Oracle® Solaris Cluster Data Service for SAP liveCache Guide

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Contents

Preface

Oracle Solaris Cluster Data Service for SAP liveCache Guide explains how to install and configure Solaris Cluster HA for SAP liveCache.

Note – This Oracle Solaris Cluster release supports systems that use the SPARC and x86 families of processor architectures: UltraSPARC, SPARC64, AMD64, and Intel 64. In this document, x86 refers to the larger family of 64-bit x86 compatible products. Information in this document pertains to all platforms unless otherwise specified.

This document is intended for system administrators with extensive knowledge of Oracle software and hardware. Do not use this document as a planning or presales guide. Before reading this document, you should have already determined your system requirements and purchased the appropriate equipment and software.

The instructions in this book assume knowledge of the Oracle Solaris Operating System and expertise with the volume-manager software that is used with Oracle Solaris Cluster software.

Using UNIX Commands

This document contains information about commands that are specific to installing and configuring Oracle Solaris Cluster data services. The document does *not* contain comprehensive information about basic UNIX commands and procedures, such as shutting down the system, booting the system, and configuring devices. Information about basic UNIX commands and procedures is available from the following sources:

- Online documentation for the Oracle Solaris Operating System
- Oracle Solaris Operating System man pages
- Other software documentation that you received with your system

Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P–1   Typographic Conventions

Typeface	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your `.login` file.
		Use `ls -a` to list all files.
		`machine_name% you have mail.`
AaBbCc123	What you type, contrasted with onscreen computer output	`machine_name%` **su**
		`Password:`
aabbcc123	Placeholder: replace with a real name or value	The command to remove a file is `rm` *filename*.
AaBbCc123	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the *User's Guide*.
		A *cache* is a copy that is stored locally.
		Do *not* save the file.
		Note: Some emphasized items appear bold online.

Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for shells that are included in the Oracle Solaris OS. Note that the default system prompt that is displayed in command examples varies, depending on the Oracle Solaris release.

TABLE P–2   Shell Prompts

Shell	Prompt
Bash shell, Korn shell, and Bourne shell	`$`
Bash shell, Korn shell, and Bourne shell for superuser	`#`
C shell	`machine_name%`
C shell for superuser	`machine_name#`

Related Documentation

Information about related Oracle Solaris Cluster topics is available in the documentation that is listed in the following table. All Oracle Solaris Cluster documentation is available at `http://docs.sun.com`.

Topic	Documentation
Data service administration	*Oracle Solaris Cluster Data Services Planning and Administration Guide*
	Individual data service guides
Concepts	*Oracle Solaris Cluster Concepts Guide*
Overview	*Oracle Solaris Cluster Overview*
Software installation	*Oracle Solaris Cluster Software Installation Guide*
System administration	*Oracle Solaris Cluster System Administration Guide*
Hardware administration	*Oracle Solaris Cluster 3.3 Hardware Administration Manual*
	Individual hardware administration guides
Data service development	*Oracle Solaris Cluster Data Services Developer's Guide*
Error messages	*Oracle Solaris Cluster Error Messages Guide*
Command and function reference	*Oracle Solaris Cluster Reference Manual*

For a complete list of Oracle Solaris Cluster documentation, see the release notes for your release of Oracle Solaris Cluster at `http://docs.sun.com`.

Related Third-Party Web Site References

Third-party URLs that are referenced in this document provide additional related information.

Note – Oracle is not responsible for the availability of third-party web sites mentioned in this document. Oracle does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Oracle will not be responsible or liable for any actual or alleged damage or loss caused or alleged to be caused by or in connection with use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

Documentation, Support, and Training

See the following web sites for additional resources:

- Documentation (http://docs.sun.com)
- Support (http://www.oracle.com/us/support/systems/index.html)
- Training (http://education.oracle.com) – Click the Sun link in the left navigation bar.

Oracle Welcomes Your Comments

Oracle welcomes your comments and suggestions on the quality and usefulness of its documentation. If you find any errors or have any other suggestions for improvement, go to http://docs.sun.com and click Feedback. Indicate the title and part number of the documentation along with the chapter, section, and page number, if available. Please let us know if you want a reply.

Oracle Technology Network (http://www.oracle.com/technetwork/index.html) offers a range of resources related to Oracle software:

- Discuss technical problems and solutions on the Discussion Forums (http://forums.oracle.com).
- Get hands-on step-by-step tutorials with Oracle By Example (http://www.oracle.com/technology/obe/start/index.html).
- Download Sample Code (http://www.oracle.com/technology/sample_code/index.html).

Getting Help

If you have problems installing or using Oracle Solaris Cluster, contact your service provider and provide the following information:

- Your name and email address (if available)
- Your company name, address, and phone number
- The model number and serial number of your systems
- The release number of the Oracle Solaris Operating System (for example, Oracle Solaris 10)
- The release number of Oracle Solaris Cluster (for example, Oracle Solaris Cluster 3.3)

Use the following commands to gather information about each node on your system for your service provider.

Command	Function
prtconf -v	Displays the size of the system memory and reports information about peripheral devices
psrinfo -v	Displays information about processors
showrev –p	Reports which patches are installed
prtdiag -v	Displays system diagnostic information
/usr/cluster/bin/clnode show-rev	Displays Oracle Solaris Cluster release and package version information

Also have available the contents of the /var/adm/messages file.

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Installing and Configuring Solaris Cluster HA for SAP liveCache

This chapter contains explains how to install and configure Solaris Cluster HA for SAP liveCache.

