

Veritas™ High Availability Agent for SAP liveCache Installation and Configuration Guide

AIX, HP-UX, Linux, Solaris

5.0

Veritas High Availability Agent for SAP liveCache Installation and Configuration Guide

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Introducing the Veritas High Availability Agent for SAP liveCache

This chapter includes the following topics:

- [About the Veritas agent for SAP liveCache](#)
- [What's new in this agent](#)
- [Supported software](#)
- [How the agent makes SAP liveCache highly available](#)
- [SAP liveCache agent functions](#)
- [Typical SAP liveCache configuration in a VCS cluster](#)
- [Setting up SAP liveCache in a VCS cluster](#)

About the Veritas agent for SAP liveCache

The Veritas High Availability agents monitor specific resources within an enterprise application. They determine the status of resources and start or stop them according to external events.

The Veritas agent for SAP liveCache provides high availability for SAP liveCache Server in a cluster.

See the following Technical Support TechNote for the latest updates or software issues for this agent:

<http://www.symantec.com/business/support/index?page=content&id=TECH46455>

What's new in this agent

The enhancements in this release of SAP liveCache agent are as follows:

- Added support for AIX 7.1.

For information on the changes introduced in the previous releases:

See [“Changes introduced in previous releases”](#) on page 59.

Supported software

The Veritas agent for SAP liveCache supports the following software versions:

Veritas Cluster Server

- AIX–VCS 4.0, 5.0, 5.1
- HP-UX–VCS 4.1, 5.0
- Linux–VCS 4.0, 4.1, 5.0, 5.1
- Solaris–VCS 4.0, 4.1, 5.0, 5.1

and all intermediate Maintenance Packs of these major releases.

Note: In the software disc, no separate agent is provided for VCS 4.0 and 5.1 on Linux and Solaris. To use the agent for VCS 4.0 and 5.1 on both these platforms, use the agent provided for VCS 4.1 and 5.0, respectively.

Similarly, on AIX, to use the agent for VCS 5.1, use the agent provided for VCS 5.0

ACC Library

5.1.0.0 and later

Operating Systems

- AIX 5.2, 5.3, 6.1, 7.1 on pSeries
- HP-UX 11i v2, 11i v3 on Itanium and PA-RISC
- Red Hat Enterprise Linux 4, 5 on Intel and ppc64
- SUSE Linux 9, 10 on Intel and ppc64
- Solaris 8, 9, 10 SPARC
- Solaris 10 x64

SAP liveCache Server

7.5, 7.6, 7.7

and all intermediate minor versions of these releases.

How the agent makes SAP liveCache highly available

The Veritas agent for SAP liveCache continuously monitors the SAP liveCache server processes to verify that they function properly.

The agent provides the following levels of application monitoring:

- **Primary or Basic monitoring**
This mode has Process check and Health check monitoring options. With the default Process check option, the agent verifies that the SAP liveCache server processes are present in the process table. Process check cannot detect whether processes are in hung or stopped states.
- **Secondary or Detail monitoring**
In this mode, the agent runs a utility to verify the status of SAP liveCache server. The agent detects application failure if the monitoring routine reports an improper function of the SAP liveCache server processes. When this application failure occurs, the SAP liveCache server service group fails over to another node in the cluster.
Thus, the agent ensures high availability for SAP liveCache server.

SAP liveCache agent functions

The agent consists of resource type declarations and agent executables. The agent executables are organized into online, offline, monitor, and clean functions.

Online

The online function performs the following tasks:

- Performs a preliminary check to ensure that the SAP liveCache instance is not online on the specified node in the cluster.
- Forcibly removes any SAP liveCache processes that remain because of an unclean shutdown.
- Removes all the IPC resources for the SAP liveCache Instance based on /sapdb/data/ipc (SAP standard) directory.
- Starts the SAP liveCache client `x_server` on the system.
- Starts the SAP liveCache instance using the `starttrfc` program.
- Ensures that the SAP liveCache instance is initialized successfully.

Offline

The offline function performs the following tasks:

- Performs a preliminary check to ensure that the SAP liveCache instance is not already offline on the specified node in the cluster.
- Stops the SAP liveCache instance using the `starttrfc` program.
- Removes all the IPC resources for the SAP liveCache instance based on `/sapdb/data/ipc` (SAP standard) directory, if exists.
- Ensures that the liveCache instance is stopped successfully.

Monitor

The monitor function monitors the state of the SAP liveCache instance on all nodes in the cluster. The function performs the following tasks:

- Scans the process table to verify the SAP liveCache instance processes are running.
See [“Monitoring a SAP liveCache instance”](#) on page 18.
- If the `SecondLevelMonitor` attribute is greater than 0, the monitor function performs a more thorough check of the SAP liveCache instance. The utility `dbmccli` used to perform this second level check.
- Executes a custom monitor utility that the `MonitorProgram` attribute specifies.

Clean

The clean function performs the following tasks:

- Attempts to gracefully shutdown the SAP liveCache server with `dbmccli`.
- Waits for 10 seconds for the SAP liveCache instance to shut down successfully.
- Ensures that no relevant SAP liveCache server processes are running. If any processes remain, the function kills the remaining processes using a `SIGKILL` signal.
- Removes all IPC resources for SAP liveCache instance based on the directory `/sapdb/data/ipc` (SAP Standard).

Typical SAP liveCache configuration in a VCS cluster

A typical SAP liveCache configuration in a VCS cluster has the following characteristics:

- VCS is installed and configured in a two-node cluster.

- The /sapdb/LCName directory is installed on shared storage.
- The SAP liveCache binaries are installed locally on both nodes or on shared disks.
- The Veritas agent for SAP liveCache is installed on both the nodes.

Figure 1-1 depicts a configuration where SAP liveCache instance binaries and /sapdb/LCName are installed completely on shared disks.

