

Oracle® Solaris Cluster Data Service for SAP Web Application Server Guide

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Preface

Oracle Solaris Cluster Data Service for SAP Web Application Server Guide explains how to install and configure Oracle Solaris Cluster data services.

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

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

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

Using UNIX Commands

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

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

Typographic Conventions

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

TABLE P-1 Typographic Conventions

Typeface	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <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% su</code> Password:
<i>aabbcc123</i>	Placeholder: replace with a real name or value	The command to remove a file is <i>rm filename</i> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . <i>A cache</i> is a copy that is stored locally. Do <i>not</i> save the file. Note: Some emphasized items appear bold online.

Shell Prompts in Command Examples

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

TABLE P-2 Shell Prompts

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

Related Documentation

Information about related Oracle Solaris Cluster topics is available in the documentation that is listed in the following table. All Oracle Solaris Cluster documentation is available at <http://www.oracle.com/technetwork/indexes/documentation/index.html>.

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

For a complete list of Oracle Solaris Cluster documentation, see the release notes for your release of Oracle Solaris Cluster at <http://www.oracle.com/technetwork/indexes/documentation/index.html>.

Related Third-Party Web Site References

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

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

Documentation and Support

See the following web sites for additional resources:

- [Documentation \(http://www.oracle.com/technetwork/indexes/documentation/index.html\)](http://www.oracle.com/technetwork/indexes/documentation/index.html)
- [Support \(http://www.oracle.com/us/support/systems/index.html\)](http://www.oracle.com/us/support/systems/index.html)

Oracle Software Resources

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

- Discuss technical problems and solutions on the [Discussion Forums \(http://forums.oracle.com\)](http://forums.oracle.com).
- Get hands-on step-by-step tutorials with [Oracle By Example \(http://www.oracle.com/technetwork/tutorials/index.html\)](http://www.oracle.com/technetwork/tutorials/index.html).

Getting Help

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

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

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

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

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

Installing and Configuring HA for SAP Web Application Server

This chapter explains how to install and configure HA for SAP Web Application Server.

Note – If you are using the Oracle Solaris 10 OS, you can install and configure this data service to run in the non-global zone. HA for SAP Web Application Server is supported in non-global zones.

This chapter contains the following sections.

- “HA for SAP Web Application Server Overview” on page 12
- “Overview of the Installation and Configuration Process for HA for SAP Web Application Server” on page 14
- “Planning the HA for SAP Web Application Server Installation and Configuration” on page 14
- “Installing and Configuring SAP Web Application Server” on page 20
- “Verifying the SAP Web Application Server Installation and Configuration” on page 36
- “Installing the HA for SAP Web Application Server Packages” on page 43
- “Registering and Configuring HA for SAP Web Application Server” on page 45
- “Using Alternate Project Identification” on page 65
- “Tuning the HA for SAP Web Application Server Fault Monitors” on page 65
- “Verifying the HA for SAP Web Application Server Installation and Configuration” on page 70
- “Migrating Existing SAP Web Application Server and SAP J2EE Engine Resource Types to Oracle Solaris Cluster 3.3” on page 76

HA for SAP Web Application Server Overview

The SAP Web Application Server platform consists of the following components:

- Relational database management system (RDBMS)
- SAP central services, which include these servers:
 - SAP enqueue server
 - SAP message server
 - SAP replica server

The SAP replica server is logically part of the SAP central services, although it always runs on a different node from the other servers in the SAP central services.
- SAP web application server component, in one the following configurations:
 - ABAP engine component
 - ABAP engine component and add-in SAP J2EE engine component
 - Standalone SAP J2EE engine component

If the configuration includes both the ABAP engine and the SAP J2EE engine, two SAP central services components exist.



Caution – For a detailed description of the SAP Web Application Server platform in the High Availability environment, see the SAP documentation at <http://service.sap.com/ha>. In particular, study the section that provides an overview of the architecture of the SAP Web Application Server to be certain that you understand the basic concepts of your version of the SAP Web Application Server.

The architecture of the SAP Web Application Server components (such as SAP enqueue server and SAP message server) changed significantly with SAP Netweaver 04. Therefore, when running in the Oracle Solaris Cluster environment, these components must be configured differently from previous versions of the platform.

To eliminate potential single points of failure in an SAP Web Application Server platform, HA for SAP Web Application Server provides fault monitoring, automatic restart, and automatic failover for the components of the SAP Web Application Server platform.

The SAP web application server component of the platform can be configured either as a failover or as a scalable data service. The SAP J2EE engine component can also be configured either as failover or as scalable. The other components must be configured as failover data services.

For conceptual information about failover services and scalable services, see the *[Oracle Solaris Cluster Concepts Guide](#)*.

Each component of the SAP Web Application Server platform has a data service that protects the component in a Oracle Solaris Cluster configuration, as described in the following table.

TABLE 1-1 Protection of SAP Web Application Server Components by Oracle Solaris Cluster Data Services

SAP Web Application Server Component	Data Service
SAP enqueue server	Resource type for SAP enqueue server in HA for SAP Web Application Server. The resource type is <code>SUNW.sapenq</code> .
SAP replica server	Resource type for SAP replica server in HA for SAP Web Application Server. The resource type is <code>SUNW.saprepl</code> .
SAP message server	Resource type for SAP message server in HA for SAP Web Application Server. The resource type is <code>SUNW.saps cs</code> .
SAP web application server	Resource type for SAP web application server component in HA for SAP Web Application Server. The resource type is <code>SUNW.sapwebas</code> .
Standalone SAP J2EE engine	The resource for the SAP Web Application Server stack that is designated for Java software only. The resource type is <code>SUNW.sapwebas</code> .
Database	The data service for the database that you are using, for example: <ul style="list-style-type: none"> For the SAP DB database, the data service is Oracle Solaris Cluster HA for MaxDB. See Oracle Solaris Cluster Data Service for MaxDB Guide. For the Oracle database, the data service is Oracle Solaris Cluster HA for Oracle. See Oracle Solaris Cluster Data Service for Oracle Guide.
NFS file system	Oracle Solaris Cluster HA for NFS. For more information about this data service, see Oracle Solaris Cluster Data Service for Network File System (NFS) Guide .

Overview of the Installation and Configuration Process for HA for SAP Web Application Server

The following table summarizes the tasks for installing and configuring HA for SAP Web Application Server and provides cross-references to detailed instructions for performing these tasks. Perform the tasks in the order that they are listed in the table.

TABLE 1-2 Tasks for Installing and Configuring HA for SAP Web Application Server

Task	For Instructions, Go To ...
Plan the SAP Web Application Server installation	Your SAP documentation <i>Oracle Solaris Cluster Data Services Planning and Administration Guide</i> “Planning the HA for SAP Web Application Server Installation and Configuration” on page 14
Install SAP Web Application Server and configure the application to run in a cluster	“Installing and Configuring SAP Web Application Server” on page 20
Verify the SAP Web Application Server installation and configuration	“Verifying the SAP Web Application Server Installation and Configuration” on page 36
Install the HA for SAP Web Application Server packages	“Installing the HA for SAP Web Application Server Packages” on page 43
Register and configure the HA for SAP Web Application Server data service	“Registering and Configuring HA for SAP Web Application Server” on page 45
(Optional) Use alternate project identifier (ID)	“Using Alternate Project Identification” on page 65
(Optional) Tune the HA for SAP Web Application Server fault monitors	“Tuning the HA for SAP Web Application Server Fault Monitors” on page 65
Verify the HA for SAP Web Application Server installation and configuration	“Verifying the HA for SAP Web Application Server Installation and Configuration” on page 70

Planning the HA for SAP Web Application Server Installation and Configuration

This section contains the information that you need to plan your HA for SAP Web Application Server installation and configuration.

Note – Before you begin, consult your SAP documentation for configuration restrictions and requirements that are not stated in Oracle Solaris Cluster documentation or imposed by Oracle Solaris Cluster software.

Be sure to read all SAP notes that pertain to your release of SAP Web Application Server. For more information, see the SAP documentation at <http://service.sap.com/ha>.

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

Configuration Restrictions



Caution – Your data service configuration might not be supported if you do not observe these restrictions.

For restrictions that apply to all data services, see *Oracle Solaris Cluster 3.3 5/11 Release Notes*. The following configuration restriction applies only to HA for SAP Web Application Server.

- The maximum length of the node names depends on the SAP release. Refer to the SAP installation guide for your release of SAP. This limitation is an SAP software restriction.
- Configure the database resource to be in a different resource group from the SAP enqueue server resource, if possible.

However, if you are using Oracle as the database, and if you must configure Oracle in the same resource group as the SAP enqueue server resource, you must ensure that the value of the `restart_type` extension property for Oracle Solaris Cluster HA for Oracle is set to `RESOURCE_RESTART`. This property setting means that if the response to a fault in the Oracle database is to restart the Oracle resource, only the Oracle database is restarted. If this property is set to `RESOURCE_GROUP_RESTART`, and if the response to a fault in the Oracle database is to restart the Oracle resource, all the resources in the resource group are restarted. However, if the SAP replica server is configured and online on another node, the SAP enqueue server cannot be restarted locally. Therefore, the `restart_type` property must be set to `RESOURCE_RESTART`.

Configuration Requirements



Caution – Configuration requirements represent actions that you must perform. If your data service configuration does not satisfy these requirements, the data service configuration might not be supported.

For requirements that apply to all data services, see “[Configuration Guidelines for Oracle Solaris Cluster Data Services](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

The following configuration requirements apply only to HA for SAP Web Application Server.

- The fault monitor probe for the resource type of the SAP message server requires the `msprot` program. You must download this binary from <http://service.sap.com>. Refer to the relevant SAP note for information about obtaining and using the `msprot` program.

Supported Data Service Configurations

HA for SAP Web Application Server supports configurations that conform to the requirements that are specified in the previous section.

All configurations of HA for SAP Web Application Server have the following requirements:

- The SAP enqueue server is configured as a failover resource.
- The SAP replica server is configured as a failover resource.
- The SAP message server is configured as a failover resource.
- The SAP web application server component can be configured either as a failover or as a scalable data service resource.
- The SAP J2EE engine can be configured either as a failover or as a scalable data service resource.
- The SAP enqueue server and the SAP message server are resources in the SAP central services resource group. The SAP replica server is a resource in the SAP replica server resource group.
- The SAP replica server resource is configured to depend on the SAP enqueue server resource. This dependency ensures that the SAP replica server does not attempt to start until the SAP enqueue server is online.
- The SAP central services resource group is configured to have weak *positive* affinity with the SAP replica server resource group. This affinity ensures that, if a hardware or software failure occurs on the node or zone that is mastering the SAP central services resource group, the SAP central services resource group fails over to the node or zone where the SAP replica server resource group is currently running.

- The SAP replica server resource group is configured to have strong *negative* affinity with the SAP central services resource group. This affinity ensures that, if the SAP central services resource group fails over, the SAP replica server resource group is off-loaded from the node where it is currently running before the SAP central services resource group is brought online on that same node. The SAP replica server resource group is started on another node, if one is available.

The following examples show the following supported configurations of HA for SAP Web Application Server.

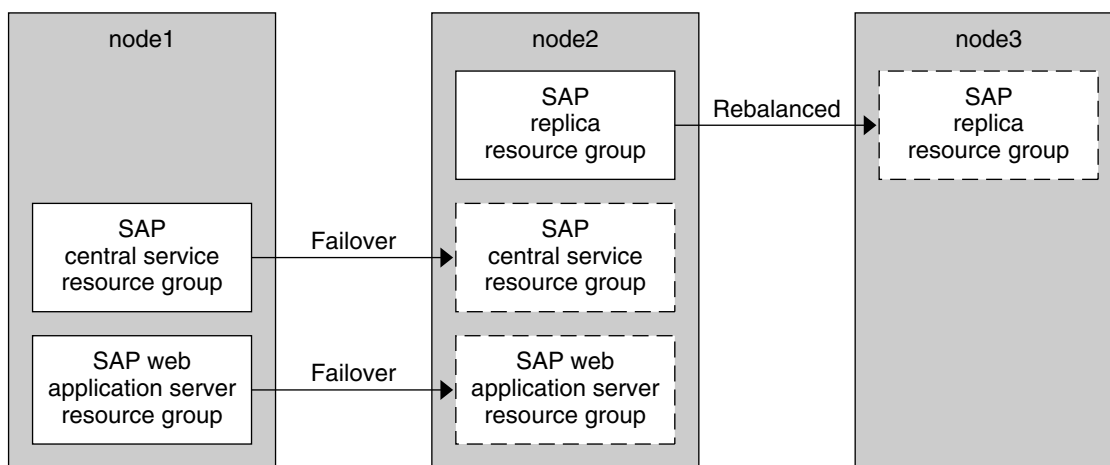
- The SAP web application server component is configured as a failover resource.
- The SAP web application server component is configured as a scalable resource.

EXAMPLE 1-1 SAP Web Application Server Component Configured as a Failover Resource

This example shows a standard configuration of HA for SAP Web Application Server with the SAP web application server component that is configured as a failover resource.

The boxes that have a solid border represent the location of the resource groups before failover.

The boxes that have a dashed border represent the location of the resource groups after a failover because of a problem on the first node. The SAP central services resource group fails over, and the SAP replica server resource group consequently moves to another node. The SAP web application server component resource group also fails over.