This chapter contains the following sections.

Solaris Cluster HA for SAP liveCache Overview

Use the information in this section to understand how Solaris Cluster HA for SAP liveCache makes liveCache highly available.

For conceptual information on scalable services, see the *Oracle Solaris Cluster Concepts Guide*.

To eliminate a single point of failure in an SAP Advanced Planner & Optimizer (APO) System, Solaris Cluster HA for SAP liveCache provides fault monitoring and automatic failover for liveCache and fault monitoring and automatic restart for SAP xserver. The following table lists the data services that best protect SAP Supply Chain Management (SCM) components in a

Solaris Cluster configuration. Figure 1–1 also illustrates the data services that best protect SAP SCM components in a Solaris Cluster configuration.

TABLE 1–1 Protection of liveCache Components

liveCache Component	Protected by
SAP APO Central Instance	Oracle Solaris Cluster HA for SAP
	The resource type is SUNW.sap_ci_v2.
	For more information on this data service, see *Oracle Solaris Cluster Data Service for SAP Guide*.
	Oracle Solaris Cluster HA for SAP Web Application Server
	The resource type is SUNW.sap_webas.
	For more information on this data service, see *Oracle Solaris Cluster Data Service for SAP Web Application Server Guide*.
SAP APO database	All highly available databases that are supported with Oracle Solaris Cluster software and by SAP.
SAP APO Application Server	Oracle Solaris Cluster HA for SAP
	The resource type is SUNW.sap_as_v2.
	For more information on this data service, see *Oracle Solaris Cluster Data Service for SAP Guide*.
	Oracle Solaris Cluster HA for SAP Web Application Server
	The resource type is SUNW.sap_webas.
	For more information on this data service, see *Oracle Solaris Cluster Data Service for SAP Web Application Server Guide*.
SAP xserver	Solaris Cluster HA for SAP liveCache
	The resource type is SUNW.sap_xserver.
SAP liveCache database	Solaris Cluster HA for SAP liveCache
	The resource type is SUNW.sap_livecache.
NFS file system	Oracle Solaris Cluster HA for NFS
	The resource type is SUNW.nfs.
	For more information on this data service, see *Oracle Solaris Cluster Data Service for Network File System (NFS) Guide*.

FIGURE 1–1   Protection of liveCache Components
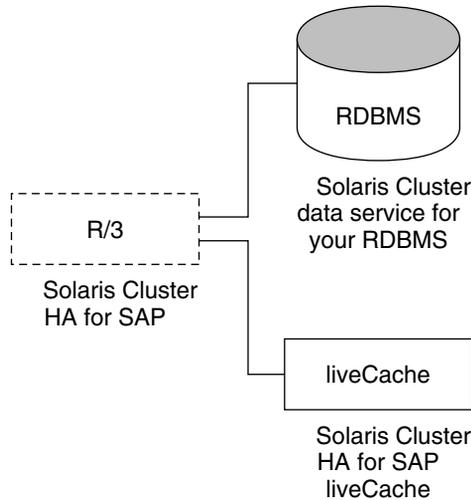
Installing and Configuring Solaris Cluster HA for SAP liveCache

Table 1–2 lists the tasks for installing and configuring Solaris Cluster HA for SAP liveCache. Perform these tasks in the order that they are listed.

TABLE 1–2   Task Map: Installing and Configuring Solaris Cluster HA for SAP liveCache

Task	For Instructions, Go To
Plan the Solaris Cluster HA for SAP liveCache installation	Your SAP documentation "Planning the Solaris Cluster HA for SAP liveCache Installation and Configuration" on page 14
Prepare the nodes and disks	"How to Prepare the Nodes" on page 16
Install and configure liveCache	"How to Install and Configure liveCache" on page 17 "How to Enable liveCache to Run in a Cluster" on page 18
Verify liveCache installation and configuration	"How to Verify the liveCache Installation and Configuration" on page 19
Install Solaris Cluster HA for SAP liveCache packages	"Installing the Solaris Cluster HA for SAP liveCache Packages" on page 20
Register and configure Solaris Cluster HA for SAP liveCache as a failover data service	"How to Register and Configure Solaris Cluster HA for SAP liveCache" on page 23

TABLE 1–2   Task Map: Installing and Configuring Solaris Cluster HA for SAP liveCache   *(Continued)*

Task	For Instructions, Go To
Verify Solaris Cluster HA for SAP liveCache installation and configuration	"Verifying the Solaris Cluster HA for SAP liveCache Installation and Configuration" on page 26
Understand Solaris Cluster HA for SAP liveCache Fault Monitors	"Tuning Solaris Cluster HA for SAP liveCache Fault Monitors" on page 28
(Optional) Upgrade the `SUNW.sap_xserver` resource type	"Upgrading the `SUNW.sap_xserver` Resource Type" on page 31

Planning the Solaris Cluster HA for SAP liveCache Installation and Configuration

This section contains the information you need to plan your Solaris Cluster HA for SAP liveCache installation and configuration.

Note – If you have not already done so, read your SAP documentation before you begin planning your Solaris Cluster HA for SAP liveCache installation and configuration because your SAP documentation includes configuration restrictions and requirements that are not outlined in Oracle Solaris Cluster documentation or dictated by Oracle Solaris Cluster software.

Note – Solaris Cluster HA for SAP liveCache can be configured to run in a whole root or a sparse root non-global zone, if required.