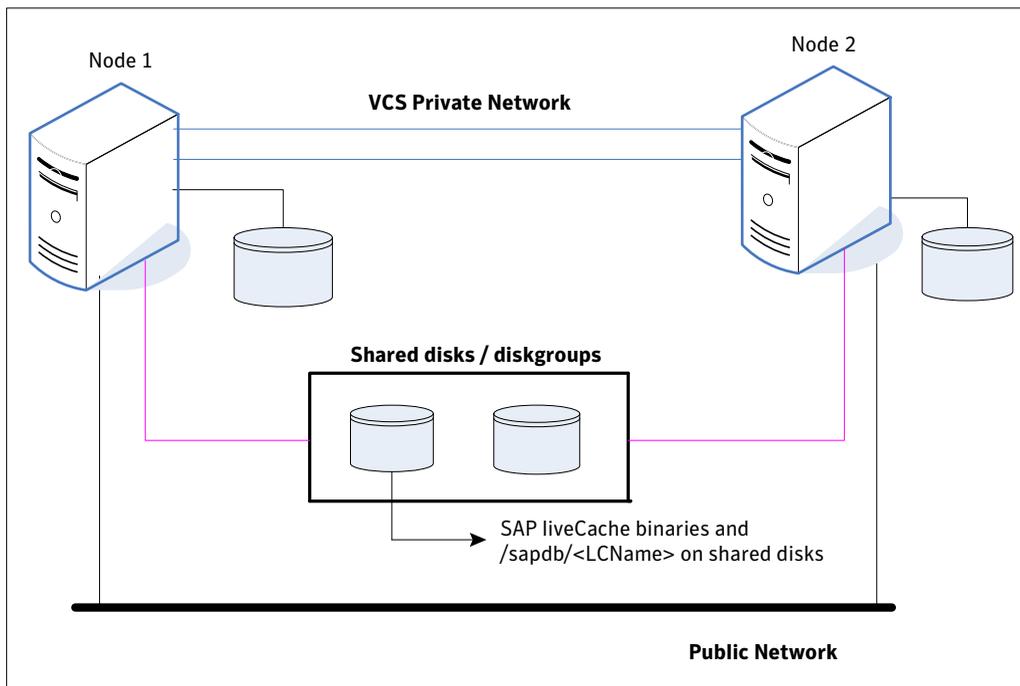
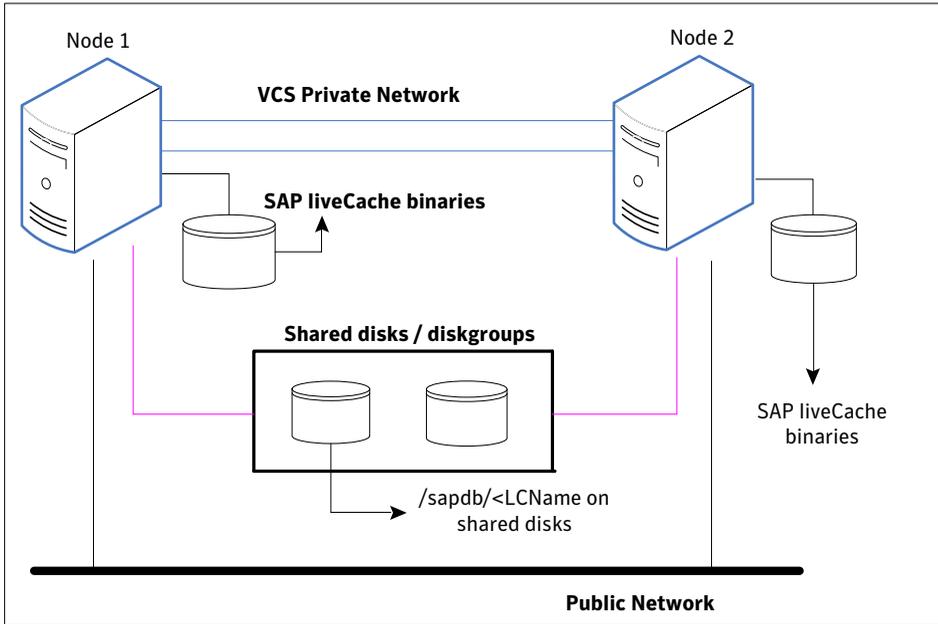


Figure 1-2 depicts a configuration where SAP liveCache instance binaries are installed locally on each node and /sapdb/LCName is installed on shared disks.



Setting up SAP liveCache in a VCS cluster

Follow the steps below to set up SAP liveCache in a cluster:

- Set up a VCS cluster.
Refer to *Veritas Cluster Server Installation Guide* for more information on installing and configuring VCS.
- Install and configure SAP liveCache for High Availability.
See [“About installing SAP liveCache for high availability”](#) on page 19.
See [“About configuring SAP liveCache for high availability”](#) on page 19.
- Install the Veritas High Availability agent for SAP liveCache.
See [“Installing the agent in a VCS environment”](#) on page 25.
- Configure the service groups for SAP liveCache.
See [“About configuring service groups for SAP liveCache”](#) on page 43.

Installing and configuring SAP liveCache for high availability

This chapter includes the following topics:

- [About SAP liveCache server](#)
- [Uniquely identifying SAP liveCache server instances](#)
- [Monitoring a SAP liveCache instance](#)
- [About installing SAP liveCache for high availability](#)
- [About configuring SAP liveCache for high availability](#)
- [Configuring SAPLiveCache server for cluster support](#)

About SAP liveCache server

SAP liveCache is based on a memory-centric offshoot of the SAP DB technology that is shipped with SAP APO since Release 2.0. For the most resource-intensive planning questions, SAP APO pushes performance-critical application logic to SAP liveCache. The data that is required for those processes is also pushed to SAP liveCache, where it is kept persistent. The persistence of both data and application logic is beneficial as it allows different processes to work on the same data and avoids bottlenecks by following the paradigm "run the logic where the data is."

SAP liveCache - technology

SAP liveCache technology is an object-based enhancement of the MaxDB database system. MaxDB is a relational database system that was developed for Online Transaction Processing (OLTP). OLTP (MaxDB) and SAP liveCache database systems are variations of the same database system.

SAP liveCache was developed to manage complex objects, for example, in logistical solutions, such as SAP SCM/APO. In such solutions, large volumes of data must be permanently available and modifiable. You can use SAP liveCache technology to represent data structures and data flows, such as networks and relationships more easily and effectively. In SAP liveCache database, all data which must be accessible to the database system is located in the main memory. SAP liveCache database instances can only be used within SAP systems.

Uniquely identifying SAP liveCache server instances

You can virtualize a SAP liveCache instance using a cluster. Using shared disk and virtual IP addresses, you can manage a large set of SAP liveCache instances in a single cluster.

For multiple instances running concurrently on a single node, the agent must be able to uniquely identify each SAP liveCache instance on a single host system.

Each instance has a unique instance name.

The instance names may follow the conventional naming conventions as follows:

- Instance name should contain only three alphanumeric uppercase characters.
- Instance name should start with alphabet always.
- Instance name should be unique on the cluster.

Note that the LCName attribute forms a unique identifier that can identify the processes running for a particular SAP liveCache server instance.

Some examples are: HOT, LC1, and so on.

Monitoring a SAP liveCache instance

The monitor operation performs process level check to ensure the proper functioning of an SAP liveCache instance. The monitor operation checks for the processes from the process table which contains "*kernel LCName*" in their name.

It also checks the database state with "*dbmccli*" utility if *SecondLevelMonitor* attribute is set.

About installing SAP liveCache for high availability

You can install SAP liveCache in the following ways, in a VCS environment:

SAP liveCache on a shared disk	Install the SAP liveCache binaries and /sapdb/LCName on the shared disks.
SAP liveCache on a local disk	Install the SAP liveCache binaries on each node and /sapdb/LCName on the shared disks.

Note: /sapdb/LCName includes the kernel, data files and log files for SAP liveCache database server.

When installing SAP liveCache, ensure that the `login_id`, `id_name`, `group_id`, and `group_name` for the `LCNameadm` and `sdb` users is the same on all the nodes.

The user `LCNameadm` and `sdb` users and the group 'sdba' must be local and not Network Information Service (NIS and NIS+) users.

For more details, refer to the product documentation.

About configuring SAP liveCache for high availability

The guidelines for configuring SAP liveCache for high availability are as follows:

- In a service group, keep the single point of failure as minimal as possible and watch the application startup time.
- Assign a virtual hostname to the component within the switchover environment. Since the physical hostname changes with the switchover, this is a must have requirement.
- Based on the expected failover time configure the reconnection parameters for all software components and enable its automatic reconnection.

Configuring SAPLiveCache server for cluster support

Configuring the SAPLiveCache server for cluster support involves the following phases:

Installing the SAP liveCache server with database on first node

Install the liveCache server using SAP provided installation tool SAPInst for the required SAP application.

Start the liveCache installation using `SAPINST_USE_HOSTNAME=VirtualHostName` and perform the following.

- Use the following command for starting the installation and proceed as per the instructions on the SAP installation GUI:

```
sapinst SAPINST_USE_HOSTNAME=VirtualHostName
```

- Perform all the post-installation steps described in the SAP liveCache installation guide.

