



Sun Cluster Data Service for SAP liveCache Guide for Solaris OS

SPARC Platform Edition

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Part No: 819-0697-10
August 2005, Revision A

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Preface

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

This document is intended for system administrators with extensive knowledge of Sun 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 document assume knowledge of the Solaris™ Operating System (Solaris OS) and expertise with the volume manager software that is used with Sun Cluster.

UNIX Commands

This document contains information about commands that are specific to installing and configuring Sun 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 Solaris Operating System
- Solaris Operating System man pages
- Other software documentation that you received with your system

Typographic Conventions

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

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name%</code> you have mail.
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name%</code> su Password:
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	The command to remove a file is <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . Perform a <i>patch analysis</i> . Do <i>not</i> save the file. [Note that some emphasized items appear bold online.]

Shell Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P-2 Shell Prompts

Shell	Prompt
C shell prompt	<code>machine_name%</code>
C shell superuser prompt	<code>machine_name#</code>
Bourne shell and Korn shell prompt	<code>\$</code>

TABLE P-2 Shell Prompts (Continued)

Shell	Prompt
Bourne shell and Korn shell superuser prompt	#

Related Documentation

Information about related Sun Cluster topics is available in the documentation that is listed in the following table. All Sun Cluster documentation is available at <http://docs.sun.com>.

Topic	Documentation
Data service administration	<i>Sun Cluster Data Services Planning and Administration Guide for Solaris OS</i> Individual data service guides
Concepts	<i>Sun Cluster Concepts Guide for Solaris OS</i>
Overview	<i>Sun Cluster Overview for Solaris OS</i>
Software installation	<i>Sun Cluster Software Installation Guide for Solaris OS</i>
System administration	<i>Sun Cluster System Administration Guide for Solaris OS</i>
Hardware administration	<i>Sun Cluster 3.0-3.1 Hardware Administration Manual for Solaris OS</i> Individual hardware administration guides
Data service development	<i>Sun Cluster Data Services Developer's Guide for Solaris OS</i>
Error messages	<i>Sun Cluster Error Messages Guide for Solaris OS</i>
Command and function reference	<i>Sun Cluster Reference Manual for Solaris OS</i>

For a complete list of Sun Cluster documentation, see the release notes for your release of Sun 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.

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Documentation, Support, and Training

Sun Function	URL	Description
Documentation	http://www.sun.com/documentation/	Download PDF and HTML documents, and order printed documents
Support and Training	http://www.sun.com/supporttraining/	Obtain technical support, download patches, and learn about Sun courses

Getting Help

If you have problems installing or using Sun 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 and serial numbers of your systems
- The release number of the Solaris Operating System (for example, Solaris 8)
- The release number of Sun Cluster (for example, Sun Cluster 3.0)

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

Command	Function
<code>prtconf -v</code>	Displays the size of the system memory and reports information about peripheral devices
<code>psrinfo -v</code>	Displays information about processors
<code>showrev -p</code>	Reports which patches are installed
<code>SPARC: prtdiag -v</code>	Displays system diagnostic information
<code>scinstall -pv</code>	Displays Sun Cluster release and package version information

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

Installing and Configuring Sun Cluster HA for SAP liveCache

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

This chapter contains the following sections.

- “Sun Cluster HA for SAP liveCache Overview” on page 11
- “Installing and Configuring Sun Cluster HA for SAP liveCache” on page 13
- “Planning the Sun Cluster HA for SAP liveCache Installation and Configuration” on page 14
- “Preparing the Nodes and Disks” on page 17
- “Installing and Configuring liveCache” on page 17
- “Verifying the liveCache Installation and Configuration” on page 19
- “Installing the Sun Cluster HA for SAP liveCache Packages” on page 20
- “Registering and Configuring the Sun Cluster HA for SAP liveCache” on page 22
- “Verifying the Sun Cluster HA for SAP liveCache Installation and Configuration” on page 26
- “Tuning Sun Cluster HA for SAP liveCache Fault Monitors” on page 28
- “Upgrading the SUNW.sap_xserver Resource Type” on page 31

Sun Cluster HA for SAP liveCache Overview

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

For conceptual information on scalable services, see the *Sun Cluster Concepts Guide for Solaris OS*.