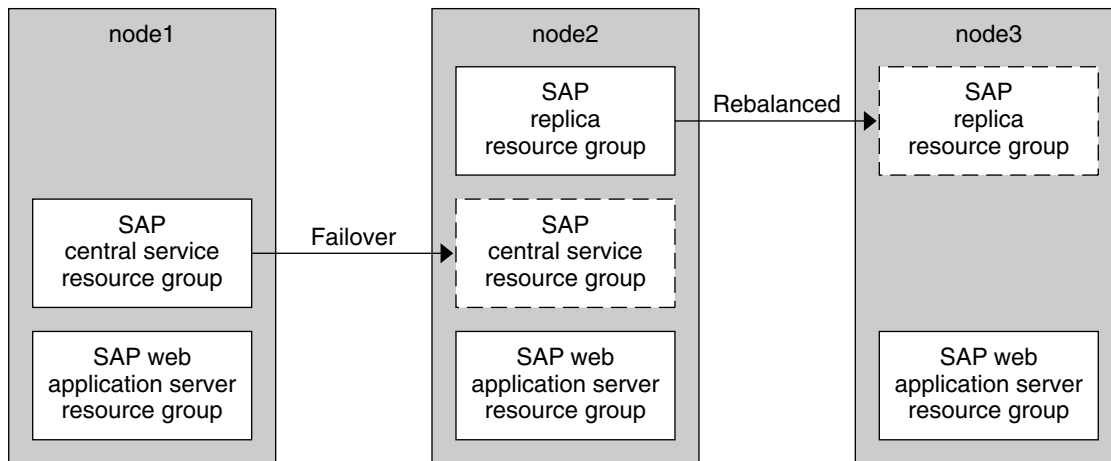
EXAMPLE 1-2 SAP Web Application Server Component Configured as a Scalable Resource

This example shows a standard configuration of HA for SAP Web Application Server with the SAP web application server component that is configured as a scalable resource.

The boxes that have a solid border represent the location of the resource groups before failover.

EXAMPLE 1-2 SAP Web Application Server Component Configured as a Scalable Resource
(Continued)

The boxes that have a dashed border represent the location of the resource groups after a failover because of a problem on the first node. As in the previous example, the SAP central services resource group fails over, and the SAP replica server resource group consequently moves to another node. Because the SAP web application server component resource group is scalable, it does not fail over, but the corresponding resource groups on the other node continue running.



Configuration Considerations

The following configuration considerations affect the installation and configuration of HA for SAP Web Application Server.

- The SAP enqueue server and SAP replica server run on different cluster nodes. Therefore, the SAP application files (binary files, configuration files, and parameter files) can be installed either on the global file system or on the local file system. However, the application files for each of these applications must be accessible at all times from the nodes on which these applications are running.

See “[Configuration Guidelines for Oracle Solaris Cluster Data Services](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. This section details the advantages and disadvantages of placing the SAP binaries on the local file system or on the cluster file system.

- The default value of the `Retry_count` system property for the SAP enqueue server is 0. This value ensures that the SAP enqueue server fails over after the first failure. If replication is running, do *not* modify this default value because enqueue locks would be lost. When replication is in operation and the Enqueue server is restarted, even on the same node, the locks are no longer valid.
- The resource group for the SAP web application server component can be configured to be a failover resource group or a scalable resource group. If the SAP web application server component is configured to be a scalable resource group, the directory `/usr/sap/SAPSID/INSTANCE_NAME` must be local on each node where the SAP web application server component is installed, as explained in [“How to Modify the Installation for a Scalable SAP Web Application Server Component” on page 28](#). Note that `SAPSID` represents the SAP system identification and `INSTANCE_NAME` represents the name of the SAP web application server instance.
- During the installation and configuration process, track any system files that you change, because you need to copy those files to all the nodes that are to run the application.
- For each new installation, the SAP start and stop scripts are overwritten. Therefore, be sure to modify these scripts as needed at each new installation.

Configuration Planning Questions

Use the questions in this section to plan the installation and configuration of HA for SAP Web Application Server. Write the answers to these questions in the space that is provided on the data service worksheets in [“Configuration Worksheets” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*](#).

- Will you run the SAP web application server component of the application as a failover resource or as a scalable resource?
- Will you run the SAP J2EE engine as a failover resource or as a scalable resource?
- What is the logical hostname for clients that will access the data service?
- Where will the system configuration files reside?

See [“Configuration Guidelines for Oracle Solaris Cluster Data Services” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*](#) for the advantages and disadvantages of placing the SAP binaries on the local file system or on the cluster file system.

Installing and Configuring SAP Web Application Server

To enable HA for SAP Web Application Server to make SAP Web Application Server highly available, additional installation and configuration operations are required. These operations supplement the standard installation and standard configuration of the SAP Web Application Server.

The procedures in this section describe the installation and configuration of the following components of the SAP Web Application Server.

- SAP central services, which include these services:
 - SAP enqueue server
 - SAP replica server
 - SAP message server
- SAP web application server for one of the following engines:
 - ABAP
 - ABAP+J2EE
 - J2EE

Configuring Your Highly Available Database

SAP supports various databases. You must configure the resource type, the resource group, and the resources for the database that you plan to use so that the database will be highly available. See details in the appropriate Oracle Solaris Cluster Data Services document for the database that you plan to use.

- If you plan to use SAP DB as the database, configure the Oracle Solaris Cluster HA for MaxDB data service. See [Oracle Solaris Cluster Data Service for MaxDB Guide](#).
- If you plan to use Oracle as the database, configure the Oracle Solaris Cluster HA for Oracle data service. See [Oracle Solaris Cluster Data Service for Oracle Guide](#).

▼ How to Install and Configure the SAP Web Application Server and the SAP J2EE Engine

- 1 **For failover resource only:** On one node of the cluster, install the SAP Web Application Server software.

Refer to the SAP installation documentation.

Note – If you are installing SAP 7.0 or NW2004 SR1, use the `SAPINST_USE_HOSTNAME` parameter to install the SAP application using the logical host. You can also use the High Availability installation option to separate the SAP central services from the central instance automatically.

2 For scalable resource only: On each node on which you plan to run the scalable SAP web application server component resource group.

a. Create a local file system.

This file system can be defined as you choose, as in the following example.

```
# mkdir /usr/sap/local/SAPSID/INSTANCE_NAME
```

```
# chown sapsidadm:sapsys /usr/sap/local/SAPSID/INSTANCE_NAME
```

Note that `SAPSID` represents the SAP system identification and `INSTANCE_NAME` represents the name of the SAP web application server instance.

b. As user *sapsidadm*, create symbolic links to the dialog instance.

On each node, create a symbolic link to the local file system from the required directory path for the installation, as in the following example.

```
$ ln -s /usr/sap/local/SAPSID/INSTANCE_NAME \
/usr/sap/SAPSID/INSTANCE_NAME
```

3 For scalable resource only: On all the nodes or zones of the cluster install the SAP Web Application Server or SAP J2EE engine.

Install the same SAP Web Application Server or SAP J2EE engine software using the same `SAPSYSTEM` number separately on each node or zone that can potentially master the corresponding resource. This requirement is applicable only if you are creating the corresponding resource to be scalable.

Refer to the SAP installation documentation.

4 If profiles for the SAP enqueue server and the SAP replica server have not been created during installation, create them manually.

Refer to the SAP documentation at <http://service.sap.com/ha>.

Note – The `SAPSYSTEM` parameter in the SAP enqueue server profile and in the SAP replica server profile must have the same value.

5 Remove the startup of the SAP enqueue server from the SAP start profile.

In the Oracle Solaris Cluster environment, the SAP enqueue server resource starts the SAP enqueue server application. Therefore, if the SAP start profile contains the startup of the SAP enqueue server, remove it. Otherwise, the SAP enqueue server will be started more than once.

6 Are you using SAP 6.4 or SAP 7.0 or NW2004 SR1?

- If no, skip to [Step 8](#).
- If yes, proceed to [Step 7](#).

7 Become user *sapsidadm*.

In the home directory of *sapsidadm*, create a wrapper script that invokes the appropriate *startsap* and *stopsap* script generated by the SAP installer with necessary parameters.

```
# echo "/usr/sap/SID/SYS/exe/run/startsap r3 instance-name logical-host" \  
> $SAPSID_HOME/startsap_instance-number  
  
# chmod 755 $SAPSID_HOME/startsap_instance-number  
  
# echo "/usr/sap/SID/SYS/exe/run/stopsap r3 instance-name logical-host" \  
> $SAPSID_HOME/stopsap_instance-number  
  
# chmod 755 $SAPSID_HOME/stopsap_instance-number
```

Proceed to [Step 11](#)

8 Create a script to return logical hostnames for the SAP message server and the SAP web application server components.

Create a script named *loghost*, which returns the logical hostnames for each instance of both the SAP message server and the SAP web application server components. The script must be located in the directory *\$HOME*, where *\$HOME* specifies the home directory of the SAP user. The following commands provide an example of the *loghost* script.

```
if [ "$1" = "DVEBMGS00" ]; then  
    echo loghost-1;  
fi  
if [ "$1" = "SCS01" ]; then  
    echo loghost-2;  
fi  
if [ "$1" = "D02" ]; then  
    echo loghost-3;  
fi
```

Note – If the SAP web application server component is configured as a scalable resource, you will modify this script in a later section, “[How to Modify the Installation for a Scalable SAP Web Application Server Component](#)” on page 28.

9 If you are using the SAP J2EE engine, modify the loghost script to return logical hostnames for the SAP J2EE engine.

Modify the script loghost, which was created in [Step 8](#), to return the logical hostnames for each instance of the SAP J2EE engine. The script is located in the directory \$HOME, where \$HOME specifies the home directory of the SAP user. The following commands provide an example of the modification of the loghost script.

```
if [ "$1" = "JC00" ]; then
    echo loghost-4;
fi
if [ "$1" = "SCS02" ]; then
    echo loghost-5;
fi
if [ "$1" = "J02" ]; then
    echo loghost-6;
fi
```

10 Set the file permissions for the script so that it is executable.

```
# chmod 755 $HOME/loghost
```

11 Modify the SAP start and stop scripts as follows:

Note – In the following steps you will be updating the SAP start and stop scripts. The initial set of updates pertain to all SAP instances being put under the control of Oracle Solaris Cluster and the second set of updates depend on the instance being put under Oracle Solaris Cluster.

a. Create copies of the original SAP start and stop scripts, as in the following example.

```
$ cp /sapmnt/SID/exe/startsap /sapmnt/SID/exe/startsap.orig
$ cp /sapmnt/SID/exe/stopsap /sapmnt/SID/exe/stopsap.orig
```

b. Ensure the uniqueness of the instance names.

Add a sort -u command to the end of the line that begins with INSTANCE= in the SAP start and stop scripts. This command sorts all the instance names that are found and retains only the unique names.

The original line is the following, where *arg* is the argument number, for example, 1 or 2.

```
INSTANCE='echo $arg | awk '/SCS[0-9][0-9]/{print $1}
/ASCS[0-9][0-9]/{print $1} /DVEBMGS[0-9][0-9]/{print $1}
/JC[0-9][0-9]/{print $1} /D[0-9][0-9]/{print $1}
/J[0-9][0-9]/{print $1} /G[0-9][0-9]/{print $1}'
```

After you add a pipe to a sort -u command at the end, the line is the following, where *arg* is the argument number, for example, 1 or 2.

```
INSTANCE='echo $arg | awk '/SCS[0-9][0-9]/{print $1}
/ASCS[0-9][0-9]/{print $1} /DVEBMGS[0-9][0-9]/{print $1}
/JC[0-9][0-9]/{print $1} /D[0-9][0-9]/{print $1}
/J[0-9][0-9]/{print $1} /G[0-9][0-9]/{print $1}' | sort -u'
```

- c. In order to source the user's profile and thus also source the SAP-specific environment files, add the following line as the second line of the SAP start and stop scripts.

```
. $HOME/.profile
```

Note – The preceding steps affect both SAP message server and SAP web application server.

- d. For SAP message server only — create a copy of the SAP start and stop scripts, as in the following example. This copy of the SAP start script will be used to start up the SAP message server resources.

```
$ cp /sapmnt/SID/exe/startsap /sapmnt/SID/exe/startsap_msg_server
```

```
$ cp /sapmnt/SID/exe/stopsap /sapmnt/SID/exe/stopsap_msg_server
```

- e. For SAP web application server only — create a copy of the SAP start and stop scripts, as in the following example. This copy of the SAP start script will be used to start up the SAP web application server resources.

```
$ cp /sapmnt/SID/exe/startsap /sapmnt/SID/exe/startsap_webas_server
```

```
$ cp /sapmnt/SID/exe/stopsap /sapmnt/SID/exe/stopsap_webas_server
```

- f. Update the SAP start and stop scripts to call the script that returns logical hostnames.

You need to run the following command for SAP central services and SAP Web Application Server resources.

Note – This step is not applicable for SAP 7.0 or NW2004 SR1.