Installing the SAP liveCache server software on second node

Install the liveCache server software on the second node with the same liveCache name used in installing on the first node.

Perform the following steps:

- Create SAP liveCache database software owner "sdb" user on the system with logon permission disabled with same UID as of first node.

- Create SAP liveCache database administration group "sdba" on the system with same GID as of first node. For example on AIX:

```
/usr/bin/mkuser gecos="Database Software Owner" pgrp="sdba" sdb  
/usr/bin/chuser rlogin=false login=false account_locked=true sdb
```

- Create SAP liveCache user "LCName adm" user with same permissions as on first node and with same UID as of first node. For example on AIX:

```
/usr/bin/mkuser gecos="Owner of Database Instance Lc5"  
pgrp="sdba" groups="sapsys" shell="/bin/csh" lc5adm
```

- Start the liveCache software installation from the liveCache media with SDBINST.

- Setup the X server logon credentials for all SAP users, namely, LCName adm, control, superdba as described in SAP note 39439.

- Copy `<LCName>` from `<indep_data_path>/config` directory on first node to `<indep_data_path>/config` directory on the second node.

```
For example, rcp -r /sapdb/data/config/LC5*  
vcsaix102:/sapdb/data/config
```

Make sure that all the files are owned by user 'sdb' and group 'sdba'

- Create a work directory for liveCache server instance

```
<indep_data_path>/wrk/<LCName>
```

For example,

```
cd /sapdb/data/wrk
mkdir LC5
```

- Create data and log directories for database. The path to the directories should be the same as of the first node.

For example,

```
cd /sapdb/LC5
mkdir sapdata
mkdir saplog
```

- Mount the data and log volumes on first node on to second node under data and log directories created.
- Start the liveCache server.

Establishing communication between Application server and SAP live Cache server

Each database instance is assigned a logical server name. This logical server name should be used for communication with the database. It is therefore entered in XUSER. As the application instance does not recognize the database server as a local host when the connection is set up, communication vis TCP/IP (x_server) is selected. Hence, you need to create a global login for XUSER entries with virtual hostname on all the nodes. Refer to SAP note 39439 for more information on how to generate XUSER entries for different users.

Note: If you copy the environment for user <LCName> adm user from first node, the XUSER.62 file in the HOME directory of the owner, usually <LCName>adm, must also be moved and regenerated.

Creating SAP liveCache RFC destination and RFC user

Follow the instructions on SAP notes 305634 and 452745 for creating liveCache RFC destination and RFC user.

Create global login for XUSER entries with virtual hostname on all the nodes. See SAP note 39439 for more information.

Installing, upgrading, and removing the agent for SAP liveCache

This chapter includes the following topics:

- [Before you install the Veritas agent for SAP liveCache](#)
- [About the ACC library](#)
- [Installing the ACC library](#)
- [Installing the agent in a VCS environment](#)
- [Removing the agent in a VCS environment](#)
- [Removing the ACC library](#)
- [Upgrading the agent in a VCS environment](#)

Before you install the Veritas agent for SAP liveCache

You must install the Veritas agent for SAP liveCache on all the systems that will host SAP liveCache service groups.

Ensure that you meet the following prerequisites to install the agent for SAP liveCache.

For VCS, do the following:

- Install and configure Veritas Cluster Server.
For more information on installing and configuring Veritas Cluster Server, refer to the *Veritas Cluster Server Installation Guide*.

- Remove any previous version of this agent.
To remove the agent,
See “[Removing the agent in a VCS environment](#)” on page 26.
- Install the latest version of ACC Library.
To install or update the ACC Library package, locate the library and related documentation in the agentpack tarball.
See “[Installing the ACC library](#)” on page 24.

About the ACC library

The operations of a VCS agent depend on a set of Perl modules known as the ACC library. The library must be installed on each system in the cluster that runs the agent. The ACC library contains common, reusable functions that perform tasks, such as process identification, logging, and system calls.

Instructions to install or remove the ACC library on a single system in the cluster are given in the following sections. The instructions assume that the agent's tar file has already been extracted.

Installing the ACC library

Install the ACC library on each system in the cluster that runs an agent that depends on the ACC library.

To install the ACC library

- 1 Log in as superuser.
- 2 Download ACC Library.

You can download either the complete Agent Pack tarball or the individual ACCLib tarball from the Symantec Operations Readiness Tools (SORT) site (<https://sort.symantec.com/agents>).
- 3 If you downloaded the complete Agent Pack tarball, navigate to the directory containing the package for the platform running in your environment.

AIX	<code>cd1/aix/vcs/application/acc_library/version_library/pkg</code>
HP-UX	<code>cd1/hpux/generic/vcs/application/acc_library/version_library/pkg</code>
Linux	<code>cd1/linux/generic/vcs/application/acc_library/version_library/rpms</code>
Solaris	<code>cd1/solaris/dist_arch/vcs/application/acc_library/version_library/pkg</code>

where *dist_arch* is sol_sparc or sol_x64.

- 4 If you downloaded the individual ACCLib tarball, navigate to the pkgs directory (for AIX, HP-UX, and Solaris), or rpms directory (for Linux).
- 5 Install the package. Enter **Yes** if asked to confirm overwriting of files in the existing package.

```
AIX          # installp -ac -d VRTSaclib.bff VRTSaclib
HP-UX       # swinstall -s `pwd` VRTSaclib
Linux      # rpm -i \
           VRTSaclib-VersionNumber-GA_GENERIC.noarch.rpm
Solaris    # pkgadd -d VRTSaclib.pkg
```

Installing the agent in a VCS environment

Install the agent for SAP liveCache on each node in the cluster.

To install the agent in a VCS environment

- 1 Download the agent from the Symantec Operations Readiness Tools (SORT) site: <https://sort.symantec.com/agents>.

You can download either the complete Agent Pack tarball or an individual agent tarball.

- 2 Uncompress the file to a temporary location, say /tmp.
- 3 If you downloaded the complete Agent Pack tarball, navigate to the directory containing the package for the platform running in your environment.

```
AIX          cdl/aix/vcs/application/sap_agent/
           vcs_version/version_agent/pkgs
HP-UX       cdl/hpux/generic/vcs/application/sap_agent/
           vcs_version/version_agent/pkgs
Linux      cdl/linux/generic/vcs/application/sap_agent/
           vcs_version/version_agent/rpms
Solaris    cdl/solaris/dist_arch/vcs/application/sap_agent/
           vcs_version/version_agent/pkgs
           where, dist_arch is sol_x64 or sol_sparc
```

If you downloaded the individual agent tarball, navigate to the pkgs directory (for AIX, HP-UX, and Solaris), or rpms directory (for Linux).

4 Log in as superuser.

5 Install the package.

```
AIX      # installp -ac -d VRTSsaplc.rte.bff VRTSsaplc.rte
```

```
HP-UX    # swinstall -s 'pwd' VRTSsaplc
```

```
Linux    # rpm -ihv \  
          VRTSsaplc-AgentVersion-GA_GENERIC.noarch.rpm
```

```
Solaris  # pkgadd -d . VRTSsaplc
```

6 After installing the agent package, you must import the agent type configuration file. See [“Importing the agent types files in a VCS environment”](#) on page 31.

Removing the agent in a VCS environment

You must uninstall the agent for SAP liveCache from a cluster while the cluster is active.