Configuration Requirements

Caution – Your data service configuration might not be supported if you do not adhere to these requirements.

Use the requirements in this section to plan the installation and configuration of Solaris Cluster HA for SAP liveCache. These requirements apply to Solaris Cluster HA for SAP liveCache only. You must meet these requirements before you proceed with your Solaris Cluster HA for SAP liveCache installation and configuration.

For requirements that apply to all data services, see *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

- Use SAP liveCache version 7.4 or a compatible version.

Standard Data Service Configurations

Use the standard configurations in this section to plan the installation and configuration of Solaris Cluster HA for SAP liveCache. Solaris Cluster HA for SAP liveCache supports the standard configurations in this section. Solaris Cluster HA for SAP liveCache might support additional configurations. However, you must contact your Oracle service provider for information on additional configurations.

Figure 1–2 illustrates a four-node cluster with SAP APO Central Instance, APO application servers, a database, and liveCache. APO Central Instance, the database, and liveCache are configured as failover data services. SAP xserver can be configured *only* as a scalable data service. APO application servers can be configured as scalable or failover data services.

FIGURE 1–2   Four-Node Cluster
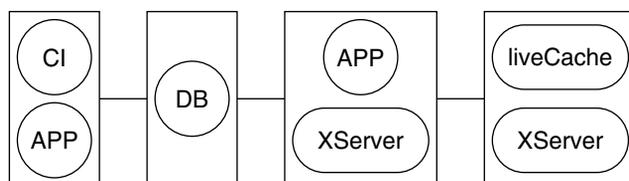
Configuration Considerations

Use the information in this section to plan the installation and configuration of Solaris Cluster HA for SAP liveCache. The information in this section encourages you to think about the impact your decisions have on the installation and configuration of Solaris Cluster HA for SAP liveCache.

- Install liveCache on its own global device group, separate from the global device group for the APO Oracle database and SAP R/3 software. This separate global device group for liveCache ensures that the liveCache resource can depend on the HAStoragePlus resource for liveCache only.
- If you want to run SAP xserver as any user other than user root, create that user on all nodes on which SAP xserver runs, and define this user in the Xserver_User extension property. SAP xserver starts and stops based on the user you identify in this extension property. The default for this extension property is user root.

Configuration Planning Questions

Use the questions in this section to plan the installation and configuration of Solaris Cluster HA for SAP liveCache. Insert the answers to these questions into the data service worksheets in

"Configuration Worksheets" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. See "Configuration Considerations" on page 15 for information that might apply to these questions.

- What resource groups will you use for network addresses and application resources and the dependencies between them?
- What is the logical hostname (for liveCache resource) for clients that will access the data service?
- Where will the system configuration files reside?

  See *Oracle Solaris Cluster Data Services Planning and Administration Guide* for the advantages and disadvantages of placing the liveCache binaries on the local file system as opposed to the cluster file system.

Preparing the Nodes and Disks

This section contains the procedures you need to prepare the nodes and disks.

▼ How to Prepare the Nodes

Use this procedure to prepare for the installation and configuration of liveCache.

1 Become superuser on all of the nodes.

2 Configure the `/etc/nsswitch.conf` file.

a. On each node or zone that can master the liveCache resource, include one of the following entries for `group`, `project`, an `passwd` database entries in the `/etc/nsswitch.conf` file.

```
database:
database: files
database: files [NOTFOUND=return] nis
database: files [NOTFOUND=return] nisplus
```

b. On each node or zone that can master the liveCache resource, ensure that `files` appears first for the `protocols` database entry in the `/etc/nsswitch.conf` file.

Example:

```
protocols: files nis
```

Solaris Cluster HA for SAP liveCache uses the su - *user* command and the dbmcli command to start and stop liveCache.

The network information name service might become unavailable when a cluster node's public network fails. Implementing the preceding changes to the /etc/nsswitch.conf file ensures that the su(1M) command and the dbmcli command do not refer to the NIS/NIS+ name services.

3 **If you are using liveCache version earlier than 7.6.03.09, comment out `/net` in `/etc/auto_master` file and remove `nis` from the automount entry in `/etc/nsswitch.conf` file.**

Installing and Configuring liveCache

This section contains the procedures that you need to install and configure liveCache.

▼ How to Install and Configure liveCache

Use this procedure to install and configure liveCache.

1 **Install and configure SAP APO System.**

See *Oracle Solaris Cluster Data Service for SAP Guide* for the procedures on how to install and configure SAP APO System on Solaris Cluster software.

2 **Install liveCache.**

> **Note –** Install liveCache by using the physical hostname if you have not already created the required logical host.

For more information, see your SAP documentation.

3 **If you are using liveCache 7.5 or compatible versions, ensure that the liveCache administrator user is in the `sdba` user group.**

The format of the liveCache administrator user's user ID is *lc-name*adm.

If you are creating the liveCache administrator user manually, add the following entry to the `/etc/group` file:

sdba::*group-id*:*lc-name*adm

group-id   The group's unique numerical ID (GID) within the system

lc-name   Lowercase name of liveCache database instance

For more information about the `/etc/group` file, see the group(4) man page.