In the section for setting HOSTNAME, insert the name of the script `$HOME/loghost`, which you created in [Step 8](#). This action is accomplished by replacing the line `HOSTNAME='hostname'` with the lines in the following example.

```
< remove
> add

# Set HOSTNAME
case 'uname' in
    OS/390* | z/OS* | AIX* | BOS*)
        HOSTNAME='hostname -s'
        ;;
    *)
        < HOSTNAME='hostname'
        > if [ $# -eq 2 ]; then
        >     HOSTNAME='$HOME/loghost $2'
        > else
        >     HOSTNAME='hostname'
        > fi
        ;;
esac
```


- 12 If you are configuring a resource for SAP 7.0 or NW2004 SR1, add the following to the LD_LIBRARY_PATH to the end of the .profile filename in the home directory of user *sapsidadm*.**
`/usr/sap/sapsid/SYS/exe/run:/oracle-client-dir/instantclient`

- 13 Remove the /net entry from /etc/auto_master.**

This task disables name service maps and enables the SAP central services instance to fail over in case of network failures.

- 14 If the Process Monitor Facility (PMF) will be used with the SAP web application server component, the `saposc1` program must be started outside of the cluster environment on all the nodes that will run the SAP Web Application Server.**

The `SUNW.sapwebas` resource type represents the SAP web application server component in a Oracle Solaris Cluster configuration. The extension property `Webas_Use_Pmf` for this resource type determines if PMF will be used with the SAP web application server component.

If PMF is used, you must start the `saposc1` program outside of the cluster environment so that PMF does not stop the `saposc1` program when it stops the resource for the SAP web application server component.

The `saposc1` program must be available to all the nodes that are running the SAP Web Application Server. Therefore, the program must be either in a global file system or in the local file system of each node.

- a. If the `saposc1` program is on the global file system and you want it to be on the local file systems, copy the program to the local file systems by performing the following actions on each node:**

- On the installation node, if the `saposc1` program was started separately, stop the `saposc1` program.
- If the SAP system is running, stop the SAP system.
- If the file system is not mounted, mount it to the installation node.
- Copy the `saposc1` executable file from the installation node to a local directory on the target node.

```
# cp /usr/sap/SAPSID/SYS/exe/saposc1 destination-directory
```

Note that `SAPSID` is the SAP system identification.

- b. Remove the startup of the `saposc1` program from the SAP start script of the SAP web application server component that will be configured to use PMF. This action is also mentioned in [Step 11](#), together with other modifications to the SAP start and stop scripts.**

- c. Start the `saposc1` program.**

- If the program is on the global file system, start the program from the global location.

- If the program is on the local file system, start the program from the local directory on each node.

15 Modify the file names and contents to use logical hostnames instead of physical hostnames.

Note – This step is not applicable for SAP 7.0 or NW2004 SR1.

The standard SAP Web Application Server installation uses the physical hostname of the node on which the SAP system is installed. You must modify SAP Web Application Server to use a logical hostname so that SAP Web Application Server works in a Oracle Solaris Cluster environment.

Note – If the SAP web application server component is configured as a scalable resource, you will make additional modifications in a later section, [“How to Modify the Installation for a Scalable SAP Web Application Server Component”](#) on page 28.

a. Make sure that the names of the “.” files in the home directory of the SAP user do not contain the physical hostname.

In the following example, the physical hostname is removed from the names of the “.” files.

```
for i in `ls *.physical-hostname.`
do
mv $i `echo $i | sed "s/_physical-hostname/"`
done
```

b. Make sure that the names and contents of the database “.” files refer to logical hostname that is used by the database and not to physical hostnames.

Note – The following substeps (c, d, and e) are not applicable for scalable SAP web application server and SAP J2EE engine instances.

c. Change the file names and contents of the profile files to use the logical hostname corresponding to the individual component instead of physical hostnames.

These files are located in `/usr/sap/SAPSID/SYS/profile`, where *SAPSID* is the SAP system identification.

d. Add the following logical hostname entries to each `SAPSID_INSTANCE_NAMESYSTEM_NUMBER_logical-hostname` file that is located in the SAP profile directory.

Note that *SAPSID* is the SAP system identification, *INSTANCE_NAME* is the SAP instance name, and *SYSTEM_NUMBER* is the SAP system number.

`SAPLOCALHOST=logical-hostname`

`SAPLOCALHOSTFULL=logical-hostname.domain`

- e. **Replace the physical hostname with the logical hostname in the file**
`/usr/sap/SAPSID/INSTANCE_NAME/igs/conf/igs.xml`.

Note that *SAPSID* is the SAP system identification and *INSTANCE_NAME* is the SAP instance name.

16 Add or modify the parameter `enq/serverhost` in the SAP instance profile.

Note – This step is not applicable for SAP 7.0 or NW2004 SR1.

After installation, the parameter `enq/serverhost` in the SAP instance profile is set to the physical hostname. Modify this parameter to contain the name of the logical host on which the SAP enqueue server will be running.

17 Make sure that the database is online and under the control of Oracle Solaris Cluster.

For information about setting up the Oracle Solaris Cluster HA for MaxDB database, see [Oracle Solaris Cluster Data Service for MaxDB Guide](#).

18 If you are using the SAP J2EE engine, modify the SAP J2EE engine settings to reference the logical hostname.

Note – This step is not applicable for SAP 7.0 or NW2004 SR1.

a. Determine the location of the configuration scripts.

- If the ABAP engine component is installed without the SAP J2EE engine component, or if the SAP J2EE engine component is installed as a standalone component, the scripts are located in the directory
`/usr/sap/SAPSID/JCINSTANCE_NUMBER/j2ee/configtool`.
- If The ABAP engine component is installed with the SAP J2EE engine, the scripts are located in the directory
`/usr/sap/SAPSID/DVEBMGSINSTANCE_NUMBER/j2ee/configtool`.

b. Run the `configtool.sh` script, which is located in the directory that was determined in [Step a](#).

Use this script to change all occurrences of a physical hostname to the corresponding logical hostname. This action includes setting the instance host and the JDBC URL to point to the logical host for the database.

c. Bring online the database with the logical host for the database.

- d. **Use the SAP configuration tool to modify the settings in the remaining steps of this procedure.**

To start the SAP configuration tool, you can use the script `offlineconfigeditor.sh`, which is located in the directory that was determined in [Step a](#).

- e. **In the `LockingManager` section, modify `enqu.host` to refer to the logical hostname for the SAP enqueue server.**

Change this entry under all the settings (the general and the instance-specific).

- f. **In the `LockingManager` section, modify all occurrences of `enq.profile.filename` to use the logical hostname.**

Change this entry under all the settings (the general and the instance-specific).

For example, change `SAPSID_JCINSTANCE_NUMBER_physicalhost` to `SAPSID_JCINSTANCE_NUMBER_logicalhost`. The new file name should be the same as the file name in the file `/sapmnt/SAPSID/profile`.

- g. **In the `ClusterManager` section, change `instance.ms.host` to refer to the logical hostname for the SAP message server.**

Change this entry under all the settings (the general and the instance-specific).

- h. **Modify the `instance.properties.IDxxxxxx` to refer to the logical host.**

For each `instance.properties.IDxxxxxx`, modify all occurrences of a physical hostname to the corresponding logical hostname.

- i. **Ensure that the `enqu.port` parameter and the URL in the `dbpool` parameter have the correct settings.**

Note – For information about updates to SAP profiles, see the SAP documentation at <http://service.sap.com/ha>.

▼ How to Modify the Installation for a Scalable SAP Web Application Server Component

The SAP web application server component of the SAP Web Application Server platform can be configured either as a failover resource or as a scalable resource.

- If you configure the SAP web application server component as a failover resource, skip this section.
- If you configure the SAP web application server component as a scalable resource, you must perform the following steps.

1 Update the script \$HOME/loghost to return the physical hostname or a string.

A scalable resource group does not contain a logical host. Therefore, if a resource group for the SAP web application server component is a scalable SAP J2EE engine resource, you must update the script \$HOME/loghost to return the physical hostname. In the following example, J85 is the full name of the dialog instance.

```
if [ "$1" = "J85" ]; then
    echo 'hostname';
fi
```

2 Create a copy of the SAP start and stop scripts, as in the following example.

```
$ cp /sapmnt/SID/exe/startsap_webas_server /sapmnt/SID/exe/startsap_webas_server_scal
```

```
$ cp /sapmnt/SID/exe/stopsap_webas_server /sapmnt/SID/exe/stopsap_webas_server_scal
```

3 Update the SAP start and stop scripts that you created in the previous step with unique names for the log files.

When the SAP web application server component resource group is configured to be scalable, multiple instances of the application can be running simultaneously on different nodes. If all instances write to the same log file, they overwrite previously written information. Therefore, change the names of the log files that are specified in the SAP start and stop scripts so that they have unique names. Renaming the log files ensures that each node writes to a unique file. In the following example, the node name is appended to the log file name.

Example of entry in script before updating:

```
LOGFILE=$R3S_LOGDIR/'basename ${0}_${INSTANCE}'.log'
```

Example of entry in script after updating:

```
LOGFILE=$R3S_LOGDIR/'basename ${0}_${INSTANCE}'_'uname -n'.log
```

For more information on how to update the SAP start and stop scripts, see [“How to Install and Configure the SAP Web Application Server and the SAP J2EE Engine” on page 20](#)

4 Make sure that the parameter enq/serverhost in the SAP instance profile contains the logical hostname of the SAP enqueue server.**5 Verify the instance parameters.**

Note – This step is only applicable to SAP J2EE engine instances.

Start the configuration tool with the script `offlineconfigeditor.sh`, which is located in the directory `/usr/sap/SAPSID/JCINSTANCE_NUMBER/j2ee/configtool`.

- Ensure that the `cluster_data` instance parameter is set to `PropertySheet instance.properties.IDxxxxxx`.
- Ensure that `instance.ms.host` is set to the logical hostname.

▼ How to Enable the SAP Web Application Server to Run in a Cluster

The following resource groups are created in this procedure:

- SAP central services resource group, to contain the following resources:
 - SAP enqueue server resource
 - SAP message server resource
 - Logical hostname for these resources
- SAP replica server resource group, to contain the following resources:
 - SAP replica server resource
 - Logical hostname for this resource
- SAP web application server resource group, to contain the following resources:
 - SAP web application server component resource
 - Logical hostname for this resource, if the resource is configured as a failover resource

Note that the procedure to enable the SAP J2EE engine to run in a cluster is located in a separate section. See [“How to Enable the Stand-Alone SAP J2EE Engine to Run in a Cluster”](#) on page 34.

- 1 **Become superuser on a cluster node.**
- 2 **Create a resource group for the SAP central services.**

The SAP central services resource group is a failover resource group to contain the SAP enqueue server resource, the SAP message server resource, and the logical hostname for these resources.

```
# clresourcegroup create central-rg
central-rg
```

Specifies the name of the resource group to be created. Choose a unique name for each resource group within the cluster.

- 3 **Add a logical hostname resource to the resource group that you created in [Step 2](#).**

```
# clreslogicalhostname create -g central-rg central-logical-hostname
-g central-rg
```

Specifies that the logical hostname resource is to be added to the resource group named *central-rg* that you created in [Step 2](#).

```
central-logical-hostname
```

Specifies that the logical hostname of the SAP central services resource is *central-logical-hostname*.

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

4 Bring online the SAP central services resource group.

```
# clresourcegroup online -M central-rg
```

`-M`

Specifies that the resource group is to be brought over into the managed state.

5 Create a resource group for the SAP replica server.

The SAP replica server resource group is a failover resource group to contain the SAP replica server resource and the logical hostname for this resource.

```
# clresourcegroup create repl-rg
```

6 Add a logical hostname resource to the resource group that you created in [Step 5](#).

```
# clreslogicalhostname create -g repl-rg saprepl-logical-hostname
```

`-g repl-rg`

Specifies the name of the resource group.

`saprepl-logical-hostname`

Specifies the logical hostname of the SAP replica server resource.

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

7 Bring online the SAP replica server resource group.

```
# clresourcegroup online -M repl-rg
```

`-M`

Specifies that the resource group is to be brought into the managed state.

8 Set weak positive affinity between the SAP central services resource group and the SAP replica server resource group.

The weak positive affinity setting ensures that, in case of failover, the SAP central services resource group fails over to the node where the SAP replica server resource group has been running.

```
# clresourcegroup set -p RG_affinities=+repl-rg central-rg
```

`central-rg`

Specifies the name of the resource group to be modified.

`-p RG_affinities=+repl-rg`

Specifies that the `central-rg` resource group has weak positive affinity with the `repl-rg` resource group.

central-rg

Specifies the name of the resource group *central-rg* to be modified

9 If the SAP central services resource group and the SAP replica server resource group are online on the same node, switch one of them to another node.

The two resource groups must be mastered on different nodes or zones before the strong negative affinity can be set between the resource groups.

```
# clresourcegroup switch -n node repl-rg
```

-n node

Specifies the node to which the resource group is to be switched.

repl-rg

Specifies the name of the resource group to be switched. This resource group can be either the SAP central services resource group or the SAP replica server resource group.

10 Set strong negative affinity between the SAP replica server resource group and the SAP central services resource group.

The strong negative affinity setting ensures that node failover behavior is appropriate. The SAP central services resource group fails over to the node where the SAP replica server resource group has been running. The SAP replica server resource group then fails over to another available node.

The SAP replica server resource group is never brought online nor allowed to remain online on a node on which the SAP central services resource group is online.

```
# clresourcegroup set -p RG_affinities=--central-rg repl-rg
```

-p RG_affinities=--central-rg

Specifies that the *repl-rg* resource group has strong negative affinity with the *central-rg* resource group.

repl-rg

Specifies the name of the resource group to be modified.

