Unable to create the filesystem resource hierarchy for <code>"/var/adm/rational/clearcase/rgy"</code> on "nodeA" server.	An error occurred while attempting to create the file system resource needed to protect the ClearCase Registry.
115013	Unable to create dependency for parent "clearcase-nodeA" and child "nfs-/export".	An error occurred while attempting to make resource nfs-/export a child of the clearcase-nodeA resource.
115019	Lookup of active IP addresses via ifconfig failed with the following error code: "XX"	The attempt to find an active IP address to determine the active alternate host names failed.
115020	No alternate host names defined.	The lookup of alternate host names for the server failed to find any names in the ClearCase <code>alternate_hostnames</code> file or none of the names listed in the file resolve to an active IP address on the system.
1150027	The command "XXX" failed on server "nodeA"	During creation the process of setting administration locks ( <b>getlocks</b> ) or the release of a lock once the creation is complete ( <b>rlslocks</b> ) has failed.
115028	Unable to determine if "nodeA" is a Registry Host Server so continuing as if it is not.	Unable to determine if the system is the ClearCase Registry Server so the hierarchy creation will continue with the assumption that it is not the Registry Server.
115030	Not all defined IPs for alternate host name "nodeZ" are active on server "nodeA" so skipping alternate name.	All IP addresses for alternate host listed in the <code>alternate_hostnames</code> file must be active or inactive on the system. During create, an alternate name was found to have at least 1 IP address active and 1 inactive.
115031	Only one ClearCase instance may be created per system.	An attempt has been made to create a second ClearCase resource instance on the system. Only one ClearCase resource instance can be created per server.

115035	Storage Bay "/storage_bay" is not shareable between nodes in the cluster.	An attempt to protect ClearCase Multisite storage and return bays failed, as the bay does not reside on a storage location considered shared between nodes in the cluster.
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### Hierarchy Extension

Error Number	Error Message	Description
115015	The values specified for the target and the template servers are the same.	The target and template (source and destination) servers specified in pre-extensions checks should be different.
115032	The MVFS configuration is not the same on the template and target systems. "nodeA" has "mvfs" whereas "nodeB" has "no mvfs".	Servers in the cluster do not have the same <b>mvfs</b> configuration. The <b>mvfs</b> configuration on both servers must match.

### Restore

Error Number	Error Message	Description
115016	The restore process for "clearcase-nodeA" has determined that ClearCase must be restarted on "nodeB" in order for it to respond as the Registry Server.	During the restore process it has been determined that the ClearCase resource "clearcase-nodeA" is protecting the Registry and in order for this server (nodeB) to now perform that function the running version of ClearCase must be stop and restarted.
115017	The restore of the ClearCase instance "clearcase-nodeA" on server "nodeA" failed	The restore attempt for resource "clearcase-nodeA" failed. See the LifeKeeper logs for additional information.

### Remove

Error Number	Error Message	Description
115018	The remove of the ClearCase instance "clearcase-nodeA" on server "nodeA" failed.	The remove attempt for resource "clearcase-nodeA" failed. See the LifeKeeper logs for additional information.
115021	The cleanup of active ClearCase sessions in the 'remove' script for the ClearCase Kit for instance "clearcase-nodeA" has hung. The remove action has failed.	The out of service action (remove) for "clearcase-nodeA" failed because it was unable to successfully complete in the allotted time (40 seconds).

115022	Process fork to remove instance "clearcase-nodeA" on "nodeA" failed: "XXX."	During out of service processing an attempt to fork a process to assist in the remove failed. "XXX" represents the reason for the failure.
115023	Got signal while processing remove for instance "clearcase_nodeA" on "nodeA."	During out of service processing an unanticipated signal was received causing the remove to fail.
115024	Unable to remove instance "clearcase-nodeA" on "nodeA" because remove issued while sitting in a View context.	An out of service request was issued while in a ClearCase View which will be terminated if the remove continued. End the View and change directories.
115025	The <b>cleartool endview</b> command failed for View "myview" on "nodeA".	An <b>endview</b> required for out of service processing failed to terminate the View and because of that the remove has failed.
115026	The <b>cleartool umount</b> command failed for VOB "publicVOB" on "nodeA".	An <b>umount</b> of a VOB required for taking the ClearCase resource out of service failed, causing the remove to fail.
115036	Resource tag "clearcase-nodeB" on server "nodeA" is set to OSU because of the removal of Resource tag "clearcase-nodeA" which protects the ClearCase registry.	The remove of ClearCase instance "clearcase-nodeA" was executed on nodeA which also had instance "clearcase-nodeB" in service. A removal of instance "clearcase-nodeA" requires stopping all ClearCase services, therefore, the other in service instance must be taken out of service because ClearCase will not be running on this server.

