



Sun Cluster Data Service for SAP liveCache Guide for Solaris OS

SPARC Platform Edition

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Contents

Preface	5
Installing and Configuring Sun Cluster HA for SAP liveCache	9
Sun Cluster HA for SAP liveCache Overview	9
Installing and Configuring Sun Cluster HA for SAP liveCache	11
Planning the Sun Cluster HA for SAP liveCache Installation and Configuration	12
Configuration Requirements	12
Standard Data Service Configurations	13
Configuration Considerations	13
Configuration Planning Questions	14
Preparing the Nodes and Disks	14
▼ How to Prepare the Nodes	14
Installing and Configuring liveCache	15
▼ How to Install and Configure liveCache	15
▼ How to Enable liveCache to Run in a Cluster	16
Verifying the liveCache Installation and Configuration	17
▼ How to Verify the liveCache Installation and Configuration	17
Installing the Sun Cluster HA for SAP liveCache Packages	18
▼ How to Install the Sun Cluster HA for SAP liveCache Packages by Using the Web Start Program	18
▼ How to Install the Sun Cluster HA for SAP liveCache Packages by Using the <code>scinstall</code> Utility	19
Registering and Configuring the Sun Cluster HA for SAP liveCache	20
Sun Cluster HA for SAP liveCache Extension Properties	20
▼ How to Register and Configure Sun Cluster HA for SAP liveCache	23
Verifying the Sun Cluster HA for SAP liveCache Installation and Configuration	26

▼ How to Verify the Sun Cluster HA for SAP liveCache Installation and Configuration	26
Understanding Sun Cluster HA for SAP liveCache Fault Monitors	28
Extension Properties	28
Monitor Check Method	28
Probing Algorithm and Functionality	28
Upgrading the <code>SUNW.sap_xserver</code> Resource Type	30
Information for Registering the New Resource Type Version	31
Information for Migrating Existing Instances of the Resource Type	31
Index	33

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 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	To delete a file, type rm <i>filename</i> .
<i>AaBbCc123</i>	Book titles, new terms, or terms to be emphasized	Read Chapter 6 in <i>User's Guide</i> . These are called <i>class</i> options. You must be <i>root</i> to do this.

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>
Bourne shell and Korn shell superuser prompt	<code>#</code>

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.x 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>.

Accessing Sun Documentation Online

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Ordering Sun Documentation

Sun Microsystems offers select product documentation in print. For a list of documents and how to order them, see “Buy printed documentation” at <http://docs.sun.com>.

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
SPARC: <code>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 the procedures on how to install and configure Sun Cluster HA for SAP liveCache.

This chapter contains the following procedures.

- “How to Prepare the Nodes” on page 14
- “How to Install and Configure liveCache” on page 15
- “How to Enable liveCache to Run in a Cluster” on page 16
- “How to Verify the liveCache Installation and Configuration” on page 17
- “How to Install the Sun Cluster HA for SAP liveCache Packages by Using the Web Start Program ” on page 18
- “How to Install the Sun Cluster HA for SAP liveCache Packages by Using the `scinstall` Utility” on page 19
- “How to Register and Configure Sun Cluster HA for SAP liveCache” on page 23
- “How to Verify the Sun Cluster HA for SAP liveCache Installation and Configuration” on page 26

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

TABLE 1–1 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 liveCache AP 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 Network File System (NFS) Guide for Solaris OS</i> .

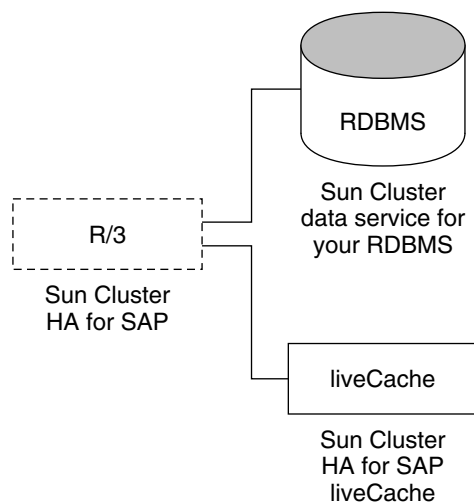


FIGURE 1-1 Protection of liveCache Components

Installing and Configuring Sun Cluster HA for SAP liveCache

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

TABLE 1-2 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 12
Prepare the nodes and disks	"How to Prepare the Nodes" on page 14
Install and configure liveCache	"How to Install and Configure liveCache" on page 15 "How to Enable liveCache to Run in a Cluster" on page 16