11 Create a resource group for the SAP web application server component.

The SAP web application server resource group can be configured as a failover or scalable resource group to contain the resource for the SAP web application server component. If the SAP web application server is configured as a failover resource, the logical hostname for this resource is also contained in the SAP web application server resource group.

- To create a failover resource group, run the following command.

```
# clresourcegroup create webas-rg
```

- To create a scalable resource group, run the following command.

```
# clresourcegroup create \  
-p Maximum primaries=value -p Desired primaries=value webas-rg
```


-p *Maximum primaries=value*

Specifies the maximum number of primary nodes for this scalable resource group.

-p *Desired primaries=value*

Specifies the desired number of primary nodes for this scalable resource group.

webas-rg

Specifies the name of the failover resource group to be added. This name can be your choice but must be unique for the resource groups within the cluster.

12 If the resource group that you created in [Step 11](#) is configured as a failover resource group, add a logical hostname resource to the resource group.

If the resource group that you created in [Step 11](#) is configured as a scalable resource group, skip this step.

```
# clreslogicalhostname create -g webas-rg webas-logical-hostname
```

-g *webas-rg*

Specifies the name of the resource group.

webas-logical-hostname

Specifies the logical hostname *saprepl-logical-hostname* of the SAP replica server resource.

By default the name of the logical-host resource is set to the same name as this. If you wish to specify a separate name then place the name of the resource at the end of the command listing.

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

13 Bring online the SAP web application server resource group.

```
# clresourcegroup online -M webas-rg
```

-M

Specifies that the resource group is to be brought into the managed state.

webas-rg

Specifies the name of the resource group that needs to be brought online.

14 (Optional) Consider configuring your cluster to off-load noncritical resource groups.

You might plan to run a noncritical, lower-priority SAP web application server component resource on a node to which a critical, higher-priority SAP central services resource can fail over. In this situation, consider setting strong negative affinity between the resource groups. This setting ensures that, if a higher-priority SAP central services resource fails over to the node where a lower-priority SAP web application server component resource is running, the lower-priority resource is off-loaded, thereby automatically freeing the node's resources to be used for the critical SAP central services resource.

```
# clresourcegroup set -p RG_affinities=--central-rg webas-rg
```

`-p RG_affinities=- -central-rg`

Specifies that the *webas-rg* resource group has strong negative affinity with the *central-rg* resource group. If the *central-rg* resource group fails over to the node where the *webas-rg* resource group is running, the *webas-rg* resource group is off-loaded.

webas-rg

Specifies the name of the resource group to be modified.

- 15 Copy all system files that were changed during the SAP Web Application Server installation and configuration process to all the nodes or zones that are to run the SAP Web Application Server resources.**

These files might include the following:

- /etc/hosts
- /etc/group
- /etc/passwd
- /etc/services

- 16 Become super user on all of the nodes or zones.**

- 17 Configure the /etc/nsswitch.conf file so that SAP web application server starts and stops correctly if a switchover or a failover occurs.**

On each node that can master the logical host that runs SAP web application server, include the following entries in the /etc/nsswitch.conf file.

```
passwd:    files [NOTFOUND=return] nis [TRYAGAIN=0]
publickey: files [NOTFOUND=return] nis [TRYAGAIN=0]
project:   files [NOTFOUND=return] nis [TRYAGAIN=0]
group:     files [NOTFOUND=return] nis [TRYAGAIN=0]
```

SAP web application server uses the `su - user` command to start, stop, and probe the service.

The network information name service might become unavailable when a cluster node's public network fails. Adding the preceding entries ensures that the `dpmon -p` command does not refer to the NIS/NIS+ name services if the network information name service is unavailable.

▼ How to Enable the Stand-Alone SAP J2EE Engine to Run in a Cluster

- 1 Create a resource group for the SAP J2EE engine.**

The SAP J2EE engine resource group can be configured as a failover or scalable resource group to contain the resource for the SAP J2EE engine. If the SAP J2EE engine is configured as a failover resource, the logical hostname for this resource is also contained in this resource group.

- To create a failover resource group, run the following command.

```
# clresourcegroup create j2ee-rg
```

- To create a scalable resource group, run the following command.

```
# clresourcegroup create \  
-p Maximum primaries=value -p Desired primaries=value j2ee-rg
```

```
-p Maximum primaries=value
```

Specifies the maximum number of primary nodes for the scalable resource group.

```
-p Desired primaries=value
```

Specifies the desired number of primary nodes for the scalable resource group.

j2ee-rg

Specifies the name of the resource group to be added. This name can be your choice but must be unique for the resource groups within the cluster. Use this name when configuring the SAP J2EE engine resource.

2 If the resource group that you created in [Step 1](#) is configured as a failover resource group, add a logical hostname resource to the resource group.

If the resource group that you created in [Step 1](#) is configured as a scalable resource group, skip this step.

```
# clreslogicalhostname create -g j2ee-rg j2ee-logical-hostname
```

```
-g j2ee-rg
```

Specifies the logical hostname resource to be added to the resource group that you created in [Step 1](#).

j2ee-logical-hostname

Specifies the logical hostname of the SAP J2EE engine resource. Use this name when configuring the SAP J2EE engine resource.

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

3 Bring online the SAP J2EE engine resource group.

```
# clresourcegroup online -M j2ee-rg
```

```
-M
```

Specifies that the resource group is to be brought into the managed state.

j2ee-rg

Specifies the name of the resource group that needs to be brought online.

Verifying the SAP Web Application Server Installation and Configuration

Before you install the HA for SAP Web Application Server packages, verify that the SAP Web Application Server software is correctly installed and configured to run in a cluster. These procedures do *not* verify that the SAP Web Application Server application is highly available because you have not yet installed your data service.

Note – For more information, see the SAP documentation at <http://service.sap.com/ha>.

The procedures in this section verify the installation and configuration of the following SAP Web Application Server components.

- SAP central services, which includes these servers:
 - SAP enqueue server
 - SAP replica server
 - SAP message server
- SAP web application server component
- SAP J2EE engine

▼ How to Verify the Installation and Configuration of the SAP Enqueue Server and the SAP Replica Server

Perform this procedure on each set of two nodes or zones that can master the SAP central services resource group and the SAP replica server resource group.

For a description of the extension properties for the SAP enqueue server resource type, `SUNW.sapenq`, see “[SUNW.sapenq Extension Properties](#)” on page 77. For a description of the extension properties for the SAP replica server resource type, `SUNW.saprepl`, see “[SUNW.saprepl Extension Properties](#)” on page 80.

- 1 **Become the superuser on one node, `Node1`.**
- 2 **Bring the SAP central services resource group online on `Node1`.**

```
# clresourcegroup switch -n node1 central-rg  
-n node1
```

Specifies the name of the node or zone on which the resource group is to be brought online.

```
central-rg
```

Specifies the name of the resource group to be brought online.

3 Become the administration user for the SAP enqueue server on Node1.

The extension property `SAP_User` for the `SUNW.sapenq` resource type specifies the name of the administration user.

4 Start the SAP enqueue server manually on Node1.

```
# enq_server_cmd pf=enq_profile
```

enq_server_cmd

Specifies the full path to the SAP enqueue server executable. The extension property `Enqueue_Server` for the `SUNW.sapenq` resource type contains this value. The name of the SAP enqueue server executable file is `enserver`.

pf=enq_profile

Specifies the full path to the profile for the SAP enqueue server. The extension property `Enqueue_Profile` for `SUNW.sapenq` resource type contains this value.

5 Confirm that the SAP enqueue server is up on Node1.

The name of the SAP enqueue server executable file is `enserver`.

```
# ps -ef | grep enserver
```

6 As user *sapsidadm*, verify that the SAP enqueue server has started correctly.

You can verify that the SAP enqueue server has started correctly in two ways.

- Run the SAP utility `ensmon`.

```
$ ensmon -H localhost -S port 1
```

-H localhost

Specifies that the name of the host is `localhost`.

-S port

Specifies the enqueue port.

1

Specifies that the probe should check the SAP enqueue server only.

If this command is run on the command line, a return code is returned on the command line.

- Check the log files that are written to the directory that was current when the SAP enqueue server command was run.

7 On a different node, Node2, log in as superuser.**8 Bring the SAP replica server resource group online on Node2.**

```
# clresourcegroup switch -n node2 repl-rg
```

switch

Specifies that a resource group is to be brought online on a different node or zone.

`-n node2`

Specifies the name of the node or zone on which the resource group is to be brought online.

`repl-rg`

Specifies the name of the resource group to be brought online.

9 Become the administration user for the SAP replica server on Node2.

The extension property `SAP_User` for `SUNW.saprepl` resource type specifies the name of the administration user.

10 As user `sapsidadm`, start the SAP replica server manually on Node2.

```
$ repl_server_cmd pf=repl_profile
```

`repl_server_cmd`

Specifies the full path to the SAP replica server executable. The extension property `Replica_Server` for the `SUNW.saprepl` resource type contains this value. The name of the SAP replica server executable file is `enrepsvr`.

`pf=repl_profile`

Specifies the full path to the profile for the SAP replica server. The extension property `Replica_Profile` for the `SUNW.saprepl` resource type contains this value.

11 Confirm that the SAP replica server is active on Node2.

The name of the SAP replica server executable file is `enrepsvr`.

```
# ps -ef | grep enrepsvr
```

12 As user `sapsidadm`, verify that the SAP replica server has started correctly.

You can verify that the SAP replica server has started correctly in two ways.

- Run the SAP utility `ensmon`.

```
$ ensmon -H localhost -S port 2
```

`-H localhost`

Specifies that the name of the host is `localhost`.

`-S port`

Specifies the enqueue port.

`2`

Specifies that the probe should check both the SAP enqueue server and the SAP replica server.

If this command is run on the command line, a return code is returned on the command line.

- Check the log files that are written to the directory that was current when the SAP replica server command was run.

13 Set up a test profile to be used with the enqt utility.

In order to create and check enqueue lock entries in [Step 14](#), you must prepare entries in a test SAP profile, including SAPSYSTEM, SAPSYSTEMNAME, and INSTANCE_NAME.

See the SAP document *The SAP Lock Concept (BC-CST-EQ)* for details about all profile parameters at <http://service.sap.com/ha>.

14 Confirm that enqueue replication is working by performing the following steps.**a. Create some enqueue lock entries.**

```
# /usr/sap/SAPSID/SYS/exe/run/enqt pf=app_server_profile 11
```

SAPSID

Specifies the SAP system ID.

app_server_profile

Specifies the full path to the test SAP profile that you set up in [Step 13](#)

b. Stop the SAP enqueue server on Node1.

```
# ps -ef | grep enserver
```

```
# kill -9 pid
```

c. Stop the SAP replica server on Node2.

```
# ps -ef | grep enrepserver
```

```
# kill -9 pid
```

d. Bring the SAP central services resource group online on Node2.

```
# clresourcegroup switch -n node2 central-rg
```

e. Become the administration user for the SAP enqueue server on Node2.**f. Start the SAP enqueue server manually on Node2.**

```
# enq_server_cmd pf=enq_profile
```

g. Confirm that no enqueue entries are lost.

```
# /usr/sap/SAPSID/SYS/exe/run/enqt pf=app_server_profile 20
```

SAPSID

Specifies the SAP system ID.

app_server_profile

Specifies the full path to the test SAP profile that you set up in [Step 13](#).

▼ How to Verify That the Configuration for the SAP Message Server Is Correct for the Data Service

Perform this procedure on each node or zone that can master the SAP central services resource group.

For a description of the extension properties for the SAP message server resource type, SUNW.sapscs, see “[SUNW.sapscs Extension Properties](#)” on page 82.

1 Bring the SAP central services resource group online on a node or zone.

```
# clresourcegroup switch -n node central-rg
-n node2
```

Specifies the name of the node or zone on which the resource group is to be brought online.

```
central-rg
```

Specifies the name of the resource group to be brought online.

2 Become superuser with superuser environment. Then become the *sapsidadm* user, while retaining the superuser environment.

Note that, in the first su command, the “dash” (-) argument causes the environment to be changed to the environment of superuser. The second su command, which is used *without* the “dash” argument, causes the environment to be retained.

```
# su - root
# su sapsidadm
```

3 Set the following environment variables:

- Set the LD_LIBRARY_PATH variable to /sapmnt/SAPSID/exe.
- Set the SAPSYSTEMNAME variable to the appropriate SAP system identification.
- Add the following paths to the PATH variable: /usr/sbin:/usr/bin:/usr/cluster/bin.
- Set the SAPSYSTEM variable to the system number configured for the specific instance of SAP which should be handled by the resource.
- Set the HOME environment variable to the home directory of the SAP administration user.
- Set the LOGNAME variable to root.

4 Run the SAP start script for the SAP message server using the absolute path and the appropriate arguments, as in the following example.

The following command is an example that runs the SAP start script for the SAP message server. You must run the equivalent command for your installation.

```
# /usr/sap/SC3/SYS/exe/run/startsap_msg_server r3 SCS01
```


- 5 **After the SAP system starts successfully, run the fault monitor probe for the SAP message server.**

The full path to the probe is specified by the extension property `Msg_Server_Monitor` for the `SUNW.saps.cs` resource type. For example, type the following command or the equivalent command.

```
# /usr/sap/SC3/SYS/exe/run/msprot -mshost host -msport port
```

- 6 **Verify that the probe was successful.**

The probe is successful when the return code equals zero.