4 **Become liveCache administrator user, create the `.XUSER.62` file for the SAP APO administrator user and the liveCache administrator user by using the following command.**

> **Note –** This user whose home directory contains the `.XUSER.62` file is an internal database user who has permissions to start, stop, and query the database.

```
$ dbmcli -uk username,passwd -d LC-NAME -n logical-hostname
```

LC-NAME   Uppercase name of liveCache database instance

logical-hostname   Logical hostname that is used with the liveCache resource

> ⚠️ **Caution** – Neither SAP APO transaction LC10 nor Solaris Cluster HA for SAP liveCache functions properly if you do not create this file correctly.

5 Copy `/usr/spool/sql` from the node or zone, on which you installed liveCache, to all the nodes or zones that will run the liveCache resource. Ensure that the ownership of these files is the same on all node or zone as it is on the node or zone on which you installed liveCache.

Example:

```
# tar cfB - /usr/spool/sql | rsh destination tar xfB -
```

destination   Specifies the node or zone which you are copying the /usr/spool/sql directory and its contents

6 Copy the `/etc/opt/sdb` directory and its contents from the node or zone on which you installed liveCache, to all the nodes or zones where resources for liveCache will run. Ensure that the ownership of these files is the same on all nodes or zones as it is on the node or zone on which you installed liveCache.

```
# tar cfB - /etc/opt/sdb | rsh destination tar xfB -
```

destination   Specifies the node or zone which you are copying the /etc/opt/sdb directory and its contents

7 Create a link from the `/sapdb/LCA/db/wrk` directory to the `/sapdb/data/wrk` directory as follows:

```
# ln -s /sapdb/data/wrk /sapdb/LCA/db/wrk
```

8 Ensure that all the required system files have been copied from the install node or zone to all the nodes or zones that will run the liveCache resource. The required files include `/etc/group` and `/etc/passwd`.

▼ How to Enable liveCache to Run in a Cluster

During a standard SAP installation, liveCache is installed with a physical hostname. You must modify liveCache to use a logical hostname so that liveCache works in a Oracle Solaris Cluster environment. Use this procedure to enable liveCache to run in a cluster.

1 Create the failover resource group to hold the network and liveCache resource.

```
# clresourcegroup create [-n node-zone-list] livecache-resource-group
```

2 Verify that you added all the network resources you use to your name service database.

3   Add a network resource (logical hostname) to the failover resource group.

```
# clreslogicalhostname create -g livecache-resource-group \
-h lc-logical-hostname lc-logical-hostname
```

Note – If you require a fully qualified hostname, you must specify the fully qualified name with the -h option and you cannot use the fully qualified form in the resource name.

---

4   Enable the failover resource group.

```
# clresourcegroup online -M livecache-resource-group
```

5   Enable the network resource (logical hostname).

```
# clresource enable lc-logical-hostname
```

6   Log on to the node or zone that hosts the liveCache resource group.

7   As the liveCache administrator user, start SAP xserver manually on the node or zone that hosts the liveCache resource group.

```
# su - lc-nameadm
$ x_server start
```

lc-name   Lowercase name of liveCache database instance

8   Log on to SAP APO System by using your SAP GUI with user DDIC.

9   Go to transaction LC10 and change the liveCache host to the logical hostname you defined in Step 3.

```
liveCache host: lc-logical-hostname
```

Verifying the liveCache Installation and Configuration

This section contains the procedure that you need to verify the liveCache installation and configuration.

▼ How to Verify the liveCache Installation and Configuration

Use this procedure to verify the liveCache installation and configuration. This procedure does not verify that your application is highly available because you have not installed your data service yet.

1   Log on to SAP APO System by using your SAP GUI with user DDIC.

2   Go to transaction LC10.

3   Ensure that you can check the state of liveCache.

4   Ensure that the following `dbmcli` commands work as user *lc-name***adm.**

```
$ dbmcli -d LC-NAME -n logical-hostname db_state
$ dbmcli -d LC-NAME -n logical-hostname db_enum
```

5   Confirm that the liveCache administrator user can run the `lcinit restart` command.

   a.   Become the liveCache administrator user.

   ```
   # su - lc-nameadm
   ```

   lc-name   Lowercase name of liveCache database instance

   b.   Run the `lcinit restart` command

   ```
   $ lcinit lc-name restart
   ```

Installing the Solaris Cluster HA for SAP liveCache Packages

If you did not install the Solaris Cluster HA for SAP liveCache packages during your initial Oracle Solaris Cluster installation, perform this procedure to install the packages. To install the packages, use the `installer` program.

Note – You need to install the Solaris Cluster HA for SAP liveCache packages in the global cluster and not in the zone cluster.

▼ How to Install the Solaris Cluster HA for SAP liveCache Packages

Perform this procedure on each cluster node where you are installing the Solaris Cluster HA for SAP liveCache packages.

You can run the `installer` program with a command-line interface (CLI) or with a graphical user interface (GUI). The content and sequence of instructions in the CLI and the GUI are similar.

Note – Even if you plan to configure this data service to run in non-global zones, install the packages for this data service in the global zone. The packages are propagated to any existing non-global zones and to any non-global zones that are created after you install the packages.

Before You Begin   Ensure that you have the Oracle Solaris Cluster installation media.

If you intend to run the `installer` program with a GUI, ensure that your `DISPLAY` environment variable is set.

1   **On the cluster node where you are installing the data service packages, become superuser.**

2   **Load the Oracle Solaris Cluster installation media into the DVD-ROM drive.**
If the Volume Management daemon `vold(1M)` is running and configured to manage DVD-ROM devices, the daemon automatically mounts the DVD-ROM on the `/cdrom` directory.