To eliminate a single point of failure in an SAP Advanced Planner & Optimizer (APO) System, Sun 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 Sun Cluster configuration. [Figure 1](#) also illustrates the data services that best protect SAP SCM components in a Sun Cluster configuration.

TABLE 1 Protection of liveCache Components

liveCache Component	Protected by
SAP APO Central Instance	Sun Cluster HA for SAP The resource type is <code>SUNW.sap_ci_v2</code> . For more information on this data service, see <i>Sun Cluster Data Service for SAP Guide for Solaris OS</i> .
SAP APO database	All highly available databases that are supported with Sun Cluster software and by SAP.
SAP APO Application Server	Sun Cluster HA for SAP The resource type is <code>SUNW.sap_as_v2</code> . For more information on this data service, see <i>Sun Cluster Data Service for SAP Guide for Solaris OS</i> .
SAP xserver	Sun Cluster HA for SAP liveCache The resource type is <code>SUNW.sap_xserver</code> .
SAP liveCache database	Sun Cluster HA for SAP liveCache The resource type is <code>SUNW.sap_livecache</code> .
NFS file system	Sun Cluster HA for NFS The resource type is <code>SUNW.nfs</code> . For more information on this data service, see <i>Sun Cluster Data Service for NFS Guide for Solaris OS</i> .

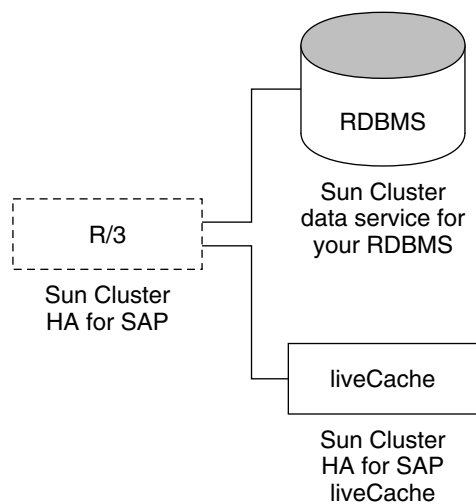


FIGURE 1 Protection of liveCache Components

Installing and Configuring Sun Cluster HA for SAP liveCache

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

TABLE 2 Task Map: Installing and Configuring Sun Cluster HA for SAP liveCache

Task	For Instructions, Go To
Plan the Sun Cluster HA for SAP liveCache installation	Your SAP documentation “Planning the Sun Cluster HA for SAP liveCache Installation and Configuration” on page 14
Prepare the nodes and disks	“How to Prepare the Nodes” on page 17
Install and configure liveCache	“How to Install and Configure liveCache” on page 18 “How to Enable liveCache to Run in a Cluster” on page 18

TABLE 2 Task Map: Installing and Configuring Sun Cluster HA for SAP liveCache
(Continued)

Task	For Instructions, Go To
Verify liveCache installation and configuration	"How to Verify the liveCache Installation and Configuration" on page 20
Install Sun Cluster HA for SAP liveCache packages	"Installing the Sun Cluster HA for SAP liveCache Packages" on page 20
Register and configure Sun Cluster HA for SAP liveCache as a failover data service	"How to Register and Configure Sun Cluster HA for SAP liveCache" on page 23
Verify Sun Cluster HA for SAP liveCache installation and configuration	"Verifying the Sun Cluster HA for SAP liveCache Installation and Configuration" on page 26
Understand Sun Cluster HA for SAP liveCache Fault Monitors	"Tuning Sun 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 Sun Cluster HA for SAP liveCache Installation and Configuration

This section contains the information you need to plan your Sun 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 Sun Cluster HA for SAP liveCache installation and configuration because your SAP documentation includes configuration restrictions and requirements that are not outlined in Sun Cluster documentation or dictated by Sun Cluster software.

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 Sun Cluster HA for SAP liveCache. These requirements apply to Sun Cluster HA for SAP liveCache only. You must meet these requirements before you proceed with your Sun Cluster HA for SAP liveCache installation and configuration.