- 7 **Run the SAP stop script for the SAP message server to verify that the SAP message server can be stopped, as in the following example.**

Verify that the SAP message server can be stopped correctly. Run the SAP stop script for the SAP message server with the full path and the appropriate arguments. The following command is an example that runs the SAP stop script. Run the equivalent command for your installation.

```
# /usr/sap/SC3/SYS/exe/run/stopsap_msg_server r3 SCS01
```

▼ How to Verify That the Configuration for the SAP Web Application Server and SAP J2EE Engine Components Is Correct for the Data Service

Perform the following procedure on each node or zone that can master the resource group for the SAP web application server or SAP J2EE Engine component.

If the SAP web application server or SAP J2EE Engine component is configured as a scalable resource, the resource runs on all these nodes or zones simultaneously. Therefore, you must execute this procedure on all nodes or zones that can simultaneously master the scalable SAP web application server or SAP J2EE Engine component resource.

- 1 **If you have configured the resource group for the SAP web application server or SAP J2EE Engine component as a failover resource group, enable the logical hostname resource for the resource group.**

- 2 **On the node where the logical hostname resource is enabled, become superuser, then the `sapsidadm` user with superuser environment.**

```
# su - root
# su sapsidadm
```

- 3 **Set the following environment variables:**

- Set the `LD_LIBRARY_PATH` variable to `/sapmnt/SAPSID/exe`.
- Set the `SAPSYSTEMNAME` variable to the appropriate SAP system identification.
- Add the following paths to the `PATH` variable: `/usr/sbin:/usr/bin:/usr/cluster/bin`.

- Set the SAPSYSTEM variable to the system number configured for the specific instance of SAP which should be handled by the resource.
- Set the HOME environment variable to the home directory of the SAP administration user.
- Set the LOGNAME variable to root.

4 Start the database.

Before running the SAP start script in the next step, you must start the database.

5 Run the SAP start script for the SAP web application server or SAP J2EE Engine component using the absolute path and the appropriate arguments.

The following command is an example that runs the SAP start script for the SAP web application server component. You must run the equivalent command for your installation.

```
# /usr/sap/SC3/SYS/exe/run/startsap_webas_server r3 D01
```

The following command is an example that runs the SAP start script for the SAP J2EE Engine component. You must run the equivalent command for your installation.

```
# /usr/sap/SC3/SYS/exe/run/startsap_webas_server r3 JC01
```

6 Change to the home directory of the SAP administration user.

For SAP web application server component only:

The dpmon utility writes files to the current directory, and this directory must be writable by the SAP administration user. In [Step 3](#) you set the HOME environment variable to the home directory of the SAP administration user.

```
# cd $HOME
```

For SAP J2EE Engine component only:

The probe utility writes files to the current directory, and this directory must be writable by the SAP administration user. In [Step 3](#) you set the HOME environment variable to the home directory of the SAP administration user.

```
# cd $HOME
```

7 For SAP web application server component only — after the SAP system starts successfully, run the probe command for the dispatcher of the SAP instance. The following command is an example:

```
# /usr/sap/SC3/SYS/exe/run/dpmon -p
```

8 For SAP J2EE Engine component only — after the SAP J2EE engine starts successfully, verify it by deploying and running some examples. See the SAP Web Application Server Installation Guide for instructions.

9 Verify that the probe was successful.

The probe is successful when the return code equals zero.

10 Run the SAP stop script for the SAP web application server or SAP J2EE engine component to verify that the SAP Web Application Server or SAP J2EE engine can be stopped.

Verify that the SAP Web Application Server or SAP J2EE engine can be stopped correctly. Run the SAP stop script for the SAP web application server or SAP J2EE engine component with the full path and the appropriate arguments. The following command is an example that runs the SAP stop script. Run the equivalent command for your installation.

For SAP web application server component only:

```
# /usr/sap/SC3/SYS/exe/run/stopsap_webas_server r3 D01
```

For SAP J2EE Enginecomponent only:

```
# /usr/sap/SC3/SYS/exe/run/stopsap_webas_server r3 JC01
```

Installing the HA for SAP Web Application Server Packages

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

Note – You need to install the HA for SAP Web Application Server packages in the global cluster and not in the zone cluster.

▼ How to Install the HA for SAP Web Application Server Packages

Perform this procedure on each cluster node where you want the HA for SAP Web Application Server software to run.

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

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

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

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

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

- 2 Load the Oracle Solaris Cluster installation media into the DVD-ROM drive.**

If the Volume Management daemon `vold(1M)` is running and configured to manage DVD-ROM devices, the daemon automatically mounts the DVD-ROM on the `/cdrom` directory.

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

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

```
# cd /cdrom/cdrom0/Solaris_sparc
```

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

```
# cd /cdrom/cdrom0/Solaris_x86
```

- 4 Start the installation wizard.**

```
# ./installer
```

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

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

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

English language support is always installed.

- 8 When prompted whether to configure the data service now or later, choose Configure Later.**

Choose Configure Later to perform the configuration after the installation.

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

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

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

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

- 11 Exit the installation wizard.
- 12 Unload the installation media from the DVD-ROM drive.
 - a. To ensure that the DVD-ROM is not being used, change to a directory that does *not* reside on the DVD-ROM.
 - b. Eject the DVD-ROM.


```
# eject cdrom
```

Registering and Configuring HA for SAP Web Application Server

To enable the HA for SAP Web Application Server data service to make SAP Web Application Server applications highly available, configure the data service as described in the procedures in this section. These procedures perform the following tasks.

- Register and configure the HASStoragePlus resources.
- Register and configure the SAP central services resources. The SAP central services consist of the following components:
 - SAP enqueue server
 - SAP replica server
 - SAP message server
- Register and configure resources for the SAP web application server component.
- Register and configure the SAP J2EE engine.

The resource groups were created in [“How to Enable the SAP Web Application Server to Run in a Cluster” on page 30](#) and in [“How to Enable the Stand-Alone SAP J2EE Engine to Run in a Cluster” on page 34](#).

Before You Begin

Before performing these procedures, ensure that the HA for SAP Web Application Server data service packages are installed.

The procedures in this section assume that the database resources have been previously created and that these resources are online.

- If you are using SAP DB as the database, configure the Oracle Solaris Cluster HA for MaxDB data service before continuing. See [Oracle Solaris Cluster Data Service for MaxDB Guide](#).
- If you are using Oracle as the database, configure the Oracle Solaris Cluster HA for Oracle data service before continuing. See [Oracle Solaris Cluster Data Service for Oracle Guide](#).

Perform these procedures as superuser on a cluster node.

Setting HA for SAP Web Application Server Extension Properties

The extension properties for HA for SAP Web Application Server are described in [Appendix A, “HA for SAP Web Application Server Extension Properties.”](#)

You can update some extension properties dynamically. You can update other properties, however, only when you create or disable a resource. The Tunable entry indicates when you can update a property.

The instructions for registering and configuring resources explain how to set *only* extension properties that HA for SAP Web Application Server requires you to set.

To set an extension property of a resource, include the following option in the `clresource(1CL)` command that creates or modifies the resource:

-p *property=value*

-p *property*

Identifies the extension property that you are setting.

value

Specifies the value to which you are setting the extension property.

You can also use the procedures in [Chapter 2, “Administering Data Service Resources,” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*](#) to configure resources after the resources are created.

Tip – As of SAP 7.1, some changes in behavior might prevent Oracle Solaris Cluster from killing necessary SAP processes, resulting in a `STOP_FAILED` state. To avoid this condition, set the `Failover_mode` property to `HARD` for the SAP Web Application Server primary instances resource and the SAP Message Server resources. This setting will cause the RGM to reboot the affected node, causing a failover.

Bear in mind that any other services that are configured on the node will also be affected if a node is rebooted because of the `Failover_mode=HARD` setting.

Tools for Registering and Configuring HA for SAP Web Application Server

Oracle Solaris Cluster provides the following tools for registering and configuring HA for SAP Web Application Server:

- **The `clsetup(1CL)` utility.** For more information, see [“How to Register and Configure the HA for SAP Web Application Server by Using `clsetup`”](#) on page 47.
- **Oracle Solaris Cluster Manager.** For more information, see the Oracle Solaris Cluster Manager online help.
- **Oracle Solaris Cluster maintenance commands.** For more information, see [“Registering and Configuring the HA for SAP Web Application Server by using Oracle Solaris Cluster Command Line Interface \(CLI\)”](#) on page 53.

The `clsetup` utility and Oracle Solaris Cluster Manager each provide a wizard for configuring HA for SAP Web Application Server. The wizards reduce the possibility for configuration errors that might result from command syntax errors or omissions. These wizards also ensure that all required resources are created and that all required dependencies between resources are set.

▼ How to Register and Configure the HA for SAP Web Application Server by Using `clsetup`

The procedures in this section describe the registration and configuration of the following components of the SAP Web Application Server by using `clsetup` utility.

- SAP central services, which include these services:
 - SAP enqueue server
 - SAP replica server
 - SAP message server

Note – If you have already created the logical hosts for the SAP central services and SAP replica server resource groups, select those logical hosts when you run `clsetup`. The `clsetup` utility will then add SAP central services and SAP replica server resources to the existing resource groups containing these logical hosts.

Perform this procedure during your initial set up of HA for SAP Web Application Server. Perform this procedure from one node only.

Note – The following instructions explain how to perform this operation by using the `clsetup` utility.

For the ABAP+J2EE configurations, you need to run the `clsetup` utility twice. For instance, in the first run you may choose to create resources for ABAP and in the second run you may choose to create resources for J2EE. While creating the ABAP+J2EE configurations, the wizard allows you to create two sets of resource groups when you choose separate logical hosts for ABAP and J2EE resources. If you require the resources of the second run to be grouped with the existing resources created in the first run, you need to choose logical hosts that resources from the first run are using.

Before You Begin Before you start the HA for SAP Web Application Server wizard, ensure that the following prerequisites are met:

- The prerequisites for configuring a logical hostname resource are met.
- The prerequisites for configuring a highly available storage resource are met.
- All the required SAP components are installed, configured, and able to run under the control of Oracle Solaris Cluster.
- A highly available database for SAP is configured.
- The HA for SAP Web Application Server packages are installed.

1 Become superuser on any cluster node.

2 Start the `clsetup` utility.

`clsetup`

The `clsetup` main menu is displayed.

3 Type the number that corresponds to the option for data services and press Return.

The Data Services menu is displayed.

4 Type the number that corresponds to the option for configuring HA for SAP Web Application Server and press Return.

The `clsetup` utility displays the list of prerequisites for HA for SAP Web Application Server.

5 Press Return to continue.

The `clsetup` utility displays a list of available nodes.

6 Select the nodes where you require SAP Web Application Server to run.

- **To accept the default selection of all listed nodes in an arbitrary order, type a and press Return.**
- **To select a subset of the listed nodes, type a comma-separated or space-separated list of the numbers that correspond to the nodes and press Return.**
Ensure that the nodes are listed in the order in which the nodes are to appear in the resource group's node list. The first node in the list is the primary node of this resource group.
- **To select all nodes in a particular order, type a comma-separated or space-separated ordered list of the numbers that correspond to the nodes and press Return.**
Ensure that the nodes are listed in the order in which the nodes are to appear in the resource group's node list. The first node in the list is the primary node of this resource group.

7 To confirm your selection of nodes, type d and press Return.

The `clsetup` utility displays a screen where you can specify the SAP system identifier.

8 Type the numbers that correspond to required identifier and press Return.

The `clsetup` utility displays a screen where you can configure additional SAP components.

9 Select the required option.

- **To configure SAP replica server component with the help of the wizard, type yes and press Return.**
- **To configure SAP replica server component manually, type no and press Return.**

The `clsetup` utility displays a screen where you can configure the SAP enqueue server and prompts you for the SAP user name.

10 Type the SAP user name and press Return.

The `clsetup` utility prompts you for the SAP enqueue server executable filename.

11 Type the SAP enqueue server executable filename and press Return.

The `clsetup` utility prompts you for the instance number of the SAP enqueue server.

12 Type the instance number of the SAP enqueue server and press Return.

The `clsetup` utility prompts you for the SAP enqueue server profile information.

13 Type the SAP enqueue server profile information and press Return.

The `clsetup` utility displays a screen where you can configure the SAP message server and prompts you for the instance number of the SAP message server.

- 14 Type the instance number of the SAP message server and press Return.**

The `clsetup` utility prompts you for the instance name of the SAP message server.

- 15 Type the instance name of the SAP message server and press Return.**

The `clsetup` utility displays a screen where you can configure the HAStorage resources.

- 16 To confirm your selection of the existing HAStorage resource, type `d` and press Return.**

Note – You can also create the required HAStorage resource on your own.

The `clsetup` utility displays a screen where you can configure the logical hostname resource.

- 17 To confirm your selection of the logical hostname resource, type `d` and press Return.**

Note – You can also create the required logical hostname resource on your own.

- 18 If you want to configure the SAP replica server component, go to the next step, otherwise, go to [Step 22](#).**

- 19 Type the SAP replica server executable filename and press Return.**

The `clsetup` utility prompts you for the SAP replica server profile information.

