SIOS Protection Suite for Linux SybaseASE Recovery Kit v9.3.1

Administration Guide

November 2018

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Chapter 1: Introduction

Sybase ASE Recovery Kit Documentation

Sybase Adaptive Server Enterprise is a powerful data management platform for high performance business applications. Sybase ASE is a versatile, enterprise-class RDBMS that is especially good at handling OLTP workloads. Sybase ASE is used widely in financial, E-commerce, and other technology arenas. The Sybase ASE platform includes many standard components, such as the Adaptive Server, Monitor Server, and Backup Server, as well as other plug-in components. The Adaptive Server component is the relational database server. The Monitor Server is a separate server from the database server that monitors the Adaptive Server. The Monitor Server can provide real time or historical data to client applications. The Backup Server is an Open Server-based application that manages all database backup (dump) and restore (load) operations for Adaptive Server.

The SIOS Protection Suite for Linux Sybase ASE Recovery Kit will provide SPS resource protection for the Sybase ASE components Adaptive Server, Monitor Server, and Backup Server.

SIOS Protection Suite Documentation

The following is a list of SIOS Protection Suite for Linux related information available from the SIOS Technology Corp. Documentation site:

- SPS for Linux Release Notes

- SPS for Linux Technical Documentation

- Optional Recovery Kit Documentation

Sybase ASE Documentation

You can find Sybase ASE documentation, including the *Installation Guide Adaptive Server for Linux*, *User Manual*, *Monitor Server User Manual*, *Troubleshooting Guide* and Reference Manual(s) at the following location on the web:

Sybase Product Documentation

Overview

The SIOS Protection Suite (SPS) for Linux Sybase ASE Recovery Kit provides a mechanism for protecting Sybase ASE Server instances within SPS. The Sybase ASE software, LifeKeeper Core and Sybase ASE Recovery Kit are installed on two or more servers in a cluster. Once the Sybase ASE Server instance is under SPS protection, clients connect to the database using an SPS protected IP address. The SPS protected IP address must be created separately prior to the creation of the Sybase ASE resource hierarchy. The Sybase

ASE resource hierarchy creation will create the dependency between the parent Sybase ASE resource instance, and the child IP address resource. In the event that the Sybase ASE Server instance fails, SPS will first attempt to recover it on the local server. If the local recovery fails, then SPS will fail over to a backup server.

Sybase ASE Resource Hierarchy

The following example shows an example Sybase ASE resource hierarchy:
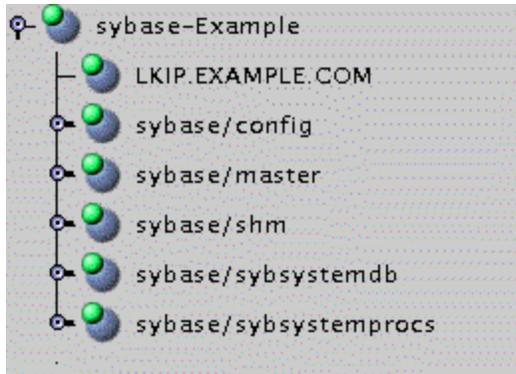
The dependencies in the above example correspond to the following protected resources:

Resource	Sybase ASE Software Component
LKIP.EXAMPLE.COM	Protects the switchable IP address used for client connections
sybase/config	Protects the file system containing the Sybase Adaptive Server, Monitor Server, and Backup Server configuration files
sybase/master	Protects the Sybase ASE master device
sybase/shm	Protects the Sybase Adaptive Server, and Monitor Server shared memory path
sybase/sybsystemdb	Protects the Sybase ASE sybsystemdb device
sybase/sybsystemprocs	Protects the Sybase ASE sybsystemprocs device

In the event of failover, SPS will bring the file system, IP address and database resources (including all the resource dependencies) in service on a backup server. Clients will be disconnected, and will need to re-connect to the server. Any SQL statement that has not been committed will need to be re-entered.

Chapter 2: Requirements

Sybase ASE Recovery Kit Requirements

Lists the hardware and software necessary to properly set up, install and operate the Sybase ASE Recovery Kit.

Your LifeKeeper configuration must meet the following requirements prior to the installation of the LifeKeeper for Linux Sybase Recovery Kit. Please refer to the SPS for Linux Installation Guide for specific instructions regarding the installation and configuration of your LifeKeeper hardware and software.

Hardware Requirements

Software Requirements

Hardware Requirements

- **Servers** - Servers should be configured in accordance with the requirements described in the SPS for Linux Technical Documentation and the SPS for Linux Release Notes.

- **IP Network Interface Cards** - Each server requires at least one Ethernet TCP/IP-supported network interface card. Remember, however, that an SPS cluster requires at least two communication paths. Two separate LAN-based communication paths using dual independent sub-nets are recommended for heartbeats, and at least one of these should be configured as a private network. Using a combination of TCP and TTY heartbeats is also supported.

- **Storage** – Servers should be configured to use SPS supported shared storage or the DataKeeper for Linux storage.

Software Requirements

- **TCP/IP Software** – Each server in your SPS configuration requires TCP/IP Software.

- **Sybase ASE Software** – SPS supports version 15.5 and later of the Sybase ASE software. This version can be obtained from Sybase Inc. at http://www.sybase.com/products/databaseservers/ase. **Note**: The same version of the Sybase ASE software must be installed on all servers in the cluster. In addition, only one version of the Sybase ASE software may be installed on the SPS protected servers.

- **SPS Software** – It is imperative that you install the same version of the SPS software and apply the same versions of the SPS software patches to each server in your cluster.

- **SPS for Linux IP Recovery Kit** – The SPS for Linux IP Recovery Kit is required by the SPS for Linux Sybase ASE Recovery Kit. The SPS for Linux IP Recovery Kit is provided on the SPS for Linux image file (*sps.img*) via ftp download.

- **SPS for Linux Sybase ASE Recovery Kit** – The Sybase ASE Recovery Kit (*steeleye-lkSYBASE*) is provided on the SPS for Linux Installation image file (*sps.img*) via ftp download. It is installed and removed via this image file.

Chapter 3: Configuration Considerations

Contains information to consider before you install and configure the Sybase ASE Recovery Kit.

Using Raw I/O

If you plan to use Sybase ASE with raw devices, you must install the SPS Raw I/O Recovery Kit from the SPS Core image file. You must also properly set up the raw I/O devices prior to use. See the topic Creating Database Devices Using Raw I/O for instructions.

Using Mirrored File Systems with DataKeeper

The Sybase ASE Recovery Kit supports the use of SIOS DataKeeper as a device space. In addition, the Sybase ASE software can be installed on mirrored file systems.