3   **Change to the installation wizard directory of the DVD-ROM.**

- **If you are installing the data service packages on the SPARC platform, type the following command:**

  `# cd /cdrom/cdrom0/Solaris_sparc`

- **If you are installing the data service packages on the x86 platform, type the following command:**

  `# cd /cdrom/cdrom0/Solaris_x86`

4   **Start the installation wizard.**

`# ./installer`

5   **When you are prompted, accept the license agreement.**

6   **From the list of Oracle Solaris Cluster agents under Availability Services, select the data service for SAP liveCache.**

7   **If you require support for languages other than English, select the option to install multilingual packages.**
English language support is always installed.

8   **When prompted whether to configure the data service now or later, choose Configure Later.**
Choose Configure Later to perform the configuration after the installation.

9 Follow the instructions on the screen to install the data service packages on the node.

The installation wizard displays the status of the installation. When the installation is complete, the wizard displays an installation summary and the installation logs.

10 (GUI only) If you do not want to register the product and receive product updates, deselect the Product Registration option.

The Product Registration option is not available with the CLI. If you are running the installation wizard with the CLI, omit this step.

11 Exit the installation wizard.

12 Unload the installation media from the DVD-ROM drive.

    a. To ensure that the DVD-ROM is not being used, change to a directory that does *not* reside on the DVD-ROM.

    b. Eject the DVD-ROM.

```
# eject cdrom
```

Next Steps See "Setting Solaris Cluster HA for SAP liveCache Extension Properties" on page 22 to register Oracle Solaris Cluster HA for SAP liveCache and to configure the cluster for the data service.

Registering and Configuring the Solaris Cluster HA for SAP liveCache

This section contains the procedures that you need to configure Solaris Cluster HA for SAP liveCache.

Setting Solaris Cluster HA for SAP liveCache Extension Properties

Use the extension properties in Appendix A, "Solaris Cluster HA for SAP liveCache Extension Properties," to create your resources. Use the following command line to configure extension properties when you create your resource.

```
clresource create -g resource-group -t resource-type -p property=value resource
```

Use the procedure in "Changing Resource Type, Resource Group, and Resource Properties" in *Oracle Solaris Cluster Data Services Planning and Administration Guide* to configure the

extension properties if you have already created your resources. You can update some extension properties dynamically. You can update others, however, only when you create or disable a resource. The Tunable fields in Appendix A, "Solaris Cluster HA for SAP liveCache Extension Properties," indicate when you can update each property. See Appendix A, "Standard Properties," in *Oracle Solaris Cluster Data Services Planning and Administration Guide* for details on all Oracle Solaris Cluster properties.

▼ How to Register and Configure Solaris Cluster HA for SAP liveCache

Use this procedure to configure Solaris Cluster HA for SAP liveCache as a failover data service for the liveCache database and SAP xserver as a scalable data service. This procedure assumes that you installed the data service packages. If you did not install the Solaris Cluster HA for SAP liveCache packages as part of your initial Oracle Solaris Cluster installation, go to "Installing the Solaris Cluster HA for SAP liveCache Packages" on page 20 to install the data service packages. Otherwise, use this procedure to configure the Solaris Cluster HA for SAP liveCache.

> ⚠ **Caution –** Do not configure more than one SAP xserver resource on the same cluster because one SAP xserver serves multiple liveCache instances in the cluster. More than one SAP xserver resource that runs on the same cluster causes conflicts between the SAP xserver resources. These conflicts cause all SAP xserver resources to become unavailable. If you attempt to start the SAP xserver twice, you receive an error message that says Address already in use.

1 Become superuser on one of the nodes or zones in the cluster that will host the liveCache resource.

2 Copy the `lccluster` file to the same location as the `lcinit` file.

```
# cp /opt/SUNWsclc/livecache/bin/lccluster \
/sapdb/LC-NAME/db/sap
```

LC-NAME   Uppercase name of liveCache database instance

3 Edit the `lccluster` file to substitute values for `put-LC_NAME-here` and `put-Confdir_list-here`.

> **Note –** The put-Confidir_list-here value exists only in the Sun Cluster 3.1 and 3.2 versions.

a. Open the `lccluster` file.

```
# vi /sapdb/LC-NAME/db/sap/lccluster
```

Note – The `CONFDIR_LIST="put-Confdir_list-here` entry exists only in the Sun Cluster 3.1 and 3.2 versions.

---

b. Replace `put-LC_NAME-here` with the liveCache instance name. The liveCache instance name is the value you defined in the `Livecache_Name` extension property.

For an example, see Step c.

LC_NAME="*liveCache-instance-name*"

c. Replace `put-Confdir_list-here` with the value of the `Confidir_list` extension property.

Note – This step is only for the Sun Cluster 3.1 and 3.2 versions. Skip this step if you are running an earlier version of Solaris Cluster.

CONFDIR_LIST="*liveCache-software-directory*"

Example:

If the liveCache instance name is LC1 and the liveCache software directory is /sapdb, edit the lccluster script as follows.

```
LC_NAME="LC1"
CONFDIR_LIST="/sapdb" [Sun Cluster 3.1 and 3.2 versions only]
```

4   Add the `HAStoragePlus` resource to the liveCache resource group.

```
# clresourcetype register SUNW.HAStoragePlus
# clresource create -g livecache-resource-group \
-t SUNW.HAStoragePlus -p filesystemmountpoints=mountpoint,... \
-p globaldevicepaths=livecache-device-group \
-p affinityon=TRUE livecache-storage-resource
```

The resource is created in the enabled state.