### Resource Monitoring

Error Number	Error Message	Description
115033	Errors occurred attempting to start the ClearCase <b>lockmgr</b> process on "nodeA".	The <b>lockmgr</b> process was found to be stopped and an attempt to restart it has failed.
115034	ClearCase quickCheck failed for "clearcase-nodeA". "albd_server" is not running on server "nodeA".	The <b>albd_server</b> process was found to be stopped on "nodeA". A local recovery will be attempted to restart ClearCase.

## Appendix A

### Registry Examples for ClearCase With LifeKeeper

As noted earlier in this document, when creating VOBs (replicated or non-replicated) and Views you can allow ClearCase to determine the host, global path to the storage location and the local path to the storage location or you can specify them explicitly. In order to provide protection via LifeKeeper these values need to be specified explicitly such that they result in entries in the ClearCase Registry using a DNS host entry that LifeKeeper can use to switch between servers in a cluster. For example, if we have a 2-node cluster consisting of the systems *nodeA* and *nodeB* and do not specify the host, global path and local path we end up with the following:

Commands to create the VOB starting with the storage location followed by the VOB:

```
cleartool mkstgloc -vob vob_store /export/storage/vobs/vob_store1
cleartool mkvob -tag /vob1 -public -stgloc vob_store
```

Results in the following entry in the Registry for the storage location and the VOB:

```
storage_path:
-entry=storage_path;-tag=vob_store;-title=-;
id=1689824f.68a111d8.8ec9.00:00:00:00:00;-type=vob;-hostname=nodeA;-
local_path=/export/storage/vobs/vob_store1;-region=test;-
global_path=/net/nodeA/export/storage/vobs/vob_store1;

vob_object:
-entry=vob_object;-hostname=nodeA;-
local_path=/export/storage/vobs/vob_store1/vob1.vbs;-
vob_replica=eee987fc.68a111d8.8ee6.00:00:00:00:00;-
vob_family=eee987f8.68a111d8.8ee6.00:00:0000:00:00;

vob_tag:
-entry=vob_tag;-tag=/vob1;-
global_path=/net/nodeA/export/storage/vobs/vob_store1/vob1.vbs;-hostname=nodeA;-
mount_access=public;-mount_options=-;-region=test;-
vob_replica=eee987fc.68a111d8.8ee6.00:00:00:00:00;
```

If the following changes are made to the command syntax when the storage area and VOB are originally created it will allow LifeKeeper to migrate the storage for the VOB between servers in the cluster and still allow clients to access the data in the VOB.

The commands to create the VOB starting with the storage location followed by the VOB:

```
cleartool mkstgloc -vob -host nodeZ
-gpath /net/nodeZ/export/storage/vobs/vob_store1
-hpath /net/nodeZ/export/storage/vobs/vob_store1
vob_store /net/nodeZ/export/storage/vobs/vob_store1
cleartool mkvob -tag /vob1 -public -stgloc vob_store
```

Results in the following entries in the Registry for the storage location and the VOB:

```
storage_path:
-entry=storage_path;-tag=vob_store;-title=-;
id=2a399dab.68a511d8.8f96.00:00:00:00:00;-type=vob;-hostname=nodeZ;-
```

```
local_path=/net/nodeZ/export/storage/vobs/vob_store1;-region=test;-
global_path=/net/nodeZ/export/storage/vobs/vob_store1;
```

**vob\_object:**

```
-entry=vob_object;-hostname=nodeZ;-
local_path=/net/nodeZ/export/storage/vobs/vob_store1/vob1.vbs;-
vob_replica=c239a1aa.68a411d8.8fa9.00:00:00:00:00:00;-
vob_family=c239a1a6.68a411d8.8fa9.00:00:00:00:00:00;
```

**vob\_tag:**

```
-entry=vob_tag;-tag=/vob1;-
global_path=/net/nodeZ/export/storage/vobs/vob_store1/vob1.vbs;-hostname=nodeZ;-
mount_access=public;-mount_options=;-region=test;-
vob_replica=c239a1aa.68a411d8.8fa9.00:00:00:00:00:00;
```