For example, a dependent file system for a Sybase ASE resource would look similar to the following, which shows a file system for the system device space and its dependency, the DataKeeper resource mirror.
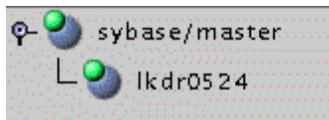
Interfaces File Considerations

The Sybase ASE Recovery Kit uses the Sybase ASE interfaces file for the detection of the client IP addresses and ports. This file is located under $SYBASE and is typically called interfaces. This file is updated whenever an Adaptive Server, Monitor Server or Backup Server instance is created using the srvbuild or similar configuration utility. The SPS for Linux Sybase ASE Recovery Kit requires this file to exist with entries for each Sybase ASE component to be protected. Comment lines are not allowed. All server names that appear in the interfaces file must be resolvable to a valid virtual IP address. All servers that will protect the Sybase ASE resource hierarchy must be able to resolve the server names that appear in the interfaces file. In addition, it is recommended that the virtual IP address be used instead of the server name.

```
Example

        master tcp ether
        example.com 4100

        query tcp ether
        example.com 4100

Example_back

        master tcp ether
        example.com 4200

        query tcp ether
        example.com 4200

Example_mon

        master tcp ether
        example.com 4200

        query tcp ether
        example.com 4200
```

Sample Interfaces File

Sybase Software Asset Manager (SySAM)

The Sybase Software Asset Management (SySAM) is used to manage licensed Sybase products. At Sybase ASE server startup, each ASE server component checks the license file in its environment for permission to run specific features. In order for the ASE server to do this, a license manager and vendor module must be running. The SPS for Linux Sybase ASE Recovery Kit does not provide protection for the SySAM license manager. It is recommended that the license manager be configured in a redundant server system. In the redundant server system, the redundant license allows you to specify local servers as the first license server in the queue, and make remote servers available as backup license servers. The SySAM application attempts to check out a license from a license-file list, starting with the first server. If that server fails for any reason, the second server in the list is contacted, and so on. The `LM_LICENSE_FILE` variable must be set properly in the user profile for the redundant license server environment.

Active/Standby Considerations

In an Active/Standby configuration, the backup server is not actively running the Sybase ASE but stands by in case the primary server experiences a failure. The following scenarios provide specific requirements that must be adhered to when protecting a Sybase ASE resource instance in active/standby configurations.

Scenario 1

The Sybase ASE product is installed **locally on all servers in the cluster.**

- All Sybase Adaptive Server, Monitor Server and Backup Server devices are configured on shared storage.

- The Sybase Adaptive Server, Monitor Server and Backup Server configuration files are stored on a shared file system.

- The Sybase Adaptive Server and Monitor Server shared memory directory is located on a shared file system.

- The interfaces file must be manually updated on all servers to contain common entries for each instance to be protected.

- All interfaces file entries must be resolvable by all servers where the resource will be protected.

- The RUN files for each Adaptive Server, Monitor Server and Backup Server must exist on all servers in the cluster.

- The RUN files for each Adaptive Server, Monitor Server and Backup Server must be executable on all servers in the cluster.

- The RUN files for each Adaptive Server, Monitor Server and Backup Server must contain the same options on all servers in the cluster.

Scenario 2

The Sybase ASE product is installed to **one or more shared file systems on the primary server.**

- All Sybase Adaptive Server, Monitor Server and Backup Server devices are configured on shared storage.

- The Sybase Adaptive Server, Monitor Server and Backup Server configuration files are stored on a shared file system.

- The Sybase Adaptive Server and Monitor Server shared memory directory is located on a shared file system.

- The interfaces file does not have to be updated on the target servers.

- All interfaces file entries must be resolvable by all servers where the resource will be protected.

- On the SPS backup server, `/etc/ld.so.conf` must be updated to add entries for the Sybase product libraries.

    - Add an entry for `$SYBASE/ASE/lib`

    - Add an entry for `$SYBASE/OCS/lib`

    - Mount the shared file system containing the Sybase ASE installed products and run `ldconfig`

Active/Active Considerations

In an Active/Active configuration, each server is actively running one or more Sybase ASE Servers, while acting as a backup for the other SPS server in case of failure. The following scenario provides specific

requirements that must be adhered to in sequential order when protecting a Sybase ASE resource instance in an active/active configuration.

Scenario 1

The Sybase ASE product is installed locally on all servers in the cluster.

- All Sybase Adaptive Server, Monitor Server, and Backup Server devices are configured on shared storage.

- The Sybase Adaptive Server, Monitor Server, and Backup Server configuration files are stored on a shared file system.

- The Sybase Adaptive Server and Monitor Server shared memory directory is located on a shared file system.

- The interfaces file must be manually updated on all servers to contain common entries for each instance to be protected.

- All interfaces file entries must be resolvable by all servers where the resource will be protected.

- The RUN files for each Adaptive Server, Monitor Server and Backup Server must exist on all servers in the cluster.

- The RUN files for each Adaptive Server, Monitor Server and Backup Server must be executable on all servers in the cluster.

- The RUN files for each Adaptive Server, Monitor Server and Backup Server must contain the same options on all servers in the cluster.

Scenario 2

The Sybase ASE product is installed to one or more shared file systems on the primary server.

- All Sybase Adaptive Server, Monitor Server and Backup Server devices are configured on shared storage.

- The Sybase Adaptive Server, Monitor Server and Backup Server configuration files are stored on a shared file system.

- The Sybase Adaptive Server and Monitor Server shared memory directory is located on a shared file system.

- The interfaces file does not have to be updated on the target servers.

- All interfaces file entries must be resolvable by all servers where the resource will be protected.

- On the SPS backup server, */etc/ld.so.conf* must be updated to add entries for the Sybase product libraries.

    - Add an entry for `$SYBASE/ASE/lib`

- Add an entry for `$SYBASE/OCS/lib`

- Mount the shared file system containing the Sybase ASE installed products and run `ldconfig`

Sybase Monitor Server and Backup Server

The SPS for Linux Sybase ASE Recovery Kit provides resource protection for the Adaptive Server, Backup Server, and Monitor Server components. However, the Backup Server and Monitor Server components are not required components of a resource hierarchy. The Sybase Backup Server, and the Sybase Monitor Server can be excluded from the resource protection. During the resource hierarchy creation users that do not wish to protect the Sybase Monitor Server, and/or the Sybase Backup Server can choose none for the respective component choices. Selecting none during the GUI resource creation will exclude the selected component from protection in the resource hierarchy. **Note**: 'none' is a reserved word in the Sybase ASE Recovery Kit, therefore neither the Sybase Backup Server nor the Sybase Monitor Server can be named 'none'.

When choosing whether to protect these components it is important to note that the configuration files that share a common file system with the Adaptive Server configuration files, device paths, log paths, or shared memory directories will be protected by SPS. If one or more components will not be protected with SPS, considerations for file placement should be made to prevent sharing between the protected components and the non-protected components.