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

- Use SAP liveCache version 7.4 or a compatible version.
- Configure SAP xserver so that SAP xserver starts on all nodes that the liveCache resource can fail over to. To implement this configuration, configure resources and resource groups as follows:
 - Ensure that the node list of the SAP xserver resource group and the liveCache resource group contain the same nodes.
 - Ensure that the value of `desired primaries` and `maximum primaries` of the SAP xserver resource is equal to the number of nodes listed in the `node list` parameter of the liveCache resource.

For more information, see [“How to Register and Configure Sun Cluster HA for SAP liveCache” on page 23](#).

- Configure SAP liveCache so that SAP liveCache starts only on the node where SAP xserver is running. To implement this configuration, configure resources and resource groups as follows:
 - Set the liveCache resource to depend on the SAP xserver resource.
 - Create on the liveCache resource group a strong positive affinity for the SAP xserver resource group.

For more information, see [“How to Register and Configure Sun Cluster HA for SAP liveCache” on page 23](#).

Standard Data Service Configurations

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

[Figure 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.

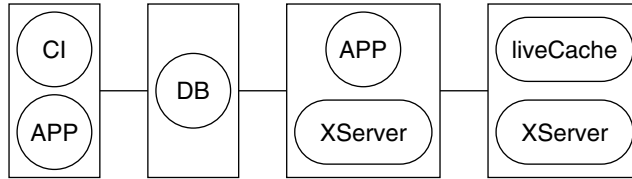


FIGURE 2 Four-Node Cluster

Configuration Considerations

Use the information in this section to plan the installation and configuration of Sun 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 Sun 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 Sun Cluster HA for SAP liveCache. Insert the answers to these questions into the data service worksheets in “Configuration Worksheets” in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*. See “Configuration Considerations” on page 16 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 *Sun Cluster Data Services Planning and Administration Guide for Solaris OS* 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.

- Steps**
1. Become superuser on all of the nodes.
 2. Configure the `/etc/nsswitch.conf` file.
 - a. On each node 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 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
```

Sun 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.

Installing and Configuring liveCache

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

▼ How to Install and Configure liveCache

Use this procedure to install and configure liveCache.

Steps 1. Install and configure SAP APO System.

See *Sun Cluster Data Service for SAP Guide for Solaris OS* for the procedures on how to install and configure SAP APO System on Sun 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. Create the `.XUSER.62` file for the SAP APO administrator user and the liveCache administrator user by using the following command.

```
# dbmcli -d LC-NAME -n logical-hostname -us user,passwd
```

`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 Sun Cluster HA for SAP liveCache functions properly if you do not create this file correctly.

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

Example:

```
# tar cfB - /usr/spool/sql | rsh phys-schost-1 tar xfb -
```

▼ 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 Sun Cluster environment. Use this procedure to enable liveCache to run in a cluster.

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

```
# scrgadm -a -g livecache-resource-group [-h nodelist]
```

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.

```
# scrgadm -a -L -g livecache-resource-group \  
-l lc-logical-hostname [-n netiflist]
```

4. Enable the failover resource group.

```
# scswitch -z -g livecache-resource-group
```

5. Log on to the node that hosts the liveCache resource group.

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

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

lc-name Lowercase name of liveCache database instance

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

8. 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 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.

- Steps**
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-nameadm`.

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

Installing the Sun Cluster HA for SAP liveCache Packages

If you did not install the Sun Cluster HA for SAP liveCache packages during your initial Sun Cluster installation, perform this procedure to install the packages. Perform this procedure on each cluster node where you are installing the Sun Cluster HA for SAP liveCache packages. To complete this procedure, you need the Sun Cluster Agents CD-ROM.

If you are installing more than one data service simultaneously, perform the procedure in “Installing the Software” in *Sun Cluster Software Installation Guide for Solaris OS*.

Install the Sun Cluster HA for SAP liveCache packages by using one of the following installation tools:

- The Web Start program
- The `scinstall` utility

Note – If you are using Solaris 10, install these packages *only* in the global zone. To ensure that these packages are not propagated to any local zones that are created after you install the packages, use the `scinstall` utility to install these packages. Do *not* use the Web Start program.

▼ How to Install the Sun Cluster HA for SAP liveCache Packages by Using the Web Start Program

You can run the Web Start 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. For more information about the Web Start program, see the `installer(1M)` man page.

- Steps**
- 1. On the cluster node where you are installing the Sun Cluster HA for SAP liveCache packages, become superuser.**
 - 2. (Optional) If you intend to run the Web Start program with a GUI, ensure that your `DISPLAY` environment variable is set.**
 - 3. Insert the Sun Cluster Agents CD-ROM into the CD-ROM drive.**

If the Volume Management daemon `vold(1M)` is running and configured to manage CD-ROM devices, it automatically mounts the CD-ROM on the `/cdrom/cdrom0` directory.
 - 4. Change to the Sun Cluster HA for SAP liveCache component directory of the CD-ROM.**

The Web Start program for the Sun Cluster HA for SAP liveCache data service resides in this directory.