To uninstall the agent in a VCS environment

1 Log in as a superuser.

2 Set the cluster configuration mode to read/write by typing the following command from any node in the cluster:

```
# haconf -makerw
```

3 Remove all SAP liveCache resources from the cluster. Use the following command to verify that all resources have been removed:

```
# hares -list Type=SAPLiveCache
```

- 4 Remove the agent type from the cluster configuration by typing the following command from any node in the cluster:

```
# hatype -delete SAPLiveCache
```

Removing the agent's type file from the cluster removes the include statement for the agent from the main.cf file, but the agent's type file is not removed from the cluster configuration directory. You can remove the agent's type file later from the cluster configuration directory.

- 5 Save these changes. Then set the cluster configuration mode to read-only by typing the following command from any node in the cluster:

```
# haconf -dump -makero
```

- 6 Use the platform's native software management program to remove the agent for SAP liveCache from each node in the cluster.

Execute the following command to uninstall the agent:

```
AIX # installp -u VRTSsaplc.rte
```

```
HP-UX # swremove VRTSsaplc
```

```
Linux # rpm -e VRTSsaplc
```

```
Solaris # pkgrm VRTSsaplc
```

Removing the ACC library

Perform the following steps to remove the ACC library.

To remove the ACC library

- 1 Ensure that all agents that use ACC library are removed.
- 2 Run the following command to remove the ACC library package.

```
AIX # installp -u VRTSaccclib
```

```
HP-UX # swremove VRTSaccclib
```

```
Linux # rpm -e VRTSaccclib
```

```
Solaris # pkgrm VRTSaccclib
```

Upgrading the agent in a VCS environment

Perform the following steps to upgrade the agent with minimal disruption, in a VCS environment.

To upgrade the agent in a VCS environment

- 1 Persistently freeze the service groups that host the application.

```
# hagr -freeze GroupName -persistent
```
- 2 Stop the cluster services forcibly.

```
# hstop -all -force
```
- 3 Ensure that the agent operations are stopped on all the nodes.

```
# ps -ef | grep SAPLiveCache
```
- 4 Uninstall the agent package from all the nodes. Use the platform's native software management program to remove the agent for SAP liveCache from each node in the cluster.

Execute the following command to uninstall the agent:

```
AIX          # installp -u VRTSsaplc.rte
HP-UX       # swremove VRTSsaplc
Linux      # rpm -e VRTSsaplc
Solaris    # pkgrm VRTSsaplc
```

- 5 Install the new agent on all the nodes.
See [“Installing the agent in a VCS environment”](#) on page 25.
- 6 Copy the new SAPLiveCacheTypes.cf file from the agent's conf directory, to the VCS conf directory /etc/VRTSvcs/conf/config.

VCS version	Operating system	Agent types file
VCS 4.x	■ AIX ■ HP-UX ■ Linux ■ Solaris	/etc/VRTSvcs/conf/sample_SAPLiveCache/ SAPLiveCacheTypes.cf

VCS 5.x	■ AIX	/etc/VRTSagents/ha/conf/SAPLiveCache/
	■ HP-UX	SAPLiveCacheTypes.cf
	■ Linux	
VCS 5.0	■ Solaris SPARC and x64	/etc/VRTSagents/ha/conf/SAPLiveCache/ SAPLiveCacheTypes50.cf
VCS 5.1	■ Solaris SPARC and x64	/etc/VRTSagents/ha/conf/SAPLiveCache/ SAPLiveCacheTypes51.cf

- 7 Check for the changes in the resource values required, if any, due to the new agent types file.

Note: To note the list of changed attributes, compare the new type definition file with the old type definition file.

- 8 Start the cluster services.

```
# hastart
```

- 9 Start the agent on all nodes, if not started.

```
# haagent -start SAPLiveCache -sys SystemName
```

- 10 Unfreeze the service groups once all the resources come to an online steady state.

```
# hagrps -unfreeze GroupName -persistent
```


Configuring the agent for SAP liveCache

This chapter includes the following topics:

- [About configuring the Veritas agent for SAP liveCache](#)
- [Importing the agent types files in a VCS environment](#)
- [SAP liveCache agent attributes](#)
- [Executing a customized monitoring program](#)

About configuring the Veritas agent for SAP liveCache

After installing the Veritas agent for SAP liveCache, you must import the agent type configuration file. After importing this file, you can create and configure SAP liveCache resources. Before you configure a resource, review the attributes table that describes the resource type and its attributes.

To view the sample agent type definition and service groups configuration.

See [“About sample configurations for the agent for SAP liveCache”](#) on page 51.

Importing the agent types files in a VCS environment

To use the agent for SAP liveCache, you must import the agent types file into the cluster.

To import the agent types file using the Veritas Cluster Server graphical user interface

- 1 Start the Veritas Cluster Manager and connect to the cluster on which the agent is installed.
- 2 Click **File > Import Types**.
- 3 In the Import Types dialog box, select the following file:

VCS version	OperatingSystem	Agent types file
VCS 4.x	■ AIX	/etc/VRTSvcs/conf/sample_SAPLiveCache/
	■ HP-UX	SAPLiveCacheTypes.cf
	■ Linux	
	■ Solaris	
VCS 5.x	■ AIX	/etc/VRTSagents/ha/conf/SAPLiveCache/
	■ HP-UX	SAPLiveCacheTypes.cf
	■ Linux	
VCS 5.0	■ Solaris SPARC and x64	/etc/VRTSagents/ha/conf/SAPLiveCache/SAPLiveCacheTypes50.cf
VCS 5.1	■ Solaris SPARC and x64	/etc/VRTSagents/ha/conf/SAPLiveCache/SAPLiveCacheTypes51.cf

- 4 Click **Import**.
- 5 Save the VCS configuration.

The SAP liveCache agent type is now imported to the VCS engine.

You can now create SAP liveCache resources. For additional information about using the VCS GUI, refer to the *Veritas Cluster Server User's Guide*.

To import the agent types file using the Veritas Cluster Server command line interface (CLI), perform the following steps.

- 1 Log on to any one of the systems in the cluster as the superuser.
- 2 Create a temporary directory.

```
# mkdir ./temp
```



```
# cd ./temp
```
- 3 Copy the sample file Types.cf.

VCS 4.x	<ul style="list-style-type: none"> ■ AIX ■ HP-UX ■ Linux ■ Solaris 	/etc/VRTSvcs/conf/sample_SAPLiveCache/ SAPLiveCacheTypes.cf
VCS 5.x	<ul style="list-style-type: none"> ■ AIX ■ HP-UX ■ Linux 	/etc/VRTSagents/ha/conf/SAPLiveCache/ SAPLiveCacheTypes.cf
VCS 5.0	<ul style="list-style-type: none"> ■ Solaris SPARC and x64 	/etc/VRTSagents/ha/conf/SAPLiveCache/ SAPLiveCacheTypes50.cf
VCS 5.1	<ul style="list-style-type: none"> ■ Solaris SPARC and x64 	/etc/VRTSagents/ha/conf/SAPLiveCache/ SAPLiveCacheTypes51.cf

4 Create a dummy main.cf file:

```
# echo 'include "SAPLiveCacheTypes.cf"' > main.cf
```

5 Create the SAP resource type as follows:

```
# hacf -verify .
# haconf -makerw
# sh main.cmd
# haconf -dump
```

The SAP liveCache agent type is now imported to the VCS engine.

You can now create SAP liveCache resources. For additional information about using the VCS CLI, refer to the *Veritas Cluster Server User's Guide*.

SAP liveCache agent attributes

A SAP liveCache service is managed within a Veritas Cluster Server (VCS) environment. VCS uses software agents to control software services within a VCS cluster. To allow VCS to monitor and control the liveCache service in HotStandby mode effectively, the service is managed with the agent.