- 20 Type the SAP replica server profile information and press Return.**

The `clsetup` utility displays a screen where you can configure the HAStorage resources.

- 21 To confirm your selection of the configuration, type `d` and press Return.**

The `clsetup` utility displays a screen where you can configure the logical hostname resource.

- 22 To confirm your selection of the configuration, type `d` and press Return.**

The `clsetup` utility displays a list of database resources.

- 23 Select the required database resource and press Return.**

The `clsetup` utility displays information about the Oracle Solaris Cluster objects that the utility will create.

- 24 To confirm your selection of the configuration, type `c` and press Return.**

- 25 To create the configuration, press Return.**

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

Note – The `clsetup` utility will rollback the changes if it fails to complete the SAP web application server configuration process.

26 Press Return to continue.

The `clsetup` utility returns you to the main menu.

27 (Optional) Type `q` and press Return repeatedly until you quit the `clsetup` utility.

Setting Up the SAP Web Application Server on Non-Global Zones for HAStoragePlus Configuration

Use the following procedure to configure a HAStoragePlus resource for non-global zones.

Note –

- The entries in the `/etc/vfstab` file for cluster file systems should contain the global keyword in the mount options.
 - The SAP binaries that will be made highly available using the HAStoragePlus resource should be accessible from the non-global zones.
 - In non-global zones, file systems that are used by different resources in different resource groups must reside in a single HAStoragePlus resource that resides in a scalable resource group. The nodelist of the scalable HAStoragePlus resource group must be a superset of the nodelists of the application resource groups that have resources which depend on the file systems. These application resources that depend on the file systems must have a strong resource dependency set to the HAStoragePlus resource. In addition, the dependent application resource group must have a strong positive resource group affinity set to the scalable HAStoragePlus resource group.
-

▼ How to Set Up the SAP Web Application Server on Non-Global Zones for HAStoragePlus Configuration

- 1 On any node in the cluster, become superuser or assume a role that provides `solaris.cluster.modify` RBAC authorization.
- 2 Create the scalable resource group with non-global zones that contain the HAStoragePlus resource.

```
# clresourcegroup create \
-p Maximum primaries=m \
-p Desired primaries=n \
[-n node-zone-list] hasp-resource-group
```

<code>-p Maximum_primaries=m</code>	Specifies the maximum number of active primaries for the resource group.
<code>-p Desired_primaries=n</code>	Specifies the number of active primaries on which the resource group should attempt to start.
<code>-n node-zone-list</code>	In the node list of a <code>HASStoragePlus</code> resource group, specifies the list of <code>nodename:zonename</code> pairs as the node list of the <code>HASStoragePlus</code> resource group, where the SAP instances can come online.
<code>hasp-resource-group</code>	Specifies the name of the scalable resource group to be added. This name must begin with an ASCII character.

3 Register the resource type for the `HASStoragePlus` resource.

```
# clresourcetype register HASStoragePlus
```

4 Create the `HASStoragePlus` resource `hasp-resource` and define the SAP filesystem mount points and global device paths.

```
# clresource create -g hasp-resource-group \
-t SUNW.HASStoragePlus \
-p GlobalDevicePaths=/dev/global/dsk/d5s2,dsk/d6 \
-p affinityon=false \
-p FilesystemMountPoints=/sapmnt/JSC,/usr/sap/trans,/usr/sap/JSC \
hasp-resource
```

<code>-g hasp-resource-group</code>	Specifies the resource group name.
<code>GlobalDevicePaths</code>	Contains the following values: <ul style="list-style-type: none"> Global device group names, such as <code>sap-dg</code>, <code>dsk/d5</code> Paths to global devices, such as <code>/dev/global/dsk/d5s2</code>, <code>/dev/md/sap-dg/dsk/d6</code>
<code>FilesystemMountPoints</code>	Contains the following values: <ul style="list-style-type: none"> Mount points of local or cluster file systems, such as <code>/local/mirrlogA</code>, <code>/local/mirrlogB</code>, <code>/sapmnt/JSC</code>, <code>/usr/sap/JSC</code>

The `HASStoragePlus` resource is created in the enabled state.

5 Register the resource type for the SAP application.

```
# clresourcetype register resource-type
```

<code>resource-type</code>	Specifies the name of the resource type to be added. For more information, see the release notes for your release of Oracle Solaris Cluster.
----------------------------	--

6 Create a SAP resource group.

```
# clresourcegroup create [-n node-zone-list] \
-p RG_affinities=++hastorageplus-rg \
resource-group-1
```

resource-group-1 Specifies the SAP services resource group.

7 Add the SAP application resource to *resource-group-1* and set the dependency to *hastorageplus-1*.

```
# clresource create -g resource-group-1 \
-t SUNW.application \
[-p "extension-property[{node-specifier}]"=value, ?] \
-p Resource_dependencies_offline_restart=hastorageplus-1 \
resource
```

8 Bring the failover resource group online.

```
# clresourcegroup online resource-group-1
```

Registering and Configuring the HA for SAP Web Application Server by using Oracle Solaris Cluster Command Line Interface (CLI)

The procedures in this section describe the registration and configuration of the following components of the SAP Web Application Server by using Oracle Solaris Cluster CLI.

- SAP central services, which include these services:
 - SAP enqueue server
 - SAP replica server
 - SAP message server
- SAP web application server component
- SAP J2EE engine

▼ How to Register and Configure HASToragePlus Resources for the SAP Central Services Components

An HASToragePlus resource is created to ensure the high availability of the global device groups where the components are installed.

1 Register the SUNW.HASToragePlus resource type.

```
# clresourcetype register SUNW.HASToragePlus
```

2 Create an **HASStoragePlus** resource for the global device group on which the SAP enqueue server and the SAP message server are installed.

Create this resource in the SAP central services resource group, which is the resource group to which the SAP enqueue server and the SAP message server resources belong.

```
# clresource create -g central-rg -t SUNW.HASStoragePlus \
-p filesystemmountpoints="mountpoint-list" \
-p affinityon=false hsp-central-rs
```

-g central-rg

Specifies that the resource is to be added to the SAP central services resource group.

-t SUNW.HASStoragePlus

Specifies that the resource is an instance of the `SUNW.HASStoragePlus` resource type.

-p filesystemmountpoints="mountpoint-list"

Specifies a list of valid mount points for the file system. For more information, see the `SUNW.HASStoragePlus(5)` man page.

hsp-central-rs

Specifies the name of the resource that you are creating.

The resource is created in the enabled state.

3 Create an **HASStoragePlus** resource for the global device group on which SAP replica server is installed.

Create this resource in the SAP replica server resource group.

```
# clresource create -g repl-rg -t SUNW.HASStoragePlus \
-p filesystemmountpoints="mountpoint-list" \
-p affinityon=false hsp-repl-rs
```

-g repl-rg

Specifies that the resource is to be added to the SAP replica server resource group.

-t SUNW.HASStoragePlus

Specifies that the resource is an instance of the `SUNW.HASStoragePlus` resource type.

-p filesystemmountpoints="mountpoint-list"

Specifies a list of valid mount points for the file system. For more information, see the `SUNW.HASStoragePlus(5)` man page.

hsp-repl-rs

Specifies the name of the resource that you are creating.

The resource is created in the enabled state.

▼ How to Register and Configure an SAP Enqueue Server Resource

The SAP enqueue server resource and the SAP message server resource must be in the same failover resource group because they fail over together.

The SAP enqueue server resource is configured to depend on its associated HASToragePlus resource. This dependency ensures that the SAP enqueue server does not attempt to start until its associated HASToragePlus resource is online.

1 Register SUNW.sapenq, the resource type for the SAP enqueue server.

```
# clresourcetype register SUNW.sapenq
```

```
register
```

Specifies that a new resource type is to be added.

```
SUNW.sapenq
```

Specifies the name of the resource type to be added. This name is predefined for the SAP enqueue server.

2 Create an SAP enqueue server resource in the SAP central services resource group.

```
# clresource create -d -gcentral-rg \
-t SUNW.sapenq \
-p enqueue_profile=path-to-enq-profile \
-p enqueue_server=path-to-enq-server-binary \
-p sap_user=enq-user \
-p enqueue_instance_number=enq-instance \
-p resource_dependencies_offline_restart=hsp-central-rs \
-p resource_dependencies=db-resource \
enq-rs
```

```
-g central-rg
```

Specifies the resource group to which the resource is to be added. The SAP central services resource group is configured as a failover resource group.

```
-t SUNW.sapenq
```

Specifies that the resource is an instance of the SUNW.sapenq resource type.

```
-p enqueue_profile=path-to-enq-profile
```

Specifies the full path to the SAP enqueue server profile.

```
-p enqueue_server=path-to-enq-server-binary
```

Specifies the full path to the SAP enqueue server executable.

```
-p sap_user=enq-user
```

Specifies the administration user for the SAP enqueue server.

```
-p enqueue_instance_number=enq-instance
```

Specifies the two-digit instance number for the SAP enqueue server. This number is the value of SAPSYSTEM in the SAP profile for SAP enqueue server.

```
-p resource_dependencies_offline_restart=hsp-central-rs
```

Specifies that the HASToragePlus resource for the global device group on which the SAP enqueue server is installed must be online in order for the SAP enqueue server to be online. If any resource in the offline-restart dependency list is stopped, this resource is stopped. If that resource in the offline-restart dependency list is subsequently restarted, this resource is restarted.

`-p resource_dependencies=db-resource`

Specifies that the database resource must be online in order for the SAP enqueue server to be online.

`enq-rs`

Specifies the name of the resource to be added.

The resource is created in the enabled state.

3 Verify that the default values for the SAP enqueue server extension properties are acceptable.

Refer to “[SUNW.sapenq Extension Properties](#)” on page 77.

4 Ensure that SAP enqueue server is *not* already running on the cluster.

If SAP enqueue server is already running on any node of the cluster, you risk the simultaneous running of multiple SAP enqueue server processes.

5 Enable the SAP enqueue server resource.

`# clresource enable enq-rs`

`enable`

Specifies that the specified resource is to be enabled.

`enq-rs`

Specifies the name of the resource to be enabled.

▼ How to Register and Configure an SAP Replica Server Resource

The SAP replica server resource must be in a *different* failover resource group from the SAP enqueue server resource, because the SAP replica server resource must *not* fail over with the SAP enqueue server resource.

The SAP replica server resource is configured to depend on its associated `HASStoragePlus` resource being online. The SAP replica server resource also depends on the SAP enqueue server resource. These dependencies ensure that the SAP replica server does not attempt to start until both its associated `HASStoragePlus` resource and the SAP enqueue server are online.

1 Register `SUNW.saprep1`, the resource type for the SAP replica server.

`# clresourcetype register SUNW.saprep1`

`register`

Specifies that a new resource type is to be registered.

`SUNW.saprep1`

Specifies the name of the resource type to be added. This name is predefined for the SAP replica server.

2 Create an SAP replica server resource in the SAP replica server resource group.

```
# clresource create -d -g repl-rg \
-t SUNW.saprepl \
-p replica_profile=path-to-repl-profile \
-p replica_server=path-to-repl-server-binary \
-p sap_user=repl-user \
-p resource_dependencies_offline_restart=hsp-repl-rs \
-p resource_dependencies=enq-rs \
repl-rs

-g repl-rg
    Specifies the resource group to which the resource is to be added. The SAP replica server
    resource group is configured as a failover resource group.

-t SUNW.saprepl
    Specifies that the resource is an instance of the SUNW.saprepl resource type.

-p replica_profile=path-to-repl-profile
    Specifies the full path to the SAP replica server profile.

-p replica_server=path-to-repl-server-binary
    Specifies the full path to the SAP replica server executable.

-p sap_user=repl-user
    Specifies the administration user for the SAP replica server.

-p resource_dependencies_offline_restart=hsp-repl-rs
    Specifies that the HASToragePlus resource for the global device group on which the SAP
    replica server is installed must be online before the SAP replica server resource can be online:

    If any resource in the offline-restart dependency list is stopped, this resource is stopped. If
    that resource in the offline-restart dependency list is subsequently restarted, this resource is
    restarted.

-p resource_dependencies=enq-rs
    Specifies that the SAP enqueue server resource must be online before the SAP replica server
    resource can be online:

repl-rs
    Specifies the name of the resource to be added.
```

The resource is created in the enabled state.

3 Verify that the default values for the SAP replica server extension properties are acceptable.

Refer to [“SUNW.saprepl Extension Properties”](#) on page 80.

4 Enable the SAP replica server resource.

```
# clresource enable repl-rs

enable
    Specifies that the specified resource is to be enabled.
```

repl-rs

Specifies the name of the resource to be enabled.

▼ How to Register and Configure an SAP Message Server Resource

The SAP enqueue server resource and the SAP message server resource must be in the same failover resource group because they fail over together.

The SAP message server resource is configured to depend on its associated HASToragePlus resource. This dependency ensures that the SAP message server does not attempt to start until its associated HASToragePlus resource is online.

1 Register SUNW.sapscs, the resource type for the SAP message server.

```
# clresourcetype register SUNW.sapscs
```

register

Specifies that a new resource type is to be added.

SUNW.sapscs

Specifies the name of the resource type to be added. This name is predefined for the SAP message server.