NOTE: The Sybase Monitor Server is no longer supported with the Sybase ASE ARK v9.0.2 and later.

Using Network Attached Storage

There are a couple of special considerations to take into account when configuring SPS to use an NFS file server (Network Attached Storage) as cluster storage.

Use the NAS Recovery Kit

The optional Network Attached Storage (NAS) Recovery Kit is required when using an NFS server as a shared storage array with SPS for Linux. Install the NAS Recovery Kit (and a license) on each cluster node. See the NAS Recovery Kit documentation for more details.

Possible Error Message

When using Network Attached Storage (NAS) with Sybase ASE, you may experience Sybase not restarting following a failover due to a system crash. The Sybase error log should indicate the cause of the error.

Sybase ASE 15.x

```
00:00:00000:00000:2011/05/09 16:08:51.66 kernel  Adaptive Server Enter-
prise(Developer Edition)
00:00:00000:00000:2011/05/09 16:08:51.66 kernel  basis_dlock: file
'/s10/sybase-data155/data/master.dat' already in use by an ASE
00:00:00000:00000:2011/05/09 16:08:51.66 kernel  kdconfig: unable to
read primary master device
```

```
00:00:00000:00000:2011/05/09 16:08:51.66 server  kiconfig: read of config
block failed
```

This indicates that the Sybase dataserver has set an NFS lock on the file "*master.dat*" on the NFS file system that is being controlled by SPS. The lock was not cleared by the system crash, so SPS is unable to bring the dataserver back into service. Sybase thinks that some other process is using the *master.dat* file.

Solution

To fix this, mount the NFS file system that will hold *master.dat* with the "nolock" NFS option before the File System resource is created. By default, NFS allows file locks to be set. If the "nolock" option is used before resource creation, SPS will pick up this option and use it each time it brings the file system resource in service. Since SPS will be controlling access (from the cluster nodes) to the file system containing *master.dat*, the lock is not typically critical. The NFS mount options used during testing were "rw,sync,tcp,nfsvers=3,noac,nolock".

It is not necessary to use the "nolock" on other file systems used by the Sybase resource hierarchy such as the file system where the Sybase ASE binaries are located.

If the NAS File System resource has already been created without the "nolock" option set, use the following procedure to change the mount option:

1. Using the LifeKeeper GUI, take the file system resource that needs to be changed out of service. This can be done from the LifeKeeper GUI putting the pointer on the file system resource and doing a right mouse click, and select "**Out of Service**" from the drop-down menu. This action may take parent resources out of service as well.
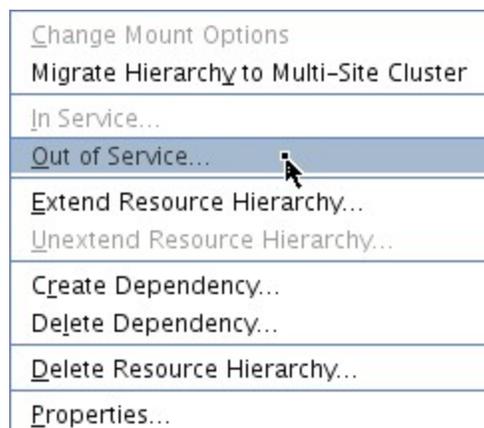
2. Confirm the "**Out of Service**" action and allow the process to complete.

3. Once the file system resource is out of service, you can put the pointer on the resource and do another right mouse click, and from the drop-down menu, select "**Change Mount Options**."
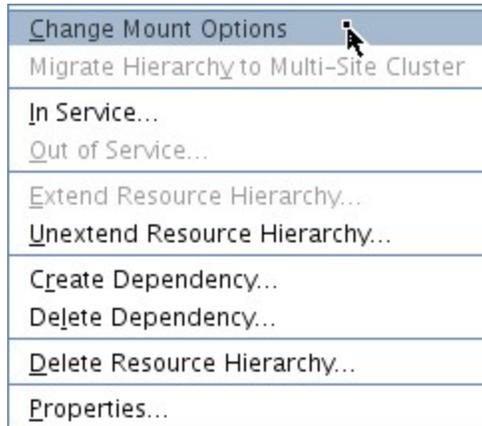
4. In the popup window, add "`nolock`" to the line of options, and click "**Set Value**." You will need to repeat steps 3 and 4 for each node in the cluster.
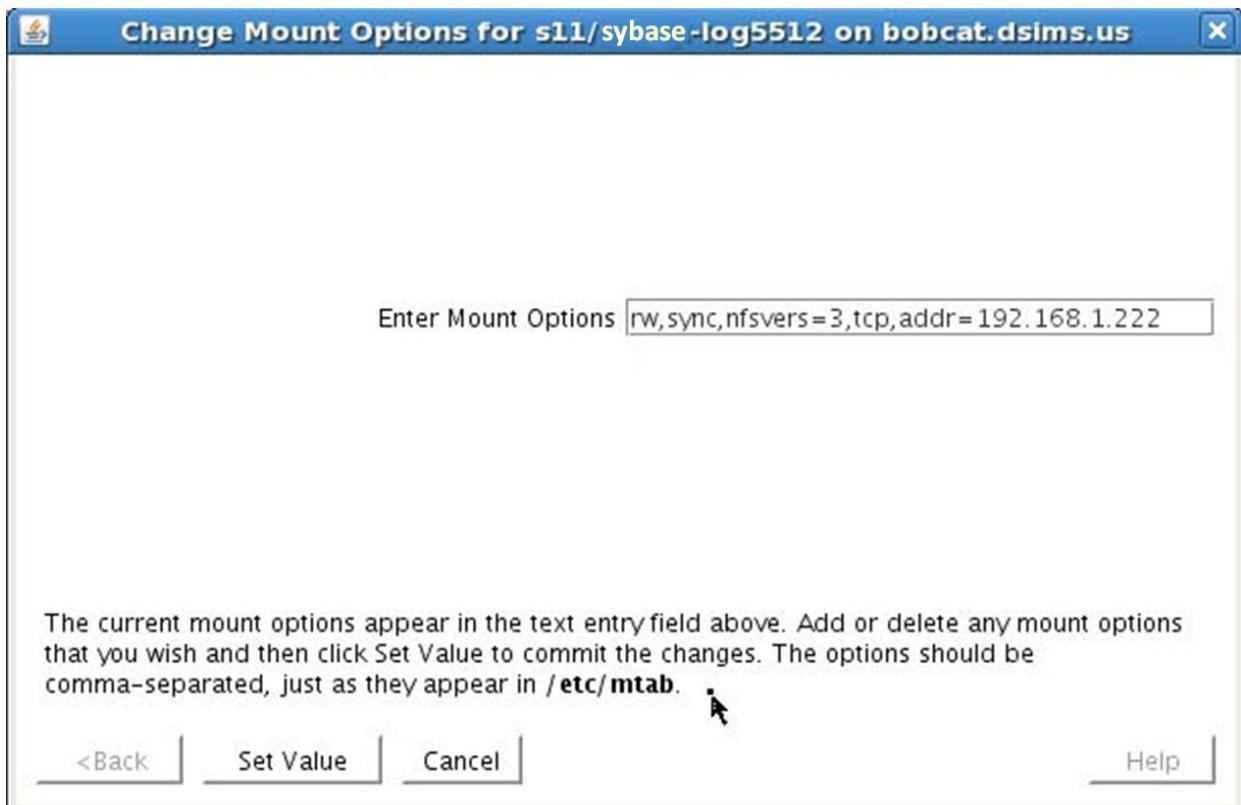
5. Bring the NAS File System resource back in service by doing a right mouse click, and selecting "**In Service**".