VCS deploys agents to manage all components or resources of the same type. For example, a single mount agent is responsible for managing all mounted file systems that are under VCS control.

The agent attributes define the details that are passed from the VCS engine to the agent to uniquely identify the specific resource component that is to be managed.

[Table 4-1](#) lists the attributes that are required for configuring a SAP liveCache instance.

Table 4-1 Required attributes

Required attributes	Description
APOHost	<p>Virtual hostname of the SAP APO application server in which liveCache is configured.</p> <p>Type and dimension: string-scalar</p> <p>Default: ""</p> <p>Example: sapsc1ci</p>
ClientId	<p>The production client ID in which the <i>RFCDest</i> and <i>RFCUserId</i> are configured for liveCache server. The liveCache server is started and stopped with this client ID.</p> <p>Type and dimension: integer-scalar</p> <p>Default: ""</p> <p>Example: 001</p>
DBMPassword	<p>Password for DBM user <i>DBMUserId</i>.</p> <ul style="list-style-type: none"> ■ store encrypted ■ agent to do decryption appropriately <p>Use <code>vcscrypt -agent</code> option to encrypt the password. If you are using VCS GUI to enter password no need to encrypt the password. VCS GUI will automatically encrypt password for you.</p> <p>Type and dimension: string-scalar</p> <p>Default: ""</p> <p>Example: jxpVmxMpkPlpMpnPo</p>
DBMUserId	<p>liveCache Database Manager Operator user name used in the "<code>dbmc1i</code>" to connect to the liveCache database server.</p> <p>Type and dimension: string-scalar</p> <p>Example: control.</p> <p>Default: "control "</p>

Table 4-1 Required attributes (*continued*)

Required attributes	Description
EnvFile	<p>Description: Environments file for <i>LCUser</i> to be sourced before starting/stopping the liveCache server. Symantec recommends keeping the environments file on shared disk for easy of maintenance.</p> <p>Type and dimension: string-scalar</p> <p>Example: /home/lc5adm/lcenv.csh</p> <p>Default: ""</p>
InstId	<p>The SAP system number or instance ID for the APO Application Server.</p> <p>Type and dimension: integer-scalar</p> <p>Example: 01</p> <p>Default: " "</p>
Language	<p>The language type used for starting and stopping liveCache server. Agent supports only English.</p> <p>Type and dimension: string-scalar</p> <p>Example: "EN"</p> <p>Default: "EN"</p>
LCHome	<p>Directory where the liveCache database software is installed. This directory is needed to get the <code>dbmcli</code> and <code>x_server</code> binaries.</p> <p>Type and dimension: string-scalar</p> <p>Example: "/sapdb/programs/bin"</p> <p>Default: ""</p>
LCName	<p>Name of the liveCache instance consisting of three alphanumeric characters. Also called liveCache SID. Only upper case letters are allowed and the first letter must be a character. This attribute is needed to uniquely identify the processes of the live Cache server. Also needed by <code>dbmcli</code> utility to find the status of the liveCache server.</p> <p>Type and dimension: string-scalar</p> <p>Example: LC5.</p> <p>Default: ""</p>

Table 4-1 Required attributes (*continued*)

Required attributes	Description
LCUser	<p>Operating system user for liveCache server. This user is responsible for starting and stopping the liveCache server. It must always be set to a value. In general this user takes the form <i>LCName</i> adm.</p> <p>Type and dimension: string-scalar</p> <p>Example: lc5adm</p> <p>Default: ""</p>
ResLogLevel	<p>String used to set the ResLogLevel of each instance of a resource. This attribute should not be confused with the VCS generic LogLevel Type attribute, which controls the VCS engine log level on a per agent type basis. The ResLogLevel attribute controls the amount of ACCLib VCS Agent Framework based logging that is written to the VCS log file on a per resource -instance basis.</p> <p>Valid values are:</p> <p>ERROR: Only Error level messages are logged.</p> <p>WARN: Above plus warning level messages are logged.</p> <p>INFO: Above plus informational level messages will be logged.</p> <p>This is the default log level.</p> <p>TRACE: Above plus trace level messages will be logged. This is very verbose and should only be used during diagnostic operations.</p> <p>Type and dimension: string-scalar</p> <p>Example: TRACE</p> <p>Default: INFO</p>
RFCDest	<p>RFC Destination configured for liveCache server start/stop. In general the destination will be in the form SID CLNT ClientId. Refer to SAP note 305634 and 452745 for more information.</p> <p>Type and dimension: string-scalar</p> <p>Example: SC1CLNT001</p> <p>Default: ""</p>

Table 4-1 Required attributes (*continued*)

Required attributes	Description
RFCHome	<p>The home directory for RFC SDK tool kit. <code>startRFC</code> binary is used to start/stop the liveCache server with function modules RSLVCSTART/RSLVCSTOP. This RFC tool kit needs to be downloaded from SAP Service Market place http://service.sap.com/swdc. This directory must have executable permission for LCUser.</p> <p>Type and dimension: string-scalar</p> <p>Example: /sapdb/rfcsdk/bin</p> <p>Default: ""</p>
RFCPassword	<p>The password for RFCUserId.</p> <ul style="list-style-type: none"> ■ store encrypted ■ agent to do decryption appropriately <p>Use <code>vcseencrypt -agent</code> option to encrypt the password. If you are using VCS GUI to enter password no need to encrypt the password. VCS GUI will automatically encrypt password for you.</p> <p>Type and dimension: string-scalar</p> <p>Example: akgIdkDgbGcgDgeGf</p> <p>Default: ""</p>
RFCUserId	<p>The RFC User configured for SAP liveCache Server to globally operate SAP liveCache Server.</p> <p>Type and dimension: string-scalar</p> <p>Example: LC5RFC</p> <p>Default: ""</p>

Table 4-2 lists the optional attributes

Table 4-2 Optional attributes

Optional attribute	Description
ContainerName	<p>This attribute is used for non-global zone support for VCS 5.0 on Solaris.</p> <p>It defines the name of the non-global zone.</p> <p>For more details refer to <i>Veritas Cluster Server User's Guide</i></p> <p>Type and dimension: string-scalar</p> <p>Example: saplc-zone1</p> <p>Default: " "</p>
ContainerInfo	<p>This attribute is used for non-global zone support for VCS 5.1 on Solaris.</p> <p>It specifies if you can use the service group with the container.</p> <p>Assign the following values to the ContainerInfo attribute:</p> <ul style="list-style-type: none"> ■ Name: The name of the container. For example, saplc-zone1 ■ Type: The type of container. Set this to Zone. ■ Enabled: Specify the value as 1, if you want to enable the container. Specify the value as 0, if you want to disable the container. <p>For more details refer to, <i>Veritas Cluster Server Administrator's Guide</i></p> <p>Type and dimension: string-association</p> <p>Example: {Name = saplc-zone1, Type = Zone, Enabled = 1}</p> <p>Default: " "</p>

Table 4-2 Optional attributes (*continued*)

Optional attribute	Description
SecondLevelMonitor	<p>Used to enable second-level monitoring and specify how often it is run. Second-level monitoring is a deeper, more thorough state check of the configured SAP liveCache instance.</p> <p>The numeric value specifies how often that the second-level monitoring routines are run.</p> <ul style="list-style-type: none"> ■ 0 - never run the second-level monitoring routines. ■ 1 - run it every monitor interval. ■ 2- run the second-level monitoring routines every second monitor interval, and so on. <p>Care should be taken while setting this attribute to large numbers. For example, if the MonitorInterval is set to 60 seconds, and the SecondLevelMonitor is set to 100, then the <code>dbmccli</code> command for this attribute would only get executed every 100 minutes, which may not be as often as intended. To provide maximum flexibility, the value set is not checked for an upper limit. Hence, you could cause the <code>secondlevelmonitor</code> command to run once a month, if that is what is desired.</p> <p>Type and dimension: integer-scalar</p> <p>Example: 1</p> <p>Default Value: 0</p>