```
# cd /cdrom/cdrom0/components/SunCluster_HA_SAP_liveCache_3.1
```
 - 5. Start the Web Start program.**

```
# ./installer
```
 - 6. When you are prompted, select the type of installation.**
 - To install only the C locale, select Typical.
 - To install other locales, select Custom.
 - 7. Follow the instructions on the screen to install the Sun Cluster HA for SAP liveCache packages on the node.**

After the installation is finished, the Web Start program provides an installation summary. This summary enables you to view logs that the Web Start program created during the installation. These logs are located in the `/var/sadm/install/logs` directory.
 - 8. Exit the Web Start program.**
 - 9. Remove the Sun Cluster Agents CD-ROM from the CD-ROM drive.**

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

```
# eject cdrom
```

▼ How to Install the Sun Cluster HA for SAP liveCache Packages by Using the `scinstall` Utility

- Steps**
1. Load the Sun Cluster Agents CD-ROM into the CD-ROM drive.
 2. Run the `scinstall` utility with no options.
This step starts the `scinstall` utility in interactive mode.
 3. Choose the Add Support for New Data Service to This Cluster Node menu option.
The `scinstall` utility prompts you for additional information.
 4. Provide the path to the Sun Cluster Agents CD-ROM.
The utility refers to the CD-ROM as the “data services cd.”
 5. Specify the data service to install.
The `scinstall` utility lists the data service that you selected and asks you to confirm your choice.
 6. Exit the `scinstall` utility.
 7. Unload the CD-ROM from the drive.

Registering and Configuring the Sun Cluster HA for SAP liveCache

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

Setting Sun Cluster HA for SAP liveCache Extension Properties

Use the extension properties in [Appendix A](#) to create your resources. Use the following command line to configure extension properties when you create your resource.

```
scrgadm -x parameter=value
```

Use the procedure in “Changing Resource Type, Resource Group, and Resource Properties” in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS* 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](#) indicate when you can update each property. See Appendix A, “Standard Properties,” in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS* for details on all Sun Cluster properties.

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

Use this procedure to configure Sun 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 Sun Cluster HA for SAP liveCache packages as part of your initial Sun Cluster installation, go to [“Installing the Sun Cluster HA for SAP liveCache Packages” on page 20](#) to install the data service packages. Otherwise, use this procedure to configure the Sun 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`.

- Steps**
1. Become superuser on one of the nodes in the cluster that will host the liveCache resource.
 2. Copy the `lccluster` file to the same location as the `lcinit` file.

```
# cp /opt/SUNWsc1c/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-Confdir_list-here` value exists only in the Sun Cluster 3.1 version.

- a. **Open the `lccluster` file.**

```
# vi /sapdb/LC-NAME/db/sap/lccluster \  
LC_NAME="put-LC_NAME-here" \  
CONFDIR_LIST="put-Confdir_list-here"
```

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

- 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 `Confdir_list` extension property.**

Note – This step is only for the Sun Cluster 3.1 version. Skip this step if you are running an earlier version of Sun 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 version only]
```

4. **Add the `HASStoragePlus` resource to the liveCache resource group.**

```
# scrgadm -a -t SUNW.HASStoragePlus  
# scrgadm -a -j livecache-storage-resource -g livecache-resource-group \  
-t SUNW.HASStoragePlus -x filesystemmountpoints=mountpoint,... \  

```



```
-x globaldevicepaths=livecache-device-group -x affinityon=TRUE
```

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 *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*.

5. Enable the liveCache storage resource.

```
# scswitch -e -j livecache-storage-resource
```

6. Register the resource type for liveCache database.