6. The File System resource's property panel should now reflect that "`nolock`" is one of the current mount options.
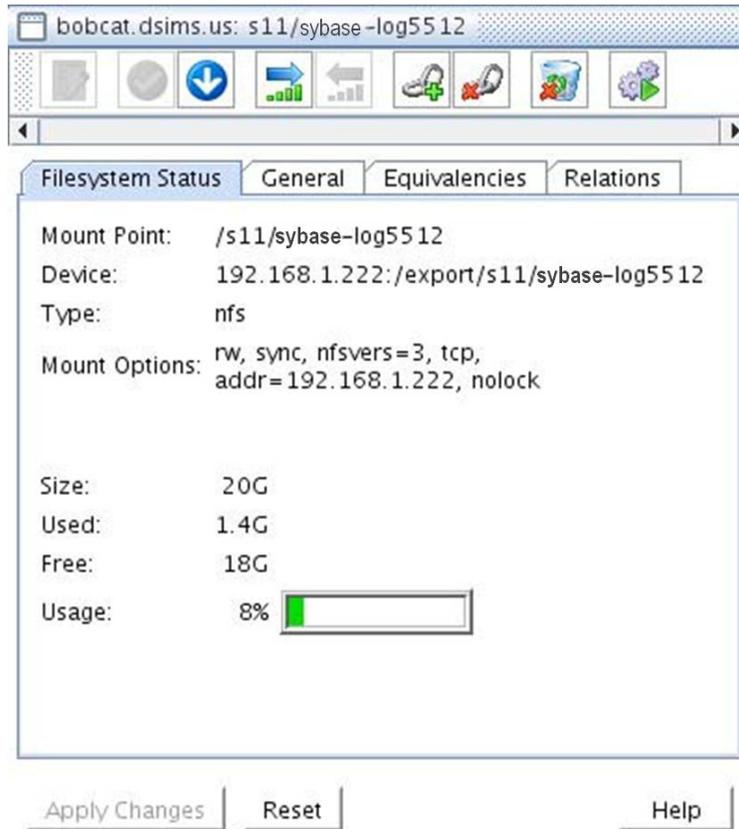
Chapter 4: Installation

Installing/Configuring Sybase ASE with SPS

The following sequence is recommended for installing and configuring the Sybase ASE product and SPS software. Each of these steps links to detailed tasks.

Install the Sybase ASE Software

Create the Sybase ASE Servers

Install the SPS Software

After you have performed these tasks, you will be ready to create the SPS resource hierarchy to protect your Sybase ASE Server(s).

Resource Configuration Tasks

Describes the various functions you may perform on your hierarchies using the LifeKeeper GUI: **create**, **extend**, **delete** and **unextend**.

Once you have completed the setup tasks described in the previous section, you are ready to create and extend your Sybase ASE resource hierarchies.

The following tasks are available for configuring the SPS for Linux Sybase ASE Recovery Kit:

- Create Resource Hierarchy - Creates a Sybase ASE resource hierarchy

- Delete Resource Hierarchy - Deletes a Sybase ASE resource hierarchy

- Extend Resource Hierarchy - Extends a Sybase ASE resource hierarchy from the primary server to the backup server

- Unextend Resource Hierarchy - Unextends (removes) a Sybase ASE resource hierarchy from a single server in the SPS cluster

- Testing Your Resource Hierarchy - Tests your Sybase ASE resource hierarchy

Refer to the GUI Administrative Tasks section of the SPS for Linux Technical Documentation for instructions on configuring SPS Core resource hierarchies, for instance, file system and IP resources.

The following tasks are described in the Administration section within the SPS for Linux Technical Documentation 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, configuration tasks are performed using the **Edit** menu. You may also perform most of the 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 in the right pane of the status display

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

Install the Sybase ASE Software

Install the Sybase ASE software on all servers in the cluster using identical parameters/settings. Refer to the *Installation Guide Adaptive Server for Linux* for details. The following are additional recommendations to ensure that SPS will work with Sybase ASE:

- A non-root system user (Sybase OS User) must exist on all servers. The user must have the same user id, group id, and home directory on all servers where the resource(s) will be protected.

- The Sybase ASE common software packages must be installed. This package provides both the Sybase `srvbuild` and Sybase `isql` utilities.

- Each SPS server containing a Sybase ASE resource hierarchy must have identical service entries in the *$SYBASE/interfaces* file for the Sybase ASE Server(s).

- Verify that a link exists between *$SYBASE/ASE-<version>* and *$SYBASE/ASE*. If the link does not exist, it must be manually created. See the topic [Creating Links for ASE and OCS](#) for additional information.

- Verify that a link exists between *$SYBASE/OCS-<version>* and *$SYBASE/OCS*. If the link does not exist, it must be manually created. See the topic [Creating Links for ASE and OCS](#) for additional information.

- Refer to the *Installation Guide Adaptive Server for Linux* for details on configuring shared memory parameters for the Adaptive Server, Monitor Server and Backup Server.

Create the Sybase ASE Servers

NOTE: The Sybase Monitor Server is no longer supported with the Sybase ASE ARK v9.0.2 and later.