Table 4-2 Optional attributes (*continued*)

Optional attribute	Description
MonitorProgram	<p>Full path and file name of an external, user-supplied monitor program. If specified, the monitor entry point will execute this file to perform an additional server state check. There are no restrictions for what actions the external monitor program performs to determine the state of a SAP liveCache server. The only constraint is that the external monitor program must return one of the following integer values:</p> <ul style="list-style-type: none"> ■ 0 (server is online) ■ 110 (server is online) ■ 100 (server is offline) ■ 1 (server is offline) ■ 99 or any thing other than{0,1,110,100}(server state is unknown) <p>Symantec recommends storing the external monitor program on the shared disk directory to ensure the file is always available on the online system. Arguments are supported.</p> <p>Type and dimension: string-scalar</p> <p>Example1: <code>/sapdb/data/db/wrk/LC5/mymonitor.sh</code></p> <p>Example2: <code>/sapdb/data/db/wrk/LC5/mymonitor.sh arg1 arg2</code></p> <p>Default: No default value</p>

Executing a customized monitoring program

The monitor function can execute a customized monitoring utility to perform an additional SAP liveCache server state check.

The monitor function executes the utility specified in the MonitorProgram attribute if the following conditions are satisfied:

- The specified utility is a valid executable file.
- The process level check and database state check indicates that the SAP liveCache Server instance is online.

The monitor function interprets the utility exit code as follows:

110 or 0 SAP liveCache server instance is online

100 or 1	SAP liveCache server instance is offline
99	SAP liveCache server instance is unknown
Any other value	SAP liveCache server instance is unknown

To ensure that the customized utility is always available to the agent, Symantec recommends storing the file in a shared directory that is available on an online node.

Configuring the service groups for SAP liveCache

This chapter includes the following topics:

- [About configuring service groups for SAP liveCache](#)
- [Before configuring the service groups for SAP liveCache](#)
- [Configuring service groups for SAP liveCache](#)
- [Copying the lcluster file to SAP liveCache directory](#)

About configuring service groups for SAP liveCache

Configuring the SAP liveCache service group involves creating the SAP liveCache service group, its resources, and defining attribute values for the configured resources. You must have administrator privileges to create and configure a service group.

You can configure the service groups using one of the following:

- The Cluster Manager (Java console)
- Veritas Operations Manager
- The command-line

See [“Configuring service groups for SAP liveCache”](#) on page 44.

Before configuring the service groups for SAP liveCache

Before you configure the SAP liveCache service group, you must:

- Verify that VCS is installed and configured on all nodes in the cluster where you will configure the service group.
Refer to the *Veritas Cluster Server Installation Guide* for more information.
- Verify that SAP liveCache is installed and configured identically on all nodes in the cluster.
See [“About installing SAP liveCache for high availability”](#) on page 19.
See [“About configuring SAP liveCache for high availability”](#) on page 19.
- Verify that the Veritas agent for SAP liveCache is installed on all nodes in the cluster.
See [“Installing the agent in a VCS environment”](#) on page 25.

Configuring service groups for SAP liveCache

While setting up a cluster, you must always ensure that the cluster has some spare capacity to handle the SAP liveCache failover scenarios. For example, in case of a backend database failure, the cluster must be able to run another database instance in conjunction with other running applications.

See *Veritas Cluster Server Installation and Configuration Guide*.

The cluster should be able to provide application failover by encapsulating the resources required for an application into a service group. A service group is a virtualized application that can switch between the cluster nodes. It contains a set of dependent resources, such as disk groups, disk volumes, file systems, IP addresses, NIC cards, and dependent application processes. It also includes logic about the dependencies between the application components.

These service groups should thus be configured such that the cluster can start, stop, monitor, and switch the service groups between the nodes, depending upon the server faults or resource faults. An administrator should also be proactively able to move a service group between cluster nodes to perform preventative maintenance or apply patches.

Perform the following steps to add a service group for SAP liveCache server

- 1 Create a service group for SAP liveCache.

```
# hagrps -add SAP76-LCS
```

For more information on creating a service group refer to, *Veritas Cluster Server User's Guide*.

- 2 Modify the SystemList attribute for the group, to add systems.

```
# hagrps -modify SAP76-LCS SystemList vc5sx074 0 vc5sx075 1
```

- 3 Create resources for NIC, IP, DiskGroup, Volume and Mount in the service group.

```
# hares -add SAP76-LCS_nic NIC SAP76-LCS
# hares -add SAP76-LCS_ip IP SAP76-LCS
```

For more details on creating and modifying resource attributes for NIC, IP, DiskGroup, Volume and Mount refer to, *Bundled Agents Reference Guide*.

- 4 Create links between the resources.

```
# hares -link SAP76-LCS_ip SAP76-LCS_nic
```

- 5 Create SAPLiveCache resource for SAP liveCache server.

```
# hares -add SAP76-LCS_lc SAPLiveCache SAP76-LCS
```

Based on the SAP liveCache server instance you are clustering, modify the resource attributes. For more information on agent attributes refer to,

[SAP liveCache agent attributes](#)

- 6 Create resource dependencies for SAPLiveCache resource.

The SAPLiveCache resource depends on the IP and Mount resources.

```
# hares -link SAP76-LCS_lc SAP76-LCS_ip
```

- 7 Verify the final resource dependencies for SAP liveCache server group.

```
# hares -dep
```

For example,

Group	Parent	Child
SAP76-LCS	SAP76-LCS_lc	SAP76-LCS_mnt
SAP76-LCS	SAP76-LCS_lc	SAP76-LCS_ip
SAP76-LCS	SAP76-LCS_ip	SAP76-LCS_nic
SAP76-LCS	SAP76-LCS_mnt	SAP76-LCS_vol
SAP76-LCS	SAP76-LCS_vol	SAP76-LCS_dg

Copying the lcluster file to SAP liveCache directory

SAP liveCache server is a cluster aware product. SAP liveCache server provides interfaces to integrate into high availability management system with all liveCache events. This interface is used to prevent the liveCache cluster resource from faulting and failing over for intentional offline of the liveCache system.

Review the information on intentional offline and implementation of the lcluster interface.

See [“Intentional offline”](#) on page 55.

See [“lcluster implementation for HA management system”](#) on page 55.

To use this feature, lcluster file must be present in directory "sap" under SAP liveCache database root directory. Typically under the directory `"/sapdb/LCName/db/sap"`.

Copy the sample lcluster file shipped with the agent to "sap" directory and set the permissions and owner of the file as follows:

- Login as superuser.
- Copy the file to "sap" directory.
For VCS 4.1, use the following command

```
cd /opt/VRTSvcs/bin/SAPLiveCache
```

For VCS 5.0, use the following command

```
cd /opt/VRTSagents/ha/bin/SAPLiveCache
```

```
cp lcluster /sapdb/LCName/db/sap
```

- Change the owner of the file with the command.

```
cd /sapdb/LCName/db/sap  
chown sdb:sdba lcluster
```

- Change the permissions of the file with the command.

```
chmod 555 lcluster
```

Troubleshooting the agent for SAP liveCache

This chapter includes the following topics:

- [Using the correct software and operating system versions](#)
- [Meeting prerequisites](#)
- [Configuring SAP liveCache resources](#)
- [Starting the SAP liveCache instance outside a cluster](#)
- [Reviewing error log files](#)

Using the correct software and operating system versions

Ensure that no issues arise due to incorrect software and operating system versions. For the correct versions of operating system and software to be installed on the resource systems:

See [“Supported software”](#) on page 12.