If the storage is placed on a NAS device, follow the configuration steps as documented in the *Rational ClearCase Administrator's Guide* chapter on “*Creating Server Storage Locations on a NAS Device*” and just substitute the virtual system name (*nodeZ* in the example above) for the host name that will be running the VOB or View Server process (*nodeA* in the example above). For example the command:

```
cleartool mkview -tag nasview -host nodeA
-gpath /net/nasdevice/viewstg/nasview.vws
-hpath /net/nasdevice/viewstg/nasview.vws /net/nasdevice/viewstg/nasview.vws
```

Changes to:

```
cleartool mkview -tag nasview -host nodeZ
-gpath /net/nasdevice/viewstg/nasview.vws
-hpath /net/nasdevice/viewstg/nasview.vws /net/nasdevice/viewstg/nasview.vws
```

The above examples discuss the changes required for creating new VOBs and Views but not the changes that are needed for existing Registry entries for VOBs and Views. The same basic changes are required to work with LifeKeeper and it is just the commands that are used to initiate the Registry updates that change. The specific commands that are needed are **mktag** and **register** with the **-replace** option.

Commands to create the View starting with the storage location followed by the View:

```
cleartool mkstgloc -view view_store ./view_store1
cleartool mkview -tag view1 -stgloc view_store
```

Results in the following entries in the Registry for the storage location and the View:

**storage\_path:**

```
-entry=storage_path;-tag=view_store;-title=;-
id=a06d1232.befc11d8.9ac0.00:00:00:00:00:00;-type=view;-hostname=nodeA;-
local_path=/export/storage/views/view_store1;-region=test;-
global_path=/net/nodeA/export/storage/views/view_store1;
```

**view\_object:**

```
-entry=view_object;-hostname=nodeA;-
local_path=/export/storage/views/view_store1/view1.vws;-owner=vobadm;-
view_uuid=bc7d12ed.befc11d8.9ac1.00:00:00:00:00:00;
```

**view\_tag:**

```
-entry=view_tag;-tag=view1;-hostname=nodeA;-
global_path=/net/nodeA/export/storage/views/view_store1/view1.vws;-region=test;-
view_uuid=bc7d12ed.befc11d8.9ac1.00:00:00:00:00;
```

Commands to update the View in the Registry:

```
cleartool register -view -replace -host nodeZ
-hpath /net/nodeZ/export/storage/views/view_store1/view1.vws
/net/nodeZ/export/storage/views/view_store1/view1.vws

cleartool mktag -view -tag view1 -replace -host nodeZ
-gpath /net/nodeZ/export/storage/views/view_store1/view1.vws
/net/nodeZ/export/storage/views/view_store1/view1.vws
```

Results in the following entries in the Registry for the View:

**view\_object:**

```
-entry=view_object;-hostname=nodeZ;-
local_path=/net/nodeZ/export/storage/views/view_store1/view1.vws;-owner=vobadm;-
view_uuid=bc7d12ed.befc11d8.9ac1.00:00:00:00:00;
```

**view\_tag:**

```
-entry=view_tag;-tag=view1;-hostname=nodeZ;-
global_path=/net/nodeZ/export/storage/views/view_store1/view1.vws;-region=test;-
view_uuid=bc7d12ed.befc11d8.9ac1.00:00:00:00:00;
```

When creating a replicated VOB via multitool mkreplica, the use of host and global paths are required just like they are for the creation of a non-replicated VOB.

The command to create a replicated VOB is as follows:

```
multitool mkreplica -import -npreserve -work /tmp/wk -tag /vob1 -public -vob
/net/nodeZ/export/vobs/vob1.vbs -host nodeZ -hpath
/net/nodeZ/export/vobs/vob1.vbs -gpath /net/nodeZ/export/vobs/vob1.vbs
/storage_bay/incoming/repl_rg1_2006-07-18T11.55.05-04_27585_1
```

Results in the following entries in the Registry for the storage location and the VOB:

**vob\_object:**

```
-entry=vob_object;-hostname=fiji1;-local_path=/net/nodeZ/export/vobs/vob1.vbs;-
vob_replica=3626ddcd.442e11db.8d57.00:50:8b:f1:d0:b6;-
vob_family=72d5e062.440811db.82ee.00:50:8b:f1:d0:b6;
```

**vob\_tag:**

```
-entry=vob_tag;-tag=/vob1;-global_path=/net/nodeZ/export/vobs/vob1.vbs;-
hostname=nodeZ;-mount_access=public;-mount_options=-;region=rg1;-
vob_replica=3626ddcd.442e11db.8d57.00:50:8b:f1:d0:b6;
```

For existing replicated VOB simply follow the process above for changing existing VOBs using **mktag** and **register** with the **-replace** option.