Follow the instructions in your *Installation Guide Adaptive Server for Linux* for configuring the Sybase Adaptive Server, Monitor Server and Backup Server. The following considerations should be followed:

- Use the `srvbuild` utility or other Sybase ASE utility to create the Sybase Adaptive Server instance

  - Configure all system devices on shared storage

  - Configure the Adaptive Server configuration files on shared storage

  - Configure the Adaptive Server shared memory directory on shared storage

  - Configure the interface to use a SPS switchable IP address

  - Optionally configure the logs on shared storage

- If required, create the Sybase Monitor Server instance

  - Configure all system devices on shared storage

  - Configure the Monitor Server configuration files on shared storage

  - Configure the Monitor Server shared memory directory on shared storage

  - Configure the interface to use a SPS switchable IP address

  - Optionally configure the logs on shared storage

- If required, create the Sybase Backup Server instance

  - Configure all system devices on shared storage

  - Configure the Monitor Server configuration files on shared storage

  - Configure the Monitor Server shared memory directory on shared storage

  - Configure the interface to use a SPS switchable IP address

  - Optionally configure the logs on shared storage

Install the SPS Software

Once you have installed the Sybase ASE software and created your database servers, you are ready to install the SPS Core software, SPS for Linux IP Recovery Kit and any required patches followed by the Sybase ASE Recovery Kit. Also, if you plan to use Sybase ASE with raw devices, you must install the SPS Raw I/O Recovery Kit from the SPS Core image file. See Creating Device Spaces Using Raw I/O for requirements and instructions on setting up raw devices.

Refer to the SPS for Linux Installation Guide for details on installing the SPS packages.

Creating a Sybase ASE Resource Hierarchy

Perform the following steps on the primary server:

1. On the **Edit** menu, select **Server**, then **Create Resource Hierarchy**.

The **Create Resource Wizard** dialog will appear.

2. Select **Sybase ASE Database** from the drop-down list and click **Next**.

3. You will be prompted for 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 any error requiring you to correct the previously entered information. You may click **Cancel** at any time to cancel the entire creation process.

Field	Tips
Server	Select the SPS server where the Sybase ASE resource is to be created.
Switchback Type	Choose either **intelligent** or **automatic**. This determines how the Sybase ASE resource will be switched back to the primary server after it comes in-service (active) on the backup server following a failover. Intelligent switchback requires administrative intervention to switch the resource back to the primary server, while automatic switchback occurs as soon as the primary server is back on line and reestablishes SPS communication paths. **Note:** The switchback strategy must match that of the dependent resources to be used by the Sybase ASE resource.
Sybase Install Directory	This field is used to specify the installation location of the Sybase ASE product. You may type in another directory path. The valid characters allowed for the pathname are letters, digits and the following special characters: - _ . /
Sybase Instance Directory	This field is used to specify the directory path that contains the Sybase data directory. The data directory will typically contain the ASE-<version>/RUN_* files for the instance.
Sybase Instance	This field contains by default the name of the first Sybase instance found on the system, for which no SPS hierarchy exists. The drop down list shows other Sybase instances that may be available on your SPS server. This field is used to specify the Sybase ASE Database instance that will be placed under LifeKeeper protection. The specified instance must exist and must be running.
Sybase Username	This field is used to enter the user name for the Sybase System Administrator. By default the user name is sa. This System Administrator must have login and full privileges on any database on the Sybase Adaptive Server being protected.

Field	Tips
Sybase Login Password	This field is used to specify the password for the Sybase System Administrator.
Sybase Backup Server	This field is used to specify the Sybase Backup server for the specified Adaptive Server instance. This Sybase Backup will be placed under SPS protection. The user may select 'none' if the Sybase Backup Server does not need to be included under SPS protection.
Sybase ASE Database Tag	This is a unique tag name for the new Sybase ASE database resource on the primary server. The default tag name consists of the word sybase followed by the name of the Adaptive Server instance. You may type in another unique tag name. The valid characters allowed for the tag are letters, digits, and the following special characters: - _ . /

4. Cllick **Next**. The *Create Resource Wizard* will then create your Sybase ASE resource hierarchy. SPS will validate the data entered. If SPS detects a problem, an error message will appear in the information box.

5. You should see a message indicating that you have successfully created a Sybase ASE resource hierarchy, and you must extend that hierarchy to another server in your cluster to achieve failover protection. Click **Next**.

6. Click **Continue**. SPS will then launch the *Pre-extend Wizard*. Refer to **Step 2** under Extending a Sybase ASE Resource Hierarchy for details on how to extend your resource hierarchy to another server.

Extending a Sybase ASE Resource 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 SPS **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	Select the server where your Sybase ASE resource is currently in service.
Tag to Extend	Select the Sybase ASE resource you wish to extend.

Field	Tips
Target Server	Enter or select the server you are extending *to*.
Switchback Type	This determines how the Sybase ASE resource will be switched back tothe primary server after it comes in-service (active) on the backup server following a failover. You can choose either intelligent or automatic. The switchback type can be changed later, if desired, from the General tab of the Resource Properties dialog box. **Note:** Remember that the switchback strategy must match that of the dependent resources to be used by the Sybase ASE resource.
Template Priority	Select or enter a **Template Priority**. This is the priority for the Sybase ASE 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.
Target Priority	This is the priority for the new extended Sybase ASE 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. Note that SPS 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.

3. After receiving the message that the pre-extend checks were successful, click **Next**.

4. Depending upon the hierarchy being extended, SPS will display a series of information boxes showing the Resource Tags to be extended, some of which cannot be edited.

5. The *Extend Wizard* will prompt you to enter the following information.

Sybase ASE Install Directory	This field contains by default the Sybase ASE install path of the Template Resource. The valid Sybase ASE installation path should be specified. The valid characters allowed for the pathname are letters, digits, and the following special characters: - _ . /
Sybase ASE Database Tag	This is a unique tag name for the new Sybase ASE database resource on the primary server. The default tag name consists of the word sybase followed by the name of the Adaptive Server instance. You may type in another unique tag name. The valid characters allowed for the tag are letters, digits, and the following special characters: - _ . /

6. 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.

7. After receiving the message "`Hierarchy Verification Finished`", click **Done**.

Unextending a Sybase ASE Resource Hierarchy

To remove a resource hierarchy from a single server in the SPS 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 Sybase ASE resource. It cannot be the server where the 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 Sybase ASE 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 Sybase ASE resource hierarchy you have chosen to unextend. Click **Unextend**.

5. Another information box appears confirming that the Sybase ASE resource was unextended successfully. Click **Done** to exit the **Unextend Resource Hierarchy** menu selection.

Deleting a Sybase ASE Resource Hierarchy

To delete a Sybase ASE resource from all servers in your SPS configuration, complete the following steps:

1. On the **Edit** menu, select **Resource**, then **Delete Resource Hierarchy**.

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

   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.

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 **Next**.

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

6. Click **Done** to exit.

Testing Your Resource Hierarchy

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

Performing a Manual Switchover from the LifeKeeper GUI

You can initiate a manual switchover from the LifeKeeper GUI by selecting **Edit**, **Resource** and **In Service**. For example, an in-service request executed on a backup server causes the Sybase ASE resource 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 resource hierarchy is taken out-of-service without bringing it in service on the other server.