2 Create an SAP message server resource in the SAP central services resource group.

```
# clresource create -d -g central-rg \
-t SUNW.sapscs \
-p sap_sid=scs-system-ID \
-p sap_instance_number=scs-instance-number \
-p sap_instance_name=scs-instance-name \
-p msg_server_port=msg-server-port \
-p scs_startup_script=scs-server-startup-script \
-p scs_shutdown_script=scs-server-shutdown-script \
-p resource_dependencies_offline_restart=hsp-central-rs \
-p resource_dependencies=db-resource \
msg-rs
```

-g central-rg

Specifies the resource group to which the resource is to be added. The SAP central services resource group is configured as a failover resource group.

-t SUNW.sapscs

Specifies that the SAP message server resource is an instance of the resource type that is named SUNW.sapscs.

-p sap_sid=scs-system-ID

Specifies the SAP system ID for the SAP message server. This ID is SAPSYSTEMNAME in the SAP profile.

-p sap_instance_number=scs-instance-number

Specifies the instance number for the SAP message server. This number is SAPSYSTEM in the SAP profile.

- p `sap_instance_name=scs-instance-name`
Specifies the instance name for the SAP message server. This name is `INSTANCE_NAME` in the SAP profile.
- p `msg_server_port=msg-server-port`
Specifies the listen port for the SAP message server.
- p `scs_startup_script=scs-server-startup-script`
Specifies the full path to the startup script for the SAP message server instance.
- p `scs_shutdown_script=scs-server-shutdown-script`
Specifies the full path to the shutdown script for the SAP message server instance.
- p `resource_dependencies_offline_restart=hsp-central-rs`
Specifies that the `HASStoragePlus` resource for the global device group on which the SAP message server is installed must be online in order for the SAP message server to be online. If any resource in the offline-restart dependency list is stopped, this resource is stopped. If that resource in the offline-restart dependency list is subsequently restarted, this resource is restarted.
- p `resource_dependencies=db-resource`
Specifies that the database resource must be online in order for the SAP message server to be online.

msg-rs

Specifies the name of the resource to be added.

The resource is created in the enabled state.

3 Verify that the default values for the SAP message server extension properties are acceptable.

Refer to “[SUNW.sapscs Extension Properties](#)” on page 82.

4 Enable the SAP message server resource.

```
# clresource enable msg-rs
```

enable

Specifies that the specified resource is to be enabled.

msg-rs

Specifies the name of the resource to be enabled.

▼ How to Register and Configure an SAP Web Application Server Component

An `HASStoragePlus` resource is created to ensure the high availability of the global device groups where the components are installed.

The resource for the SAP web application server component is configured to depend on its associated `HASStoragePlus` resource. The resource for the SAP web application server

component also depends on the database resource, as well as the SAP message server resource. These dependencies ensure that the resource for the SAP web application server component does not attempt to start until its associated `HASStoragePlus` resource, the database, and the SAP message server resource are all online.

Note – The SAP web application server component can be configured to run under PMF or not to run under PMF. See the extension property `Webas_Use_Pmf` in “[SUNW.sapwebas Extension Properties](#)” on page 85. If the component is configured to run under PMF control, and if the network is not available, PMF stops the resource in such a way that no data is lost. However, if the component is configured *not* to run under PMF, and if the network is not available, the resource and the resource group for the SAP web application server component are in the `stop_failed` state and user intervention is required. Because no SAP utility is available to stop all SAP processes, in order to prevent possible data corruption, the data service does not automatically restart the processes.

The following procedure applies to both failover and scalable configurations of SAP web application server component.

1 Create an `HASStoragePlus` resource for the global device group on which SAP web application server component is installed.

Create this resource in the SAP web application server resource group.

```
# clresource create -g webas-rg -t SUNW.HASStoragePlus \  
-p filesystemmountpoints="mountpoint-list" \  
-p affinityon=false hsp-webas-rs
```

`-g webas-rg`

Specifies that the resource is to be added to the SAP web application server resource group. This resource group can be failover or scalable.

`-t SUNW.HASStoragePlus`

Specifies that the resource is an instance of the `SUNW.HASStoragePlus` resource type.

`-p filesystemmountpoints="mountpoint-list"`

Specifies a list of valid mount points for the file system. For more information, see the `SUNW.HASStoragePlus(5)` man page.

`hsp-webas-rs`

Specifies the name of the resource that you are creating.

The resource is created in the enabled state.

2 Register `SUNW.sapwebas`, the resource type for the SAP web application server component.

```
# clresourcetype register SUNW.sapwebas
```

`register`

Specifies that a new resource type is to be added.

SUNW.sapwebas

Specifies the name of the resource type to be added. This name is predefined for the SAP web application server component.

3 Create a resource for the SAP web application server component.

The SAP web application server component can be configured either as a failover resource or as a scalable resource by adding the resource to a resource group that was created as a failover or a scalable resource group.

```
# clresource create -d -g webas-rg \
-t SUNW.sapwebas \
-p sap_sid=webas-system-ID \
-p sap_instance_number=webas-instance-number \
-p sap_instance_name=webas-instance-name \
-p sap_instance_type=ABAP_J2EE \
-p webas_startup_script=sap_startup_script \
-p webas_shutdown_script=sap_shutdown_script \
-p resource_dependencies_offline_restart=hsp-webas-rs \
-p resource_dependencies=db-webas-rs,msg-rs \
-p start_timeout=600 \
webas-rs
```

-g webas-rg

Specifies the resource group to which the resource is to be added. The SAP web application server resource group can be configured as a failover or a scalable resource group.

-t SUNW.sapwebas

Specifies that the resource is an instance of the SUNW.sapwebas resource type.

-p sap_sid=webas-system-ID

Specifies the SAP system ID for the SAP web application server component. This ID is SAPSYSTEMNAME in the SAP profile.

-p sap_instance_number=webas-instance-number

Specifies the two-digit SAP system number for the SAP web application server component instance. This number is SAPSYSTEM in the SAP profile.

-p sap_instance_name=webas-instance-name

Specifies the instance name for the SAP web application server component. This name is INSTANCE_NAME in the SAP profile.

-p sap_instance_type=ABAP_J2EE

Specifies that both the ABAP and J2EE components are included. This property must be set to ABAP_J2EE when both the ABAP central instance and SAP J2EE engine are present. The default value is ABAP. It takes the value J2EE when only a standalone SAP J2EE engine is configured.

-p webas_startup_script=sap_startup_script

Specifies the startup script for the SAP web application server instance.

-p webas_shutdown_script=sap_shutdown_script

Specifies the shutdown script for the SAP web application server instance.

-p resource_dependencies_offline_restart=*hsp-webas-rs*

Specifies that the HASToragePlus resource for the global device group on which the SAP web application server component is installed must be online before the resource for the SAP web application server component can be online:

If any resource in the offline-restart dependency list is stopped, this resource is stopped. If that resource in the offline-restart dependency list is subsequently restarted, this resource is restarted.

-p resource_dependencies=*db-webas-rs,msg-rs*

Specifies that the following resources must be online before the resource for the SAP web application server component can be online:

- Database resource. The database resource is created by the relevant data service.
- SAP message server resource.

webas-rs

Specifies the name of the resource to be added.

The resource is created in the enabled state.

4 Verify that the default values for the SAP web application server component extension properties are acceptable.

Refer to “[SUNW.sapwebas Extension Properties](#)” on page 85.

5 Enable the SAP web application server component resource.

```
# clresource enable webas-rs
```

enable

Specifies that the specified resource is to be enabled.

webas-rs

Specifies the name of the resource to be enabled.

Examples of Configuring the SAP Web Application Server

The following examples show how the SAP Web Application Server can be configured to be highly available in Oracle Solaris Cluster. The examples assume that the resource groups have been created, the resource groups are online, and the resource types have been registered.

- Configuring the SAP central services, which consist of the following components:
 - SAP enqueue server
 - SAP replica server
 - SAP message server
- Configuring the SAP web application server component

EXAMPLE 1-3 Configuring the SAP Central Services Components

In this example the SAP central services resource group is called `centralrg`, and the SAP replica server resource group is called `replrg`.

1. To create an `HASStoragePlus` resource called `hspcentralrs` for the global device group `enqdg` in the resource group `centralrg`, the following command is run. The group `centraldg` is the global device group on which the SAP enqueue server is installed, and `centralrg` is the resource group to which the SAP enqueue server resource and the SAP message server resource belong.

```
# clresource create -g centralrg \
-t SUNW.HASStoragePlus \
-p filesystemmountpoints="/global/sapdata" \
-p affinityon=false \
hspcentralrs
```

2. To create an `HASStoragePlus` resource called `hspreplrs` for the global device group `repldg` in the resource group `replrg`, the following command is run. The group `repldg` is the global device group on which SAP replica server is installed, and `replrg` is the resource group to which the SAP replica server resource belongs.

```
# clresource create -g replrg \
-t SUNW.HASStoragePlus \
-p filesystemmountpoints="/global/sapdata" \
-p affinityon=false \
hspreplrs
```

The resource is created in the enabled state.

3. To create an SAP enqueue server resource called `enqrs` in the resource group `centralrg`, the following command is run. This resource is dependent on the `hspcentralrs` and `dbwebasrs` resource.

```
# clresource create -g centralrg \
-t SUNW.sapenq \
-p enqueue_profile=/usr/sap/SC3/SYS/profile/SC3_ASCS07_central-lh \
-p enqueue_server=/sapmnt/SC3/exe/enserver \
-p sap_user=sc3adm \
-p enqueue_instance_number=07 \
-p resource_dependencies_offline_restart=hspcentralrs \
-p resource_dependencies=db-resource \
enqrs
```

The resource is created in the enabled state.

4. To create an SAP replica server resource called `replrs` in the resource group `replrg`, the following command is run. This resource is dependent on the `hspreplrs` resource and the `enqrs` resource.

```
# clresource create -g replrg \
-t SUNW.saprepl \
-p replica_profile=/usr/sap/SC3/SYS/profile/SC3_REP07 \
-p replica_server=/sapmnt/SC3/exe/enrepserver \
-p sap_user=sc3adm \
-p resource_dependencies_offline_restart=hspreplrs \
replrs
```

EXAMPLE 1-3 Configuring the SAP Central Services Components *(Continued)*

```
-p resource_dependencies=enqrs \
replrs
```

The resource is created in the enabled state.

5. To create an SAP message server resource called `msgrs` in the resource group `centralrg`, the following command is run. This resource is dependent on the `hspcentralrs` resource. The SAP message server resource is an instance of the resource type that is named `SUNW.sapscs`.

```
# clresource create -g centralrg \
-t SUNW.sapscs \
-p sap_sid=SC3 \
-p sap_instance_number=07 \
-p sap_instance_name=ASCS07 \
-p msg_server_port=3607 \
-p scs_startup_script=/usr/sap/SC3/SYS/exe/run/my_startsap \
-p scs_shutdown_script=/usr/sap/SC3/SYS/exe/run/my_stopsap \
-p resource_dependencies_offline_restart=hspcentralrs \
-p resource_dependencies=db-resource \
msgrs
```

The resource is created in the enabled state.

EXAMPLE 1-4 Configuring the SAP Web Application Server Component

In this example the resource group for the SAP web application server component is called `webasrg`.

1. To create an `HAStoragePlus` resource called `hspwebasrs` for the global device group `webasdg` in the resource group `webasrg`, the following command is run. The group `webasdg` is the device group on which the SAP web application server component is installed, and `webasrg` is the resource group to which the SAP web application server resource belongs.

```
# clresource create -g webasrg \
-t SUNW.HAStoragePlus \
-p filesystemmountpoints="/global/sapdata" \
-p affinityon=false \
hspwebasrs
```

The resource is created in the enabled state.

2. To create a resource called `webasrs` for the SAP web application server component, the following command is run. This resource is created in the failover resource group `webasrg`. This resource is dependent on the `hspwebasrs` resource. The `webasrs` resource is also dependent on the database resource `dbwebasrs`, which has already been created by the relevant data service. In addition, this resource is dependent on the SAP message server resource, which is called `msgrs` in the previous example.

```
# clresource create -g webasrg \
-t SUNW.sapwebas \
-p sap_sid=SC3 \
-p sap_instance_number=08 \
```


EXAMPLE 1-4 Configuring the SAP Web Application Server Component (Continued)

```

-p sap_instance_name=D08 \
-p sap_instance_type=ABAP \
-p resource_dependencies_offline_restart=hspwebasrs \
-p resource_dependencies=dbwebasrs,msgsrs \
-p start_timeout=600 \
webasrs

```

The resource is created in the enabled state.

Using Alternate Project Identification

You can create a specific project, that is, an alternate project identification (ID), for the application. Set either `RG_project_name` or `Resource_project_name` or both, for the resource group and/or the resource, so that the application is started up under the specified project. Refer to the RGM doc for how to set these system properties.

See Cluster Administration and Application Development in [Oracle Solaris Cluster Concepts Guide](#).