TABLE 1-2 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 17
Install Sun Cluster HA for SAP liveCache packages	"Installing the Sun Cluster HA for SAP liveCache Packages" on page 18
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	"Understanding 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 30

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 an SAP liveCache version 7.4 or higher.
- Configure SAP xserver so that SAP xserver starts on all nodes that the liveCache resource can failover to. To implement this configuration, ensure that the node list of the SAP xserver resource group and the liveCache resource group contain the same nodes. Also, the value of `desired primaries` and `maximum primaries` of the SAP xserver resource must be equal to the number of nodes listed in the `nodelist` parameter of the liveCache resource. 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 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.

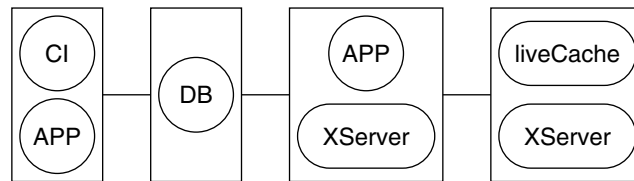


FIGURE 1-2 Four-Node Cluster

Configuration Considerations

Use the information in this section to plan the installation and configuration of 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 13 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.

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.

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.

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. 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.

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 Java Enterprise System Accessory CD Volume 3.

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 – The Web Start program is *not* available in releases earlier than Sun Cluster 3.1 Data Services 10/03.

▼ 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.

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. **Load the Sun Java Enterprise System Accessory CD Volume 3 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 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. Unload the Sun Java Enterprise System Accessory CD Volume 3 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

1. Load the Sun Java Enterprise System Accessory CD Volume 3 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 Java Enterprise System Accessory CD Volume 3.**

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.

Sun Cluster HA for SAP liveCache Extension Properties

Use the extension properties in Table 1–3 and Table 1–4 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 Table 1–3 and Table 1–4 indicate when you can update each property. See “Standard Properties” in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS* for details on all Sun Cluster properties.

TABLE 1-3 Sun Cluster HA for SAP liveCache (SUNW.sap_xserver) Extension Properties

Name/Data Type	Description
Confdir_List (optional) String	<p>The directory for liveCache software and instance directories.</p> <p>Default: /sapdb</p> <p>Range: None</p> <p>Tunable: At creation</p>
Independent_Program_Path (optional) String	<p>The full path to the directory that contains the following programs and libraries for the SAP xserver system:</p> <ul style="list-style-type: none"> ■ Programs that are independent of the database software version ■ Libraries for the client runtime environment <p>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.</p> <p>Range: None</p> <p>Tunable: When disabled</p> <p>Introduced in release: 3.1 4/04</p>
Monitor_retry_count	<p>Number of PMF restarts that are allowed for the fault monitor.</p> <p>Default: 4</p> <p>Tunable: Any time</p>
Monitor_retry_interval	<p>Time interval in minutes for fault monitor restarts.</p> <p>Default: 2</p> <p>Tunable: Any time</p>
Probe_timeout	<p>Time-out value in seconds for the probes.</p> <p>Default: 120</p> <p>Tunable: Any time</p>

TABLE 1-3 Sun Cluster HA for SAP liveCache (SUNW.sap_xserver) Extension Properties (Continued)

Name/Data Type	Description
Soft_Stop_Pct (optional) Integer	Percentage of stop timeout that is used to stop SAP xserver by using the SAP utility <code>x_server stop</code> before <code>SIGKILL</code> is used to stop all SAP xserver processes. Default: 50 Range: 1-100 Tunable: When disabled
Xserver_User (optional) String	SAP xserver system administrator user name. Default: root Range: None Tunable: At creation

TABLE 1-4 Sun Cluster HA for SAP liveCache (SUNW.sap_livecache) Extension Properties

Name/Data Type	Description
Confdir_list (optional) String	The directory for liveCache software and the instance directory. Default: /sapdb Range: None Tunable: At creation
Livecache_name (required) String	Name of liveCache database instance. Default: None Range: None Tunable: At creation
Monitor_retry_count	Number of PMF restarts that are allowed for the fault monitor. Default: 4 Tunable: Any time
Monitor_retry_interval	Time interval in minutes for fault monitor restarts. Default: 2 Tunable: Any time

TABLE 1-4 Sun Cluster HA for SAP liveCache (SUNW.sap_livecache) Extension Properties (Continued)

Name/Data Type	Description
Probe_timeout	Time-out value in seconds for the probes. Default: 90 Tunable: Any time

▼ 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 18 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`.