⚠️	**IMPORTANT**: After bringing your resource hierarchy in service on the backup server, you should attempt to connect to the databases, especially when using raw devices as device spaces. This is necessary to ensure that all disk partitions are visible on the backup servers and the raw bindings are being established correctly.
	If the raw bindings have not been established on the backup servers, it is most likely caused by the fact that new partitions were created on the primary server and added to the configuration, but the partition tables have not yet been updated on the backup servers.
	The solution is to reboot the backup servers so that the partition tables are updated correctly.

Chapter 5: Administration

Resource Hierarchy Administration

Provides important recommendations for ongoing administration of the Sybase ASE hierarchy.

The following tasks may be required after your resource hierarchies have been created.

Modifying Protection for the Sybase Backup Server

Modifying Protection for the Sybase Monitor Server

Updating Parameters

Modifying Protection for the Sybase Backup Server

The Sybase Backup Server is an Open Server-based application that manages all database backups (dump) and restores (load) operations for Adaptive Server. The Sybase Backup Server can be protected by the SPS Sybase ASE resource hierarchy during the resource creation, or added to the SPS protection after the resource hierarchy creation. In addition, the Sybase Backup Server can be removed from SPS protection after the hierarchy has been created.

Adding a Sybase Backup Server

To add a Sybase Backup Server to an existing Sybase ASE resource hierarchy, the Sybase `srvbuild` or other configuration utility must have created one.

1. On the **Edit** menu, select **Resource**, then select **Properties**. A *Resource Properties wizard* will appear.

2. Select the resource tag from the **Select Resource** drop-down. This is the resource tag for the SPS protected Sybase ASE resource to modify.

3. Select the SPS Server from the **Select Server for Resource** drop-down. This will be the server to update the Sybase ASE resource instance on. If changes are required on more than one SPS server, then this process should be repeated for each server in the cluster.

4. Select the **Resource Configuration** button on the **Resource Properties** page. This will launch a *Reconfiguration wizard* for the protected resource selected in Step 3. The first screen of the wizard will display the current configuration settings for the resource under SPS protection. Select **Next**.

5. If a valid Sybase Backup Server exists on the specified server, the next screen will display a drop-

down for the Sybase Backup Server to add or remove. Select the Sybase Backup Server to add from the list. Select **Next**. **Note**: For Sybase ASE installations where the Sybase software is installed on shared storage, the file system containing the installation must be in service on the server where the reconfiguration will take place.

6. If a valid Sybase Monitor Server exists, the next screen will allow you to configure it now. Refer to Modifying Protection for the Sybase Monitor Server for considerations regarding modifying the Monitor Server protection.

7. Select **Reconfigure**. If any errors are displayed they must be corrected before proceeding. Otherwise, select **Done**.

8. Any Sybase Backup Server configuration file paths or associated database devices should be manually protected with an SPS file system resource and made a dependent of the parent resource hierarchy.

9. The virtual IP address associated with the Sybase Backup Server must be made a dependent of the parent resource hierarchy. To find the associated IP address, look for the master and query lines following the Sybase Backup Server name in the interfaces file.

Removing a Sybase Backup Server

The following steps outline the process for removing a Sybase Backup Server from an existing Sybase ASE resource hierarchy.

1. On **the** Edit menu, select **Resource**, select **Properties**. A *Resource Properties wizard* will appear.

2. Select the resource tag from the **Select Resource** drop-down. This is the resource tag for the SPS protected Sybase ASE resource to modify.

3. Select the SPS Server from the **Select Server for Resource** drop-down. This will be the server to update the Sybase ASE resource instance on. If changes are required on more than one SPS server, then this process should be repeated for each server in the cluster.

4. Select the **Resource Configuration** button on the **Resource Properties** page. This will launch a *Reconfiguration wizard* for the protected resource selected in Step 3. The first screen of the wizard will display the current configuration settings for the resource under SPS protection. Select **Next**.

5. If a valid Sybase Backup Server exists on the specified server, the next screen will display a drop-down for the Sybase Backup Server to add or remove. Select '**none**' from the list to remove protection for the Sybase Backup Server. Select **Next**.

6. If a valid Sybase Monitor Server exists, the next screen will allow you to configure it now. Refer to Modifying Protection for the Sybase Monitor Server for considerations regarding modifying the Monitor Server protection.

7. Select **Reconfigure**. If any errors are displayed, they must be corrected before proceeding. Otherwise, select **Done**.

8. Any Sybase Backup Server configuration file paths or associated database devices that are no longer in use should be removed from the Sybase ASE resource dependency and deleted from SPS.

9. Any Sybase Backup Server virtual IP resources that are no longer in use should be removed from the Sybase ASE resource dependency and deleted from SPS.

Modifying Protection for the Sybase Monitor Server

NOTE: The Sybase Monitor Server is no longer supported with the Sybase ASE ARK v9.0.2 and later.

The Monitor Server is a separate server from the database server that monitors the Adaptive Server. The Monitor Server can provide real time or historical data to client applications. The Sybase Monitor Server can be protected by the SPS Sybase ASE resource hierarchy during the resource creation, or added to the SPS protection after the resource hierarchy creation. In addition, the Sybase Monitor Server can be removed from SPS protection after the hierarchy has been created.

Adding a Sybase Monitor Server

To add a Sybase Monitor Server to an existing Sybase ASE resource hierarchy, the Sybase `srvbuild` or other configuration utility must have created one.

1. On the **Edit** menu, select **Resource**, select **Properties**. A *Resource Properties wizard* will appear.

2. Select the resource tag from the **Select Resource** drop-down. This is the resource tag for the SPS protected Sybase ASE resource to modify.

3. Select the SPS Server from the **Select Server for Resource** drop-down. This will be the server to update the Sybase ASE resource instance on. If changes are required on more than one SPS server, then this process should be repeated for each server in the cluster.

4. Select the **Resource Configuration** button on the **Resource Properties** page. This will launch a *Reconfiguration wizard* for the protected resource selected in Step 3. The first screen of the wizard will display the current configuration settings for the resource under SPS protection. Select **Next**.

5. If a valid Sybase Backup Server exists, the next screen will allow you to configure it now. Refer to Modifying Protection for the Sybase Backup Server for considerations regarding modifying the Backup Server protection.

6. If a valid Sybase Monitor Server exists on the specified server, the next screen will display a drop-down for the Sybase Monitor Server to add or remove. Select the Sybase Monitor Server to add from the list. Select **Next**. **Note**: For Sybase ASE installations where the Sybase software is installed on shared storage, the file system containing the installation must be in-service on the server where the reconfiguration will take place.

7. Select **Reconfigure**. If any errors are displayed they must be corrected before proceeding. Otherwise, select **Done**.

8. Any Sybase Monitor Server configuration file paths or associated database devices should be manually protected with an SPS file system resource and made a dependent of the parent Sybase ASE resource hierarchy.