Meeting prerequisites

Before installing the agent for SAP liveCache, double check that you meet the prerequisites.

For example, you must install the ACC library on VCS before installing the agent for SAP liveCache.

See [“Before you install the Veritas agent for SAP liveCache”](#) on page 23.

Configuring SAP liveCache resources

Before using SAP liveCache resources, ensure that you configure the resources properly. For a list of attributes used to configure all SAP liveCache resources, refer to the agent attributes.

Starting the SAP liveCache instance outside a cluster

If you face problems while working with a resource, you must disable the resource within the cluster framework. A disabled resource is not under the control of the cluster framework, and so you can test the SAP liveCache instance independent of the cluster framework. Refer to the cluster documentation for information about disabling a resource.

You can then restart the SAP liveCache instance outside the cluster framework.

Note: Use the same parameters that the resource attributes define within the cluster framework while restarting the resource outside the cluster framework.

A sample procedure to start a SAP instance outside the cluster framework, is illustrated as follows.

To restart the SAP liveCache server instance outside the framework

- 1 Log in as superuser.
- 2 Ensure that the SAP database is up and running. Refer to the relevant database documentation or consult your database administrator for more information.
- 3 Use the LCUser attribute to log in to the SAPliveCache server:

```
# su LCUser
$ USER=LCUser; LOGNAME=LCUser; HOME=/home/LCUser
$ export USER LOGNAME HOME
$ . EnvFile
```

For certain shell versions on AIX, LOGNAME is read-only.

- 4 Start the SAP liveCache server instance:

```
$ Path_RFCSDK/bin/starttrfc -3 -d RFCDest -h APOHost -s InstId
-c ClientId -u RFCserId -p RFCPassword -l Language
-F START_LIVECACHE_LVC -E IV_CON_NAME=LCA
```

- 5 Ensure that the SAP liveCache instance is running successfully by running the grep command for LCName.

For example, for a SAP liveCache server instance LC5:

```
$ ps -ef | grep LC5
```

You must see the kernel processes running on the system for liveCache server.

If the SAP liveCache server instance is running outside the cluster framework, you can then attempt to restart the SAP liveCache server within the cluster framework by enabling the liveCache resource.

Reviewing error log files

If you face problems while using SAP liveCache or the agent for SAP liveCache, use the log files described in this section to investigate the problems.

Using SAP liveCache log files

If a SAP liveCache server is facing problems, you can access the server log files to further diagnose the problem. The SAP liveCache log files are located in the `/sapdb/data/wrk/<LCName>` directory.

Reviewing cluster log files

In case of problems while using the agent for SAP liveCache, you can access the engine log file for more information about a particular resource. The engine log file is located at `/var/VRTSvcs/log/engine_A.log`.

Additionally, you can also refer to the latest SAPLiveCache agent log files located at `/var/VRTSvcs/log/SAPLiveCache_A.log`

Note: Include both these log files while addressing the problem to Symantec support team.

Using trace level logging

The `ResLogLevel` attribute controls the level of logging that is written in a cluster log file for each SAP liveCache resource. You can set this attribute to `TRACE`, which enables very detailed and verbose logging.

If you set `ResLogLevel` to `TRACE`, a very high volume of messages are produced. Symantec recommends that you localize the `ResLogLevel` attribute for a particular resource.

Note: Starting with version 5.1.1.0 of the ACC library, the `TRACE` level logs for any `ACCLib` based agent are generated locally at the location `/var/VRTSvcs/log/Agent_A.log`.

Warning: You may consider to temporarily increase the timeout values for `SAPLiveCache` for debugging purposes. After the debugging process is complete, you can revert back to the original timeout values.

To localize `ResLogLevel` attribute for a resource

- 1 Identify the resource for which you want to enable detailed logging.
- 2 Localize the `ResLogLevel` attribute for the identified resource:

```
# hares -local Resource_Name ResLogLevel
```

- 3 Set the `ResLogLevel` attribute to `TRACE` for the identified resource:

```
# hares -modify Resource_Name ResLogLevel TRACE -sys SysA
```

- 4 Note the time before you begin to operate the identified resource.
- 5 Test the identified resource. The function reproduces the problem that you are attempting to diagnose.
- 6 Note the time when the problem is reproduced.
- 7 Set the `ResLogLevel` attribute back to `INFO` for the identified resource:

```
# hares -modify Resource_Name ResLogLevel INFO -sys SysA
```

- 8 Review the contents of the log file. Use the time noted in Step 4 and Step 6 to diagnose the problem.

You can also contact Symantec support for more help.

Sample Configurations

This appendix includes the following topics:

- [About sample configurations for the agent for SAP liveCache](#)
- [Sample agent type definition for SAP liveCache](#)
- [Sample SAP liveCache resource configuration for VCS](#)
- [Sample service group configurations for SAP liveCache](#)
- [Intentional offline](#)
- [lcluster implementation for HA management system](#)

About sample configurations for the agent for SAP liveCache

The sample configuration graphically depicts the resource types, resources, and resource dependencies within the service group. Review these dependencies carefully before configuring the agent for SAP liveCache. For more information about these resource types, see the *Veritas Cluster Server Bundled Agents Reference Guide*.

Sample agent type definition for SAP liveCache

Examples of agent type definition files follow.

VCS 4.1

```
type SAPLiveCache (  
    static str ArgList[] = { ResLogLevel, State, IState, EnvFile,  
        LCHome, LCUser, LCName, DBMUserId, DBMPassword, APOHost, InstID,
```

```
ClientID, RFCDest, RFCHome, RFCUserId, RFCPassword, Language,  
SecondLevelMonitor, MonitorProgram }  
str ResLogLevel = INFO  
str EnvFile  
str LCHome  
str LCUser  
str LCName  
str DBMUserId = control  
str DBMPassword  
str APOHost  
int InstId  
int ClientId  
str RFCDest  
str RFCHome  
str RFCUserId  
str RFCPassword  
str Language = EN  
int SecondLevelMonitor = 0  
str MonitorProgram  
)
```

VCS 5.0

```
type SAPLiveCache (  
    static str AgentDirectory =  
"/opt/VRTSagents/ha/bin/SAPLiveCache"  
    static str AgentFile = "/opt/VRTSvcS/bin/Script50Agent"  
  
static str ArgList[] = { ResLogLevel, State, IState, EnvFile,  
LCHome, LCUser, LCName, DBMUserId, DBMPassword, APOHost, InstId,  
ClientId, RFCDest, RFCHome, RFCUserId, RFCPassword, Language,  
SecondLevelMonitor, MonitorProgram }  
    str ResLogLevel = INFO  
    str EnvFile  
    str LCHome  
    str LCUser  
    str LCName  
    str DBMUserId = control  
    str DBMPassword  
    str APOHost  
    str InstId  
    str ClientId  
    str RFCDest  
    str RFCHome
```

```
    str RFCUserId  
    str RFCPassword  
    str Language = EN  
    int SecondLevelMonitor = 0  
    str MonitorProgram  
)
```

Sample SAP liveCache resource configuration for VCS

The sample resource configuration for VCS is as follows:

```
SAPLiveCache SAPLC5_liveCache (  
  
    ResLogLevel          = "INFO"  
    EnvFile              = "/home/lc5adm/lcenv.csh"  
    LCHome               = "/sapdb/programs/bin"  
    LCUser               = "lc5adm"  
    LCName               = "LC5"  
    DBMUserId            = "control"  
    DBMPassword          = "asfjfdsyuklf"  
    APOHost              = "sapsclci"  
    InstId               = 01  
    ClientId             = 001  
    RFCDest              = "SC1CLNT001"  
    RFCHome              = "/sapdb/rfcsdk/bin"  
    RFCUserId            = "LC5RFC"  
    RFCPassword          = "SaskDWlksa"  
    Language             = "EN"  
    SecondLevelMonitor   = 0  
    MonitorProgram       = ""  
  
)
```

Sample service group configurations for SAP liveCache

Create SAP liveCache resource using VCS GUI. The following diagrams provide the sample configuration of VCS resource for SAP liveCache Server.