Note – AffinityOn must be set to TRUE and the local file system must reside on global disk groups to be failover.

For the procedure on how to set up an HAStoragePlus resource, see *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

5   Register the resource type for liveCache database.

```
# clresourcetype register SUNW.sap_Livecache
```

6   Register the resource type for SAP xserver.

```
# clresourcetype register SUNW.sap_xserver
```

7 **Create a scalable resource group for SAP xserver. Configure SAP xserver to run on all the potential nodes or zones that liveCache will run on.**

Note – Configure SAP xserver so that SAP xserver starts on all nodes or zones that the liveCache resources can fail over to. To implement this configuration, ensure that the *node-zone-list* parameter of the SAP xserver resource group contains all the nodes or zones listed in the liveCache resource groups' *node-zone-list*. Also, the value of `desired_primaries` and `maximum_primaries` of the SAP xserver resource group must be equal to each other.

```
# clresourcegroup create -S -n node-zone-list  \
-p Maximum_primaries=value \
-p Desired_primaries=value xserver-resource-group
```

8 **Add the `HAStoragePlus` resource to the SAP xserver resource group.**

```
# clresource create \
-g xserver-resource-group \
-t SUNW.HAStoragePlus \
-p filesystemmountpoints=mountpoints \
-p affinityon=false xserver-storage-resource
```

The resource is created in the enabled state.

For more information about setting up an `HAStoragePlus` resource, see "Enabling Highly Available Local File Systems" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

9 **Create an SAP xserver resource in this scalable resource group.**

```
# clresource create  \
-g xserver-resource-group -t SUNW.sap_xserver \
-p resource_dependencies=xserver-storage-resource xserver-resource
```

The resource is created in the enabled state.

See "Setting Solaris Cluster HA for SAP liveCache Extension Properties" on page 22 for a list of extension properties.

10 **Create the liveCache resource.**

```
# clresource create -g livecache-resource-group \
-t SUNW.sap_livecache -p livecache_name=LC-NAME \
-p resource_dependencies=livecache-storage-resource,xserver-resource  livecache-resource
```

The resource is created in the enabled state.

11   Ensure that the liveCache resource group is brought online only on the node or zone where the SAP xserver resource group is online.

To meet this requirement, create on the liveCache resource group a strong positive affinity for the SAP xserver resource group.

```
# clresourcegroup set \
-p rg_affinities=++xserver-resource-group  livecache-resource-group
```

12   Enable the liveCache failover resource group.

```
# clresourcegroup online -M livecache-resource-group
```

13   (Optional) Consider configuring your cluster to prevent the APO application server resource group from being brought online on the same node or zone as the liveCache resource group.

You might plan to run the APO application server on a node or zone to which the liveCache resource can fail over. In this situation, consider using resource group affinities to shut down the APO application server when the liveCache resource fails over to the node or zone.

To specify this behavior, create on the APO application server resource group a strong negative affinity for the liveCache resource group.

```
# clresourcegroup set \
-p rg_affinities=--liveCache-resource-group  apo-resource-group
```

Verifying the Solaris Cluster HA for SAP liveCache Installation and Configuration

This section contains the procedure you need to verify that you installed and configured your data service correctly.

▼ How to Verify the Solaris Cluster HA for SAP liveCache Installation and Configuration

Use this procedure to verify that you installed and configured Solaris Cluster HA for SAP liveCache correctly. You need the information in the following table to understand the various states of the liveCache database.

State	Description
OFFLINE	liveCache is not running.
COLD	liveCache is available for administrator tasks.
WARM	liveCache is online.

State	Description
STOPPED INCORRECTLY	liveCache stopped incorrectly. This is also one of the interim states while liveCache starts or stops.
ERROR	Cannot determine the current state. This is also one of the interim states while liveCache starts or stops.
UNKNOWN	This is one of the interim states while liveCache starts or stops.

1   **Log on to the node or zone that hosts the resource group that contains the liveCache resource, and verify that the fault monitor functionality works correctly.**

   a.   **Terminate liveCache abnormally by stopping all liveCache processes.**

   Oracle Solaris Cluster software restarts liveCache.

   If you do not see this behavior, you might not have correctly performed Step 2 and Step 3 in "How to Register and Configure Solaris Cluster HA for SAP liveCache" on page 23.

   ```
   # ps -ef|grep sap|grep kernel
   # kill -9 livecache-processes
   ```

   b.   **Terminate liveCache by using the Stop liveCache button in LC10 or by running the lcinit command.**

   Oracle Solaris Cluster software does not restart liveCache. However, the liveCache resource status message reflects that liveCache stopped outside of Oracle Solaris Cluster software through the use of the Stop liveCache button in LC10 or the lcinit command. The state of the liveCache resource is UNKNOWN. When the user successfully restarts liveCache by using the Start liveCache button in LC10 or the lcinit command, the Solaris Cluster HA for SAP liveCache Fault Monitor updates the resource state and status message to indicate that liveCache is running under the control of Oracle Solaris Cluster software.

   If you do not see this behavior, you might not have correctly performed Step 2 and Step 3 in "How to Register and Configure Solaris Cluster HA for SAP liveCache" on page 23.