9. The virtual IP address associated with the Sybase Monitor Server must be made a dependent of the

parent Sybase ASE resource hierarchy. To find the associated IP address, look for the master and query lines following the Sybase Monitor Server name in the interfaces file.

Removing a Sybase Monitor Server

The following steps outline the process for removing a Sybase Monitor Server from an existing Sybase ASE resource hierarchy.

1. On the **Edit** menu, select **Resource**, select **Properties**. A *Resource Properties wizard* will appear.

2. Select the resource tag from the **Select Resource** drop-down. This is the resource tag for the SPS protected Sybase ASE resource to modify.

3. Select the SPS Server from the Select Server for Resource pull down. This will be the server to update the Sybase ASE resource instance on. If changes are required on more than one SPS server, then this process should be repeated for each server in the cluster.

4. Select the **Resource Configuration** button on the **Resource Properties** page. This will launch a *Reconfiguration wizard* for the protected resource selected in Step 3. The first screen of the wizard will display the current configuration settings for the resource under SPS protection. Select **Next**.

5. If a valid Sybase Backup Server exists, the next screen will allow you to configure it now. Refer to Modifying Protection for the Sybase Backup Server for considerations regarding modifying the Backup Server protection

6. If a valid Sybase Monitor Server exists on the specified server, the next screen will display a pull down for the Sybase Monitor Server to add or remove. Select '**none**' from the list to remove protection for the Sybase Monitor Server. Select **Next**.

7. Select **Reconfigure**. If any errors are displayed they must be corrected before proceeding. Otherwise, select **Done**.

8. Any Sybase Monitor Server configuration file paths or associated database devices that are no longer in use should be removed from the Sybase ASE resource dependency and deleted from SPS.

9. Any Sybase Monitor Server virtual IP resources that are no longer in use should be removed from the Sybase ASE resource dependency and deleted from SPS.

Updating Parameters

When database parameters are updated for a Sybase ASE instance, it is necessary to check that all changes will allow the instance to function on all LifeKeeper servers in the cluster. If changes require the addition or deletion of LifeKeeper resources, such as file systems, raw devices or virtual IP addresses, these must be added manually and made a dependency of the parent Sybase ASE resource hierarchy.

Chapter 6: Troubleshooting

Sybase ASE Error During Resource Creation

Symptom: Unable to create the resource instance during the resource creation
Cause: If the instance is running, it could be because the profile is not located in the default $Sybase directory
Solution: In /etc/default/LifeKeeper set the tunable SYBASE_PROFILE to the location of the correct SYBASE.sh profile
 For example: Add to /etc/default/LifeKeeper

> SYBASE_PROFILE=/opt/my-non-standard-path/SYBASE.sh

Symptom: SPS-L Sybase Resource fails to come in-service but the database instance is started.
Cause: The instance took longer than the default start up time to complete its startup and recovery process.
Solution: Increase the start wait tunable via the /etc/default/LifeKeeper file
 For example: Add to /etc/default/LifeKeeper

> SYBASE_STARTWAIT=120

Sybase ASE Recovery Kit Error Messages

Lists and describes the error messages associated with the Sybase ASE Recovery Kit.

114000	Usage: %s
114001	The Sybase Install Directory cannot be empty. ACTION: Please specify a value for this field.
114002	The path %s is not a valid directory.
114003	The Sybase Product was not found in the directory %s on server %s. ACTION: Verify that a supported version of Sybase is installed in the specified location.
114004	The specified instance %s is not a valid Sybase ASE Server on %s.
114005	Unable to verify that the Sybase ASE Server %s is running.
114006	The Sybase Monitor Server %s will be protected.
114007	The Sybase Backup Server %s will be protected.
114008	The Sybase ASE Server %s is already under SPS protection on %s.
114009	An unknown error has occurred in utility %s on server %s. ACTION: View the SPS logs for details and retry the operation.

114010	Unable to get the version for the Sybase Server %s installed under %s on %s.
114011	The device %s for Sybase ASE Server %s is not a valid device.
114012	An error has occurred while trying to obtain the devices for Sybase ASE Server %s.
114013	Unable to create raw resource hierarchy for %s.
114014	Unable to create file system resource hierarchy for %s.
114015	The path %s is not on a shared file system.
114016	Unable to create resource dependency for parent %s and child %s.
114017	Information: SPS will not protect the path %s because it is not located on a shared file system.
114018	Unable to get the owner for the Sybase ASE Server %s installed under %s on %s.
114019	Unable to open file %s on server %s due to error %s.
114020	There are no hosts defined for the Sybase ASE Server %s in the file %s.
114021	There are no ports defined for the Sybase ASE Server %s in the file %s.
114022	The specified host name %s defined for the Sybase ASE Server %s in the file %s cannot be resolved.
114023	Unable to detect the host and ports for the Sybase ASE Server %s.
114024	A LifeKeeper resource hierarchy does not exist for the IP address %s on server %s. ACTION: Create a LifeKeeper resource hierarchy for the specified IP address
114025	The values specified for the target and the template servers are the same. ACTION: Please specify the correct values for the target and template servers.
114026	The system user %s does not exist on the server %s.
114027	The group id for user %s is not the same on template server %s and target server %s.
114028	The user id for user %s is not the same on template server %s and target server %s.
114029	There are no IP dependent resources defined for the Sybase resource %s on %s. ACTION: Create the required dependent IP resource hierarchy.
114030	The interfaces defined for Sybase ASE Server %s differ on template server %s and target server %s
114031	The ports defined for Sybase ASE Server %s differ on template server %s and target server %s
114032	The port %s used by the Sybase resource hierarchy %s on the server %s is in use by another application on server %s.
114033	The startup of the Sybase ASE Server(s) on %s failed for the following Sybase ASE Server(s): %s.
114034	Unable to stop the Sybase ASE Server(s) %s on %s.

114035	The Sybase ASE resource hierarchy %s does not contain any valid gen/filesys or scsi/raw resource dependents on server %s. ACTION: The hierarchy does not contain any valid dependents, you must delete and recreate the hierarchy.
114036	There are no Sybase ASE Servers available for protection with LifeKeeper.
114037	Unable to obtain the pid of the backupserver process corresponding to instance %s.
114038	The pid detected for Sybase Backup Server %s in the LifeKeeper pidfile %s.LK on server %s exists in another LifeKeeper pidfile on this server. ACTION: The duplicate pid entry in the pid files should be resolved. The pid file for the instance that is not running should be removed.
114039	Unable to update the resource instance %s on server %s.
114040	The update of the resource instance %s failed on server %s. All attempts to rollback the instance information field have failed. ACTION: Manual intervention is required.
114041	The interfaces file %s on %s contains an invalid comment line. ACTION: Please correct the interfaces file to remove any comment lines.
114042	One or more of the Sybase ASE Servers is missing from the file %s.
114043	The file %s does not exist on server %s.
114044	The reconfiguration of the Sybase ASE resource hierarchy %s on server %s was successful
114045	The update of the resource instance %s failed on server %s. The instance information field has not been modified. ACTION: Retry the reconfiguration operation
114046	The home directory for user %s is not the same on template server %s and target server %s
114047	The file %s on server %s is a link that does not resolve to a dependent shared resource on the template server %s.
114048	The link %s and its resolved path %s are not on a protected shared filesystem.