Please note that the storage location definition is not affected by the above changes. There is no option to replace the defined storage location so it will need to be deleted and re-added to change to a global path for the storage location.

The last Registry related item that needs to be addressed is the *rgy\_hosts.conf* file. For new ClearCase installations the setting for this file comes from the information in the *site.dat* file in the ClearCase Release Area. See the next section for a discussion on the impacts to the Release Area. For an existing installation, the individual ClearCase clients and servers can be updated individually or via a ClearCase update after the *site.dat* file has been updated (see below).

It is highly recommended that a backup of the Registry be made before attempting any of the changes listed in Appendix A.

## Release Area Setup for ClearCase with LifeKeeper (setup of *site.dat* and *rgy\_hosts.conf*)

One of the first steps in installing ClearCase is running the *site\_prep* script, which specifies the name of the Registry Server. For the examples listed below, assume that *nodeA* is the real name of the machine on which the *site\_prep* script is run to setup the Release Area and that that machine will also act as the Registry Server within the region. Additionally, *nodeZ* will be used as the virtual server name (floating server name) for the Registry Server providing a global path to those services regardless of the underlying cluster server that is actually providing those services. The initial running of *site\_prep* must specify the real name of the Registry Server Host (*nodeA*). After running *site\_prep*, install ClearCase on the Registry Server Host, *nodeA* in this example, so it will create all the necessary files.

The installation on the Registry Server must occur before any other ClearCase installs are done. It requires the real server name during install in order for all the Registry files to get created; whereas all other systems will install with it set to the virtual server name (floating name). If an entry has not been made in DNS for the virtual host name and IP address, that step will need to be done at this point. At this point following the installation of the *nodeA*, you will have the following setup:

The Release Area *site.dat* file contains the following entry: D\_REGISTRY\_HOST:*nodeA*

The *rgy\_hosts.conf* file on *nodeA* contains the following entry: *nodeA*

Before installing ClearCase on any other system, the *site\_prep* script needs to be run again or the *site.dat* file needs to be edited to specify the virtual name of the Registry Server Host, which in this example is *nodeZ*. The next step is to edit the *rgy\_hosts.conf* file on *nodeA* to contain the virtual host name (*nodeZ*). At this point you will have the following setup:

The *site.dat* file contains the following entry: D\_REGISTRY\_HOST:*nodeZ*

The *rgy\_hosts.conf* file on *nodeA* contains the following entry: *nodeZ*

Now you need to start LifeKeeper on the Registry Server and create an IP resource using the virtual IP address for *nodeZ* and create the ClearCase resource which will create the file system resource to protect */var/adm/rational/clearcase/rgy*. Next install or update ClearCase on all other servers and clients. So now you will have the following setup:

The *site.dat* file contains the following entry: D\_REGISTRY\_HOST:*nodeZ*

The *rgy\_hosts.conf* file on *nodeA* contains the following entry: *nodeZ*

The *rgy\_hosts.conf* file on *nodeB* contains the following entry: *nodeZ*

## Alternate Host File Setup (*alternate\_hostnames*)

The last item that needs to be addressed is the *alternate\_hostnames* file. This file contains all the names a host is known by for use with ClearCase. It will need to be created or edited because of the use of virtual names (*nodeZ*) by the ClearCase kit. The file should contain the real server name and all alternate names this server could have.

In an Active/Standby setup the file would include the real server name and the virtual name, *nodeA* and *nodeZ* as used in all the examples. In an Active/Active setup, the file would be expanded to include the virtual name of the other server in the cluster, which in the examples above would be *nodeY*.

Once the editing is completed, ClearCase will need to be stopped and restarted so it knows all the names the system plans to respond to as a ClearCase server.

Now if DNS has been configured with an entry for *nodeZ* with an IP address of 1.1.1.1, an access of a VOB with the global path of */net/nodeZ* will resolve to the server that has IP address 1.1.1.1 in service at the time of the request. If the **albd\_server** process is running (ClearCase has been started), then that server will respond to the request and start the **vob\_server** and **vobrpc\_server** processes as needed.