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 `Confidir_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 `HASStoragePlus` 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 “Sun Cluster HA for SAP liveCache Extension Properties” on page 20 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
```

12. Set up a resource group dependency between SAP xserver and liveCache.

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

13. Enable the liveCache failover resource group.

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

14. Are you running an APO application server on a node that liveCache can fail over to?

- If no, this step completes this procedure.
- If yes, proceed to Step 15.

15. Is the scalable APO application server resource group already in an RGOffload resource's `rg_to_offload` list?

```
# scrgadm -pvv | grep -i rg_to_offload | grep value:
```

- If yes, this step completes this procedure.
- If no, consider adding an RGOffload resource in the liveCache resource group.

This configuration enables you to automatically shut down the APO application server if the liveCache resource fails over to a node on which the APO application server was running.

For the procedure on how to set up an RGOffload resource, see *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*.

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.

TABLE 1-5 States of the liveCache database

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

TABLE 1-5 States of the liveCache database (Continued)

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 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
```

Understanding Sun Cluster HA for SAP liveCache Fault Monitors

Use the information in this section to understand Sun Cluster HA for SAP liveCache Fault Monitors. This section describes the Sun Cluster HA for SAP liveCache Fault Monitors' probing algorithm or functionality, states the conditions, messages, and recovery actions associated with unsuccessful probing, and states the conditions and messages associated with successful probing.

Extension Properties

See "Sun Cluster HA for SAP liveCache Extension Properties" on page 20 for the extension properties that the Sun Cluster HA for SAP liveCache Fault Monitors use.

Monitor Check Method

A liveCache resource `Monitor_check` method checks whether SAP xserver is available on this node. If SAP xserver is not available on this node, this method returns an error and rejects the failover of liveCache to this node.

This method is needed to enforce the cross-resource group resource dependency between SAP xserver and liveCache.

Probing Algorithm and Functionality

Sun Cluster HA for SAP liveCache has a fault monitor for each resource type.

- "SAP xserver Fault Monitor" on page 29 (`SUNW.sap_xserver`)
- "liveCache Fault Monitor" on page 29 (`SUNW.sap_livecache`)

SAP xserver Fault Monitor

The SAP xserver parent process is under the control of process monitor `pmfadm`. If the parent process is stopped or killed, the process monitor contacts the SAP xserver Fault Monitor, and the SAP xserver Fault Monitor decides what action must be taken.

The SAP xserver Fault Monitor performs the following steps in a loop.

1. Sleeps for `Thorough_probe_interval`.
2. Uses the SAP utility `dbmcli` with `db_enum` to check SAP xserver availability.
 - If SAP xserver is unavailable, the SAP xserver probe restarts the SAP xserver resource. If the maximum number of restarts is reached, the SAP xserver Fault Monitor takes the SAP xserver resource offline on the node where SAP xserver is unavailable.
 - If any system error messages are logged in `syslog` during the checking process, the SAP xserver probe concludes that a partial failure has occurred. If the system error messages logged in `syslog` occur four times within the `probe_interval`, SAP xserver probe restarts SAP xserver.

liveCache Fault Monitor

The liveCache probe checks for the presence of the liveCache parent process, the state of the liveCache database, and whether the user intentionally stopped liveCache outside of Sun Cluster software. If a user used the `Stop liveCache` button in LC10 or the `lcinit` command to stop liveCache outside of Sun Cluster software, the liveCache probe concludes that the user intentionally stopped liveCache outside of Sun Cluster software.

If the user intentionally stopped liveCache outside of Sun Cluster software by using the `Stop 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 reflect this action, but it does not restart liveCache. When the user successfully restarts liveCache outside of Sun Cluster software 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, and Sun Cluster HA for SAP liveCache Fault Monitor takes appropriate action if it detects liveCache is `OFFLINE`.

If liveCache database state reports that liveCache is not running or that the liveCache parent process terminated, the Sun Cluster HA for SAP liveCache Fault Monitor restarts or fails over liveCache.

The Sun Cluster HA for SAP liveCache Fault Monitor performs the following steps in a loop. If any step returns `liveCache is offline`, the liveCache probe restarts or fails over liveCache.