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Appendix

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Creating Device Spaces Using Raw I/O

Requirements

In order to use the Sybase ASE Recovery Kit with raw I/O, the following requirements must be met:

- The Linux OS must support raw I/O devices. For most distributions this support was included in the 2.4 kernel, but there are some distributions that support raw I/O on a 2.2 kernel.

- All raw I/O devices must be bound to a shared disk partition. The number of database devices (devspaces) that will be located on raw I/O devices determines the exact number of raw devices and shared disk partitions required. Refer to the *Installation Guide Adaptive Server for Linux* for guidelines for creating database devices on raw devices.

- The version of the Sybase ASE software must support the use of raw I/O devices.

Naming Conventions

The naming of raw devices and controller varies by Linux distribution.

- On Red Hat, the device name is `/dev/raw/raw<number>` and the controller is `/dev/rawctl`

- On SuSE SLES 11 versions, the device name is `/dev/raw/raw<number>` and the controller is `/dev/raw/rawctl`

Raw I-O Setup Steps

1. Select a shared disk partition of appropriate size for the Sybase ASE database device.

2. Bind an unused raw device node to this partition. Since this needs to be done every time the machine is rebooted, and requires root access, you may want to add the raw bindings to a system initialization file (i.e. rc.local or boot.local). These bindings must be removed from the file once the hierarchy is under SPS protection. SPS will re-establish the raw bindings for raw I/O devices that are under SPS protection. Use the command `raw -qa` to see which raw device nodes are already in use. For example:

   ```
   # raw -qa

   # raw /dev/raw/raw1 /dev/sda1
   ```

3. Set global read permissions on both the raw device controller (*/dev/rawctl or /dev/raw/rawctl*), and the disk partition on all servers that will protect the database instance.

```
# chmod a+r /dev/rawctl (or chmod a+r /dev/raw/rawctl)
```

4. Set group and user read/write permissions on the raw device on all servers that will protect the database instance.

```
# chmod 664 /dev/raw/raw1
```

5. Change the owner of the raw device to the Sybase ASE owner for the given database instance on all servers that will protect the database instance.

```
# chown -R sybase:sybase /dev/raw/raw1
```

6. Refer to the *Installation Guide Adaptive Server for Linux* for information on adding the raw device to the database server(s).

Adding a Database Device After Creating Hierarchy

If a database device is added on a raw I/O device or shared file system after the Sybase ASE hierarchy has been created in SPS, you must manually create a resource hierarchy for the raw device or file system via the LifeKeeper GUI. The newly created resource hierarchy must then be made a dependent (child) of the Sybase ASE resource hierarchy.

Creating Links for ASE and OCS

The SPS for Linux Sybase ASE Recovery Kit requires that the path *$SYBASE/ASE-<version>* be symbolically linked to *$SYBASE/ASE*. In addition, the path *$SYBASE/OCS-<version>* must be symbolically linked to *$SYBASE/OCS*. The SPS for Linux Sybase ASE Recovery Kit uses these links to access various Sybase utilities and files. To create the links follow the steps below.

1. From the command line, change directories into the *$SYBASE* directory.

   Example:

   ```
   server1 # cd $SYBASE

   server1 # pwd

       /opt/sybase-15.5
   ```

2. Locate the *ASE-<version>* directory

   Example:

   ```
   server1 # ls -ld ASE*

   drwxrwxr-x 16 sybase sybase 4096 Nov 18 09:08 ASE-15_5

   lrwxrwxrwx 1 sybase sybase 8 Nov 17 11:35 ASEP -> ASEP-1_0

   drwxrwxr-x 4 sybase sybase 4096 Nov 17 11:35 ASEP-1_0
   ```

Note: If a link already exists between *ASE-15_5* and *ASE*, proceed to Step 5.

3. Verify that the *ASE-<version>* directory contains the *bin/srvbuild* utility.

   Example:

   ```
   server1 # ls ASE-15_5/bin/srvbuild

          srvbuild
   ```

   Note: If a "`no such file or directory`" error occurs, then you have chosen the wrong path.

4. From the command line, create a link between the identified *ASE-<version>* directory and *ASE*.

   Example:

   ```
   server1 # pwd

          /opt/sybase-15.5

   server1 # ln -s ASE-15_5 ASE
   ```

5. Verify the link was properly created.

   Example:

   ```
   server1 # ls -ld ASE*

          lrwxrwxrwx 1 sybase sybase 8 Nov 17 11:20 ASE -> ASE-15_5

          drwxrwxr-x 16 sybase sybase 4096 Nov 18 09:08 ASE-15_5

          lrwxrwxrwx 1 sybase sybase 8 Nov 17 11:35 ASEP -> ASEP-1_0

          drwxrwxr-x 4 sybase sybase 4096 Nov 17 11:35 ASEP-1_0

   server1 # ls ASE/bin/srvbuild

          srvbuild
   ```

6. From the command line, change directories into the *$SYBASE* directory.

   Example:

   ```
   server1 # cd $SYBASE
   server1 # pwd

          /opt/sybase-15.5
   ```

7. Locate the *OCS-<version>* directory

   Example:

   ```
   server1 # ls -ld OCS*

          drwxrwxr-x 16 sybase sybase 4096 Nov 18 09:08 OCS-15_5
   ```

   Note: If a link already exists between *OCS-15_5* and *OCS*, proceed to Step 5.

8. Verify that the *OCS-<version>* directory contains the *bin/isql* utility.

   Example:

   ```
   server1 # ls OCS-15_5/bin/isql

           isql
   ```

   Note: If a "`no such file or directory`" error occurs, then you have chosen the wrong path.

9. From the command line, create a link between the identified *OCS-<version>* directory and *OCS*.

   Example:

   ```
   server1 # pwd

           /opt/sybase-15.5

   server1 # ln -s OCS-15_5 OCS
   ```

10. Verify the link was properly created.

    Example:

    ```
    server1 # ls -ld OCS*

            lrwxrwxrwx 1 sybase sybase 8 Nov 17 11:20 OCS -> OCS-15_5

            drwxrwxr-x 16 sybase sybase 4096 Nov 18 09:08 OCS-15_5

    server1 # ls ASE/bin/isql

            isql
    ```