[Figure A-1](#) shows the dependency graph for the configuration.

Figure A-1 Dependency graph for SAP liveCache

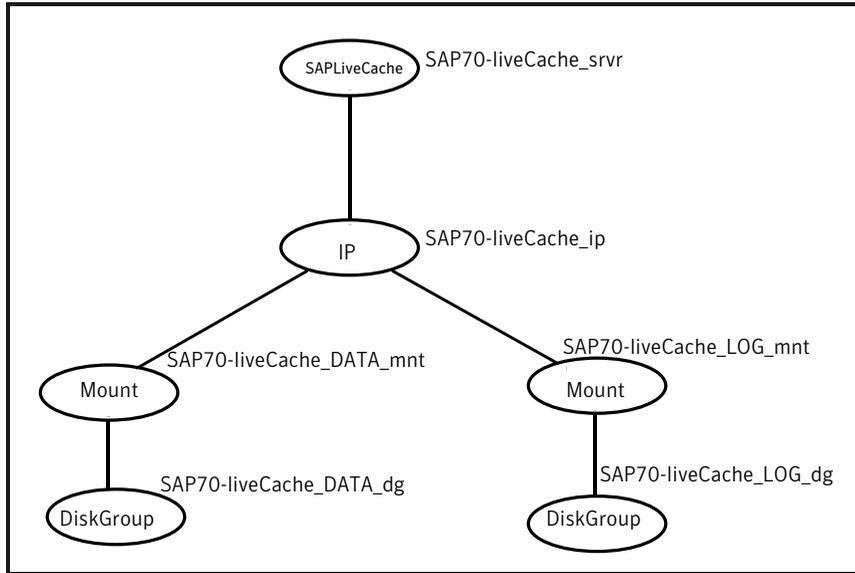


Table A-1 shows the agent attributes for SAP liveCache.

Table A-1 Agent attributes for SAP liveCache

Attribute	Value
ResLogLevel	INFO
EnvFile	/home/lc3adm/.lcenv.csh
LCHome	/sapdb/programs/bin
LCUser	lc3adm
LCName	HOT
DBMUserId	control
DBMPassword	govSjsLshSukKuiQvmHmh
APOHost	saplc1ci
InstId	11
ClientId	001
RFCDest	LC1CLNT001

Table A-1 Agent attributes for SAP liveCache (*continued*)

Attribute	Value
RFCHome	/usr/sap/rfcsdk/bin
RFCUserId	LC3RFC
RFCPassword	FLTkrITILghk
Language	EN
SecondLevelMonitor	0
MonitorProgram	

Intentional offline

Intentional offline is needed to detect graceful shutdown of the SAP liveCache server with liveCache transaction LC10. SAP liveCache server has a mechanism to notify the high availability management system whenever the liveCache server is started or stopped gracefully with the help of lcluster. The lcluster script must be implemented if the HA management system needs to be notified for all graceful actions.

See [“lcluster implementation for HA management system”](#) on page 55.

All graceful starts of the liveCache server can be detected by the SAP liveCache agent without the help of the lcluster script. For defined MonitorInterval, monitor entry point is run by the VCS HA management system for all the resources of type SAPliveCache. Hence, the agent can easily detect whenever SAP liveCache server is started gracefully with maximum time delay of MonitorInterval.

Generally, for all graceful stops of the SAP liveCache server, the agent faults the resource assuming unexpected offline. The Clean entry point will be called and if the resource is set to "critical", the service group will be failed-over to the other node in the cluster, which is not intended. Hence, to prevent this scenario, intentional offline has been implemented.

lcluster implementation for HA management system

SAP recommends starting/stopping the liveCache server for APO with liveCache transaction LC10. The transaction LC10 calls SAP provided script `/sapdb/<LCName>/db/sap/lcinit` to start/stop the liveCache instance. The lcinit script can inform the high availability management system with the start/stop actions of the liveCache with the help of another script

/sapdb/LCName/db/sap/lcluster, if implemented. Otherwise lcluster assumes that the liveCache is running in a non-HA environment. In case of SAP liveCache starts and stops in HA environments, lcluster calls lcluster with the following options:

starting req	lcluster begins to start the liveCache
starting ok	lcluster has started the liveCache successfully
starting error	start up of the liveCache failed
stopping req	lcluster begins to stop the liveCache
stopping ok	lcluster has stopped the liveCache successfully
stopping error	stop of the liveCache failed

This script must be implemented to prevent faulting of SAP liveCache server resource for intentional stop of liveCache server with transaction LC10.

This script is implemented such that whenever a liveCache is started/stopped out of the liveCache transaction LC10, the lcluster script, creates a tmp file with the name symc_lcluster_LCName under the liveCache working directory /sapdb/data/wrk/LCName.

Get the LCName from lcluster script full path name.

Following is a sample code for lcluster script.

```
bash-2.05b$ cat /sapdb/LC5/db/sap/lcluster
#!/opt/VRTSperl/bin/perl -w
use Fcntl;
use File::Path qw ( mkpath );
my $sClustMode = $ARGV[0];
my $sStatus = $ARGV[1];
my $sClustStatus = "$sClustMode $sStatus";
my ( $sFileName, $sSAP, $sDB, $sLCName ) = reverse $0 =~
m@([^\/]+)@g;
my $sWrkDir = "/sapdb/data/wrk/" . $sLCName ;
my $sClustFile = $sWrkDir . "/symc_lcluster_" . $sLCName ;
#-----
# Create work folder if needed..
#-----
if ( -d $sWrkDir ) {
    # Directory already exists.
}
elsif ( ! mkpath ( $sWrkDir, 0, 0700 ) ) {
    # Not able to create a directory.
```

```
    return 0;
}
if ( sysopen( CLUSTFILE, $sClustFile,
O_WRONLY|O_SYNC|O_CREAT|O_TRUNC, 0660 ) ) {
    print CLUSTFILE $sClustStatus;
}
else {
    # Not able to create the file.
}
close ( CLUSTFILE );
bash-2.05b$
```


Changes introduced in previous releases

This appendix includes the following topics:

- [Changes introduced in previous releases](#)

Changes introduced in previous releases

The enhancements in the previous releases of SAP liveCache agent are as follows:

- Changed the startup method for X Server to start as "LCUser" instead of "root", to inherit LCUser ulimits.
- Added support for VCS 5.1 on AIX, Linux, and Solaris
- Added support for special characters in the passwords
- Added support for AIX 6.1 on p-series
- Added support for RHEL 5.0 and SuSE 10.0
- Added support for Solaris 10 x64

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