2   **Log on to SAP APO by using your SAP GUI with user DDIC, and verify that liveCache starts correctly by using transaction LC10.**

3   **As user root, switch the liveCache resource group to another node or zone.**

   ```
   # clresourcegroup switch -n node2 livecache-resource-group
   ```

4   **Repeat Step 1 through Step 3 for each potential node or zone on which the liveCache resource can run.**

5   **Log on to the nodes or zones that host the SAP xserver resource, and verify that the fault monitor functionality works correctly.**

Terminate SAP xserver abnormally by stopping all SAP xserver processes.

```
# ps -ef|grep xserver
# kill -9 xserver-process
```

Verify that the SAP xserver agent restarts the SAP xserver.

Tuning Solaris Cluster HA for SAP liveCache Fault Monitors

Fault monitoring for the Solaris Cluster HA for SAP liveCache data service is provided by the following fault monitors:

- The SAP liveCache fault monitor
- The SAP xserver fault monitor

Each fault monitor is contained in a resource whose resource type is shown in the following table.

TABLE 1–3   Resource Types for Solaris Cluster HA for SAP liveCache Fault Monitors

Fault Monitor	Resource Type
SAP liveCache	SUNW.sap_livecache
SAP xserver	SUNW.sap_xserver

System properties and extension properties of these resources control the behavior of the fault monitors. The default values of these properties determine the preset behavior of the fault monitors. The preset behavior should be suitable for most Oracle Solaris Cluster installations. Therefore, you should tune the Solaris Cluster HA for SAP liveCache fault monitors *only* if you need to modify this preset behavior.

Tuning the Solaris Cluster HA for SAP liveCache fault monitors involves the following tasks:

- Setting the interval between fault monitor probes
- Setting the timeout for fault monitor probes
- Defining the criteria for persistent faults
- Specifying the failover behavior of a resource

For more information, see "Tuning Fault Monitors for Oracle Solaris Cluster Data Services" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. Information about the Solaris Cluster HA for SAP liveCache fault monitors that you need to perform these tasks is provided in the subsections that follow.

Tune the Solaris Cluster HA for SAP liveCache fault monitors when you register and configure Solaris Cluster HA for SAP liveCache. For more information, see "Registering and Configuring the Solaris Cluster HA for SAP liveCache" on page 22.

Factors That Affect the Interval Between Fault Monitor Probes

To determine whether SAP xserver and SAP liveCache are operating correctly, the Solaris Cluster HA for SAP liveCache fault monitors probe these resources periodically. The optimum interval between fault monitor probes depends on the time that is required to respond to a fault in a resource. This time depends on how the complexity of the resource affects the time that is required for operations such as restarting the resource.

Operations by the Solaris Cluster HA for SAP liveCache Fault Monitors During a Probe

The optimum timeout for fault monitor probes depends on the operations that a fault monitor performs to probe the resource.

Operations by the SAP liveCache Fault Monitor During a Probe

During a probe, the SAP liveCache fault monitor performs the following operations:

1. The SAP liveCache fault monitor determines whether SAP liveCache is online.

2. If liveCache is online, the SAP liveCache fault monitor determines whether the liveCache parent process is running.

3. If liveCache is not online, the SAP liveCache fault monitor determines whether a user stopped liveCache outside the control of Oracle Solaris Cluster.

   A user can stop liveCache by using the Stop liveCache button in LC10 or the lcinit command.

4. If a user did not stop liveCache outside the control of Oracle Solaris Cluster, the SAP liveCache fault monitor determines whether SAP xserver is available.

Operations by the SAP xserver Fault Monitor During a Probe

During a probe, the SAP xserver fault monitor determines whether SAP xserver is available.

Faults Detected by the Solaris Cluster HA for SAP liveCache Fault Monitors

Faults that each Solaris Cluster HA for SAP liveCache fault monitor detects are described in the subsections that follow.

Faults Detected by the SAP liveCache Fault Monitor

The SAP liveCache fault monitor detects the following faults in SAP liveCache:

- Unexpected termination of liveCache

Note – The liveCache fault monitor also detects the expected termination of liveCache, which is not a fault. For more information, see "Monitoring the Termination of liveCache by a User" on page 31.

- Unexpected termination of the liveCache parent process
- System failures

SAP liveCache can be stopped or restarted only if SAP xserver is available. Therefore, the SAP liveCache fault monitor also detects the unavailability of SAP xserver. This fault monitoring supplements the fault monitoring that the SAP xserver fault monitor provides. This additional fault monitoring enforces the cross-resource group resource dependency between SAP xserver and SAP liveCache.

Faults Detected by the SAP xserver Fault Monitor

The SAP xserver fault monitor detects following faults:

- **Unavailability of SAP xserver.** Unavailability of SAP xserver is also detected by the SAP liveCache fault monitor.
- **System errors.** The SAP xserver fault monitor treats a system error as a partial failure.
- **Persistent system errors.** A persistent system error is a system error that occurs four times within the retry interval. If a persistent system error occurs, the fault monitor restarts SAP xserver.

Recovery Actions in Response to Detected Faults

To minimize the disruption that transient faults in a resource cause, a fault monitor restarts the resource in response to such faults. For persistent faults, more disruptive action than restarting the resource is required:

- For the SAP liveCache resource, the fault monitor fails over the resource to another node or zone. The SAP liveCache resource is a failover resource.

- For the SAP xserver resource, the fault monitor takes the resource offline. The SAP xserver is a scalable resource.

Monitoring the Termination of liveCache by a User

The SAP liveCache fault monitor detects when a user stops liveCache outside the control of Oracle Solaris Cluster. A user can stop liveCache by using the Stop liveCache button in LC10 or the lcinit command.