```
# scrgadm -a -t SUNW.sap_livecache
```

7. Register the resource type for SAP xserver.

```
# scrgadm -a -t SUNW.sap_xserver
```

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

Note – Configure SAP xserver so that SAP xserver starts on all nodes that the liveCache resources can fail over to. To implement this configuration, ensure that the *nodelist* parameter of the SAP xserver resource group contains all the nodes listed in the liveCache resource groups' *nodelist*. Also, the value of *desired primaries* and *maximum primaries* of the SAP xserver resource group must be equal to each other.

```
# scrgadm -a -g xserver-resource-group \  
-y Maximum_primaries=value \  
-y Desired_primaries=value \  
-h nodelist
```

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

```
# scrgadm -a -j xserver-resource\  
-g xserver-resource-group -t SUNW.sap_xserver
```

See [“Setting Sun Cluster HA for SAP liveCache Extension Properties”](#) on page 23 for a list of extension properties.

10. Enable the scalable resource group that now includes the SAP xserver resource.

```
# scswitch -Z -g xserver-resource-group
```

11. Register the liveCache resource.

```
# scrgadm -a -j livecache-resource -g livecache-resource-group \  
-t SUNW.sap_livecache -x livecache_name=LC-NAME \  
-y resource_dependencies=livecache-storage-resource,xserver-resource
```

12. Ensure that the liveCache resource group is brought online only on the node 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.

```
# scrgadm -c -g livecache-resource-group \  
-y rg_affinities=++xserver-resource-group
```

13. Enable the liveCache failover resource group.

```
# scswitch -Z -g livecache-resource-group
```

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

You might plan to run the APO application server on a node 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.

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

```
# scrgadm -c -g apo-resource-group \  
-y rg_affinities=--liveCache-resource-group
```

Verifying the Sun 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 Sun Cluster HA for SAP liveCache Installation and Configuration

Use this procedure to verify that you installed and configured Sun 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.
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.

Steps 1. Log on to the node 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.

Sun 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 Sun 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.

Sun Cluster software does not restart liveCache. However, the liveCache resource status message reflects that liveCache stopped outside of Sun 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 Sun Cluster HA for SAP liveCache Fault Monitor updates the resource state and status message to indicate that liveCache is running under the control of Sun 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 Sun 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.


```
# scswitch -z -g livecache-resource-group -h node2
```
4. Repeat [Step 1](#) through [Step 3](#) for each potential node on which the liveCache resource can run.
5. Log on to the nodes 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
```

Tuning Sun Cluster HA for SAP liveCache Fault Monitors

Fault monitoring for the Sun 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 3 Resource Types for Sun 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 Sun Cluster installations. Therefore, you should tune the Sun Cluster HA for SAP liveCache fault monitors *only* if you need to modify this preset behavior.

Tuning the Sun 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 Sun Cluster Data Services” in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*. Information about the Sun Cluster HA for SAP liveCache fault monitors that you need to perform these tasks is provided in the subsections that follow.

Tune the Sun Cluster HA for SAP liveCache fault monitors when you register and configure Sun Cluster HA for SAP liveCache. For more information, see [“Registering and Configuring the Sun 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 Sun 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 Sun 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 Sun 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 Sun 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 Sun Cluster HA for SAP liveCache Fault Monitors

Faults that each Sun 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. 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 Sun 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 Sun 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 *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*. 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 Sun Cluster data services is shown in the following table. The release of Sun Cluster data services indicates the release in which the version of the resource type was introduced.

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

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

- `scrgadm -p`
- `scrgadm -pv`

The resource type registration (RTR) file for this resource type is `/opt/SUNWsc1c/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 Sun Cluster HA for SAP liveCache Extension Properties” on page 23](#).

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

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

```
# scrgadm -cj sapxserver-rs -y Type_version=2 \  
-x Independent_Program_Path=/sapdb/indep_prog
```

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`.

Sun Cluster HA for SAP liveCache Extension Properties

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

- “`SUNW.sap_livecache` Extension Properties” on page 35
- “`SUNW.sap_xserver` Extension Properties” on page 36

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 Sun 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	<code>/sapdb</code>
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 Sun 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

Sun 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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