1. Sleeps for `Thorough_probe_interval`.

2. Uses the `dbmcli` utility with `db_state` to check the liveCache database state.
3. If liveCache is online, liveCache probe checks the liveCache parent process.
 - If the parent process terminates, liveCache probe returns `liveCache is offline`.
 - If the parent process is online, liveCache probe returns `OK`.
4. If liveCache is not online, liveCache probe determines if the user stopped liveCache outside of Sun Cluster software by using the `Stop liveCache` button in LC10 or the `lcinit` command.
5. If the user stopped liveCache outside of Sun Cluster software by using the `Stop liveCache` button in LC10 or the `lcinit` command, returns `OK`.
6. If the user did not stop liveCache outside of Sun Cluster software by using the `Stop liveCache` button in LC10 or the `lcinit` command, checks SAP xserver availability.
 - If SAP xserver is unavailable, returns `OK` because the probe cannot restart liveCache if SAP xserver is unavailable.
 - If SAP xserver is available, returns `liveCache is offline`.
7. If any errors are reported from system function calls, returns `system failure`.

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 Cluster Data 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 “Sun Cluster HA for SAP liveCache Extension Properties” on page 20.

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

```
# 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:

EXAMPLE 1-1 Editing an Instance of the `SUNW.sap_xserver` Resource Type During Upgrade (Continued)

- 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`.

Index

C

- C locale, 19
- commands, node information, 8
- Confdir_List extension property
 - SUNW.sap_livcache resource type, 22
 - SUNW.sap_xserver resource type, 21
- configuring, Sun Cluster HA for SAP
 - liveCache, 23

D

- directories, /var/sadm/install/logs, 19

E

- editing, resource type instances, 31
- extension properties
 - SUNW.sap_livcache resource type, 22
 - SUNW.sap_xserver resource type, 21

F

- fault monitor, 28
- files
 - installation logs, 19
 - RTR, 31

I

- Independent_Program_Path extension property, 21
- installing
 - liveCache, 15
 - Sun Cluster HA for SAP liveCache
 - by using scinstall utility, 19
 - by using Web Start program, 18
 - log files created, 19

L

- liveCache
 - See also* Sun Cluster HA for SAP liveCache
 - enabling to run in cluster, 16
 - installing, 15
 - preparing the nodes, 14
 - verifying installation and configuration, 17
- Livecache_Name extension property, 22
- locales, 19
- log files, installation, 19

M

- migrating, resource type instances, 31
- Monitor_retry_count extension property
 - SUNW.sap_livcache resource type, 22
 - SUNW.sap_xserver resource type, 21
- Monitor_retry_interval extension property
 - SUNW.sap_livcache resource type, 22

Monitor_retry_interval extension property (Continued)
SUNW.sap_xserver resource type, 21

P

Probe_timeout extension property
SUNW.sap_livecache resource type, 23
SUNW.sap_xserver resource type, 21
properties
 See also extension properties
 Type_version, 31
prtconf -v command, 8
prtdiag -v command, 8
psrinfo -v command, 8

R

registering
 Sun Cluster HA for SAP liveCache, 23
 SUNW.sap_xserver resource type
 during initial set up, 25
 during upgrade, 31
resource type registration (RTR) file, 31
resource types, migrating instances of, 31
RTR (resource type registration) file, 31

S

SAP xserver, upgrading, 30
scinstall -pv command, 8
showrev -p command, 8
Soft_Stop_Pct extension property, 22
Sun Cluster HA for SAP liveCache
 See also liveCache
 configuration
 considerations, 13
 planning, 12, 14
 requirements, 12
 extension properties, 20
 fault monitor, 28
 liveCache fault monitor, 29
 monitor check method, 28
 probing algorithm and functionality, 28
 SAP xserver fault monitor, 29

Sun Cluster HA for SAP liveCache (Continued)

installing
 by using scinstall utility, 19
 by using Web Start program, 18
 planning, 12
 overview, 9
 protection of liveCache components, 10
 registering and configuring, 23
 standard configurations, 13
 verifying installation, 26
SUNW.sap_livecache resource type,
 extension properties, 22
SUNW.sap_xserver resource type
 extension properties, 21
 resource type versions, 31

T

Type_version property, 31

U

upgrading, SAP xserver, 30

V

/var/sadm/install/logs directory, 19
verifying
 liveCache installation and configuration, 17
 Sun Cluster HA for SAP liveCache, 26
versions, resource types, 31

W

Web Start program, 18

X

Xserver_User extension property, 22