In this situation, the liveCache fault monitor updates the status of the liveCache resource to indicate that liveCache is stopped. However, the liveCache fault monitor performs no recovery action.

If a user restarts liveCache, the liveCache fault monitor updates the status of the liveCache resource to indicate that liveCache is running again.

Upgrading the SUNW.sap_xserver Resource Type

Upgrade the SUNW.sap_xserver resource type if all conditions in the following list apply:

- You are upgrading from an earlier version of the Solaris Cluster HA for SAP liveCache data service.
- You need to use the new features of the SUNW.sap_xserver resource type.

For general instructions that explain how to upgrade a resource type, see "Upgrading a Resource Type" in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. The information that you need to complete the upgrade of the SUNW.sap_xserver resource type is provided in the subsections that follow.

Information for Registering the New Resource Type Version

The relationship between a resource type version and the release of Oracle Solaris Cluster data services is shown in the following table. The release of Oracle Solaris Cluster data services indicates the release in which the version of the resource type was introduced.

Resource Type Version	Oracle Solaris ClusterData Services Release
1.0	3.0 5/02 asynchronous release
2	3.1 4/04

Resource Type Version	Oracle Solaris ClusterData Services Release
3.2	3.2

To determine the version of the resource type that is registered, use one command from the following list:

- `clresourcetype show`
- `clresourcetype show -v`

The resource type registration (RTR) file for this resource type is /opt/SUNWsclc/xserver/etc/SUNW.sap_xserver.

Information for Migrating Existing Instances of the Resource Type

The information that you need to migrate instances of the SUNW.sap_xserver resource type is as follows:

- You can perform the migration only when the resource is unmonitored.
- If you need to use the new features of the SUNW.sap_xserver resource type, the required value of the Type_version property is 2.
- If you need to specify the directory that contains programs and libraries for the SAP xserver runtime environment, set the Independent_Program_Path extension property. For more information, see "Setting Solaris Cluster HA for SAP liveCache Extension Properties" on page 22.

The following example shows a command for editing an instance of the SUNW.sap_xserver resource type.

EXAMPLE 1–1   Editing an Instance of the SUNW.sap_xserver Resource Type During Upgrade

```
# clresources set -p Independent_Program_Path=/sapdb/indep_prog  \
  -p Type_version=2 sapxserver-rs
```

This command edits a SUNW.sap_xserver resource as follows:

- The SUNW.sap_xserver resource is named sapxserver-rs.
- The Type_version property of this resource is set to 2.
- The independent program path is /sapdb/indep_prog.

APPENDIX A

Solaris Cluster HA for SAP liveCache Extension Properties

Extension properties for Solaris Cluster HA for SAP liveCache resource types are described in the following sections.

- "SUNW.sap_livecache Extension Properties" on page 33
- "SUNW.sap_xserver Extension Properties" on page 34

For details about system-defined properties, see the r_properties(5) man page and the rg_properties(5) man page.

SUNW.sap_livecache Extension Properties

The SUNW.sap_livecache resource type represents the SAP liveCache application in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

Confdir_list (optional)
    The directory for liveCache software and the instance directory.

Data type	String
Default	/sapdb
Range	Not applicable
Tunable	At creation

Livecache_name (required)
    Name of liveCache database instance.

Data type	String
Default	None
Range	Not applicable
Tunable	At creation

Monitor_retry_count
  Number of PMF restarts that are allowed for the fault monitor.

Data type	Integer
Default	4
Range	No range defined
Tunable	Any time

Monitor_retry_interval
  Time interval in minutes for fault monitor restarts.

Data type	Integer
Default	2
Range	No range defined
Tunable	Any time

Probe_timeout
  Timeout value in seconds for the probes.

Data type	Integer
Default	90
Range	No range defined
Tunable	Any time

SUNW.sap_xserver **Extension Properties**

The SUNW.sap_xserver resource type represents SAP xserver in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

Confdir_List
  The full path to the directory that contains the SAP liveCache software and SAP liveCache database instance.

Data type	String
Default	/sapdb
Range	Not applicable
Tunable	At creation

Independent_Program_Path

The full path to the directory that contains the following programs and libraries for SAP xserver:

- Programs that are independent of the database software version
- Libraries for the client runtime environment

Solaris Cluster HA for SAP liveCache determines the path to the x_server command from the value of this property. The x_server command resides in the bin subdirectory of the directory that this property specifies.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled
Introduced in release	3.1 4/04

Monitor_retry_count

The maximum number of restarts by the PMF that are allowed for the fault monitor.

Data type	Integer
Default	4
Range	No range defined
Tunable	Any time

Monitor_retry_interval

The period of time in minutes during which the PMF counts restarts of the fault monitor.

Data type	Integer
Default	2
Range	No range defined
Tunable	Any time

Probe_timeout

The timeout value in seconds for fault monitor probes.

Data type	Integer
Default	120
Range	No range defined
Tunable	Any time

Soft_Stop_Pct

The percentage of the `Stop` method timeout that is used to stop SAP xserver by using the SAP utility `x_server stop`. If this timeout is exceeded, the `SIGKILL` signal is used to stop all SAP xserver processes.

Data type	Integer
Default	50
Range	1–100
Tunable	When disabled

Xserver_User

The UNIX user identity of the OS user who administers SAP xserver.

Data type	String
Default	root
Range	Not applicable
Tunable	At creation

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