Tuning the HA for SAP Web Application Server Fault Monitors

Fault monitoring for the HA for SAP Web Application Server data service is provided by the following fault monitors:

- The fault monitor for the SAP enqueue server
- The fault monitor for the SAP replica server
- The fault monitor for the SAP message server
- The fault monitor for the SAP web application server component
- The fault monitor for the SAP J2EE engine

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

TABLE 1-3 Resource Types for the Fault Monitors of HA for SAP Web Application Server

Component	Resource Type
SAP enqueue server	SUNW.sapenq
SAP replica server	SUNW.saprep1
SAP message server	SUNW.sapses
SAP web application server component	SUNW.sapwebas

TABLE 1-3 Resource Types for the Fault Monitors of HA for SAP Web Application Server (Continued)

Component	Resource Type
SAP J2EE engine	SUNW.sapwebas

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

Tuning these fault monitors involves the following tasks:

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

Perform these tasks when you register and configure HA for SAP Web Application Server, as described in “[Registering and Configuring HA for SAP Web Application Server](#)” on page 45.

For detailed information about these tasks, see “[Tuning Fault Monitors for Oracle Solaris Cluster Data Services](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

Operation of the Fault Monitor for the SAP Enqueue Server Resource Type

To determine whether the SAP enqueue server and the SAP replica server are operating correctly, the fault monitor for the SAP enqueue server resource type probes these resources periodically.

The probe uses the SAP utility `ensmon` to check the health of the SAP enqueue server and the SAP replica server.

`# ensmon -H localhost -S port option`

`-H localhost`

Specifies that the name of the host is `localhost`.

`-S port`

Specifies the enqueue port.

`option`

Specifies the resources that the probe should check. The possible values of this option are as follows:

- 1 – Check the SAP enqueue server only.

- 2 – Check both the SAP enqueue server and the SAP replica server.

If this command is run on the command line, a return code is returned on the command line.

During a probe, the fault monitor first determines whether both the SAP enqueue server and the SAP replica server are online by running the `ensmon` command with the `option` argument set to 2.

```
# ensmon -H localhost -S port 2
```

The result of this command determines the action of the probe, as follows:

1. If the command times out, the SAP enqueue server fault monitor checks whether only the SAP enqueue server is online by running the `ensmon` command with the option set to 1.


```
# ensmon -H localhost -S port 1
```

 - If this command times out, the SAP enqueue server issues a partial failure. If this timeout occurs one more time within the probe interval period, a failover occurs.
 - If this command succeeds, the SAP enqueue server fault monitor logs a warning message to explain that the SAP enqueue server is online but the status of the SAP replica server is unknown.
 - If this command causes a system error, the SAP enqueue server issues a less serious partial failure. If a system error occurs three more times within the probe interval period, a failover occurs.
 - For all other unsuccessful conditions, the SAP enqueue server triggers a failover.
2. If the command does not time out, the probe checks the value of the return code from the `ensmon` command, as follows:
 - A return code value of 0 indicates that the command is successful, and no further action is taken until the next probe.
 - A return code value of 4 indicates that the enqueue is running, and the replica is configured, but the replica is not running. The probe logs a warning message to indicate that the replica is not running.
 - A return code value of 8 indicates that the enqueue server is not running, and the probe triggers a failover.
 - A return code of 12 indicates an invalid parameter for the command, and the probe triggers a failover.
 - All other return codes are treated as a partial failure. If such a failure occurs three more times within the probe interval period, a failover occurs.

Note that the values for the number of timeouts and the probe interval period are assigned by the SAP enqueue server fault monitor. You cannot change these values.

Operation of the Fault Monitor for the SAP Replica Server Resource Type

Fault monitor responsibility for the SAP replica server resource type is currently handled by the Process Monitor Facility (PMF) in Oracle Solaris Cluster.

Operation of the Fault Monitor for the SAP Message Server Resource Type

To determine whether the SAP Message Server is operating correctly, the fault monitor for the SAP Message Server resource type probes these resources periodically.

The probe uses the SAP utility `msprot` to check the health of the SAP Message Server.

```
# msprot -mshost localhost -msserv port -r probe_timeout/2
```

`-mshost localhost`

Specifies that the name of the host is `localhost`.

`-msserv port`

Specifies the message server port.

`-r probe_timeout/2`

Specifies the time within which the `msprot` command should be executed. This value should be set to the `probe_timeout` value of the resource.

If this command is run on the command line, a return code is returned on the command line.

During a probe, the fault monitor determines whether the SAP Message Server is online by running the `msprot` command.

```
# msprot -mshost localhost -msserv port -r probe_timeout/2
```

The result of this command determines the action of the probe, as follows:

1. If the command times out, the SAP Message Server issues a partial failure. If this time-out occurs one more time within the probe interval period, a failover occurs.
2. If the command does not time out, the probe checks the value of the return code from the `msprot` command, as follows:
 - A return code value of 0 indicates that the command is successful, and no further action is taken until the next probe.
 - A return code value of 7 indicates that the message server is not responding, and the probe triggers a failover.
 - All other return codes are treated as a partial failure. If such a failure occurs three more times within the probe interval period, a failover occurs.

Note that the values for the number of timeouts and the probe interval period are assigned by the SAP Message Server fault monitor. You cannot change these values.

Operation of the Fault Monitor for the SAP Web Application Server and SAP J2EE Engine Component Resource Type

To determine whether the SAP Web Application Server and the SAP J2EE Engine are operating correctly, the fault monitor for the SAP Web Application Server resource type probes these resources periodically.

The probe uses the SAP utility `dpmon` to check the health of the SAP Web Application Server and sends an XML/HTTP request to the SAP J2EE Engine.

```
# dpmon -p
```

```
-p
```

Specifies the dispatcher info that needs to be retrieved.

If this command is run on the command line, a return code is returned on the command line.

During a probe, the fault monitor determines whether both the SAP Web Application Server is online by running the `dpmon` command with the `-p` option.

```
# dpmon -p
```

The result of this command determines the action of the probe, as follows:

1. If the command times out, the SAP Web Application Server issues a partial failure. If this time-out occurs one more time within the probe interval period, a failover occurs.
2. If the command does not time out, the probe checks the value of the return code from the `dpmon` command, as follows:
 - A return code value of 0 indicates that the command is successful, and no further action is taken until the next probe.
 - All other return codes are treated as a partial failure. If such a failure occurs three more times within the probe interval period, a failover occurs.

The fault monitor probe for the SAP J2EE Engine instance is not configurable.

Note that the values for the number of timeouts and the probe interval period are assigned by the SAP Web Application Server fault monitor. You cannot change these values.

Verifying the HA for SAP Web Application Server Installation and Configuration

You have installed, registered, and configured the data service for SAP Web Application Server. Now verify that the data service makes the SAP Web Application Server highly available by performing the following tasks.

- Verify the operation of the fault monitor for the SAP enqueue server
- Verify the operation of the fault monitor for the SAP replica server
- Verify the operation of the fault monitor for the SAP message server
- Verify the operation of the fault monitor for the SAP web application server component
- Verify the installation and configuration of the SAP J2EE engine

See [“Tuning the HA for SAP Web Application Server Fault Monitors”](#) on page 65 for a description of the fault monitors.

▼ How to Verify the Operation of the Fault Monitor for the SAP Enqueue Server

Perform this procedure on each set of two nodes where the SAP enqueue server and the SAP replica server can run.

1 Log in to a node as superuser.

2 Ensure that the SAP replica server resource group is offline on all nodes.

At this point in this procedure you are testing the behavior of the SAP enqueue server resource group *without* the SAP replica server resource group. Therefore, the SAP replica server resource group must be offline on all nodes. Further in this procedure you will test the behavior of the SAP enqueue server *with* the SAP replica server resource group.

3 Bring online the resource group to which the SAP enqueue server belongs.

```
# clresourcegroup online -n node central-rg
```

```
-n node
```

Specifies the name of the node or zone on which the resource group is to be brought online. This node is the node that you have just logged in to.

```
central-rg
```

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP enqueue server belongs.

4 Abnormally terminate the SAP enqueue server.

- a. Determine the process ID of the SAP enqueue server, where the name of the SAP enqueue server executable file is `enserver`.

```
# ps -ef | grep enserver
```

- b. Kill the process for the SAP enqueue server.

```
# kill -9 pid
```

pid

Specifies the process ID of the SAP enqueue server. This ID is the process ID that you determined with the `ps` and `grep` commands.

5 Confirm that the SAP enqueue server fails over to the node where SAP replica server is online, if configured.

Run the `clresource status` command to confirm that the SAP enqueue server resource is offline on the first node or zone and online on the second node or zone.

6 Again, bring online the resource group to which the SAP enqueue server belongs.

```
# clresourcegroup online -n node central-rg
```

-n node

Specifies the name of the node or zone on which the resource group is to be brought online.

central-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP enqueue server belongs.

7 Log in to a different node or zone as superuser. On this node or zone, bring online the resource group to which the SAP replica server belongs.

```
# clresourcegroup online -n node repl-rg
```

-n node

Specifies the name of the node or zone on which resource group is to be brought online. This node is the node that you have just logged in to.

repl-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP replica server belongs.

8 Again, abnormally terminate the SAP enqueue server, as in [Step 4](#).

- 9 **Confirm that the SAP enqueue server resource group fails over to the node on which the SAP replica server resource group is running.**

As the SAP enqueue server resource group starts on the node on which the SAP replica server resource group is running, the SAP replica server resource group fails over to another available node. If no node is available, the SAP replica server resource group is offline.

Run the `clresource status` command to confirm that the SAP enqueue server resource group is offline on the first node or zone and online on the second node or zone. Confirm also that the SAP replica server resource group is offline on the second node. The SAP replica server resource group can be either online on another available node or zone or be offline.

▼ **How to Verify the Operation of the Fault Monitor for the SAP Replica Server**

Perform this procedure on each set of two nodes where the SAP replica server and the SAP enqueue server can run.

- 1 **Log in to a node as superuser.**
- 2 **Bring online the resource group to which the SAP enqueue server belongs.**

The SAP replica server resource is configured to be dependent on the SAP enqueue server resource.

```
# clresourcegroup online -n node central-rg
```

-n node

Specifies the name of the node or zone on which the resource group is to be brought online. This is the node or zone that you have just logged in to.

central-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP enqueue server belongs.

- 3 **Log in to a different node as superuser.**
- 4 **Bring online the resource group to which the SAP replica server belongs.**

```
# clresoourcegroup online -n node repl-rg
```

-n node

Specifies the name of the node or zone on which the resource group is to be brought online. This node is the node that you have just logged in to.

repl-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP replica server belongs.

5 Abnormally terminate the SAP replica server.

- a. Determine the process ID of the SAP replica server, where the name of the SAP replica server executable file is `enrepserver`.

```
# ps -ef | grep enrepserver
```

- b. Kill the process for the SAP replica server.

```
# kill -9 pid
```

pid

Specifies the process ID of the SAP replica server. This ID is the process ID that you determined with the `ps` and `grep` commands.

6 Confirm that the SAP replica server either restarts or fails over.

If the abnormal termination action in [Step 5](#) is repeated a specified number of times within a specified time interval, the SAP replica server fails over to an available node that is not running the SAP enqueue server. If no node is available, the SAP replica server is offline.

If the abnormal termination action is *not* repeated a specified number of times within a specified time interval, the SAP replica server restarts on the same node.

Run the `clresource status` command to determine the status of the SAP replica server.

The maximum number of times that the application can be abnormally terminated before failing over is specified with the standard property `Retry_count`. The time interval is specified with the standard property `Retry_interval`. These properties are described in “[Resource Properties](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

▼ How to Verify the Operation of the Fault Monitor for the SAP Message Server

Perform this procedure on each node where the SAP message server can run.

- 1 Log in to a node as superuser.
- 2 Bring online the resource group to which the SAP message server belongs.

```
# clresourcegroup switch -n node central-rg
```

-n node

Specifies the name of the node or zone on which the resource group is to be brought online. This node is the node that you have just logged in to.

central-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP message server belongs.

3 Specify that failover is to be enabled for the resource group.

```
# clresourcegroup set -p Failover_Enabled=True central-rg
```

```
-p Failover_Enabled=True
```

Specifies that the resource group is to fail over when `Retry_count` is exceeded during `Retry_interval`.

```
central-rg
```

Specifies the name of the resource group to be modified.

4 Terminate the SAP message server.**5 Confirm that the SAP message server either restarts or fails over.**

If the abnormal termination action in [Step 4](#) is repeated a specified number of times within a specified time interval, the SAP message server fails over to an available node. If no node is available, the SAP message server is offline.

If the abnormal termination action is *not* repeated a specified number of times within a specified time interval, the SAP message server restarts on the same node.

Run the `clresource status` command to determine the status of the SAP message server.

Note that the maximum number of times that the application can be abnormally terminated before failing over is specified with the standard property `Retry_count`, and the time interval is specified with the standard property `Retry_interval`. These properties are described in “Resource Properties” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

6 Again, bring online the resource group to which the SAP message server belongs, as described in [Step 2](#).**7 Specify that failover is to be disabled for the resource group.**

```
# clresourcegroup set -p Failover_Enabled=False central-rg
```

```
-p Failover_Enabled=False
```

Specifies that the resource group is *not* to fail over when `Retry_count` is exceeded during `Retry_interval`.

```
central-rg
```

Specifies the name of the resource group to be modified.

8 Terminate the SAP message server.**9 Confirm that the SAP message server restarts.**

Because the `Failover_Enabled` is set to `False`, the SAP message server always restarts.

▼ How to Verify the Operation of the Fault Monitor for the SAP Web Application Server and SAP J2EE Engine Components

Perform this procedure on each node where the SAP web application server or SAP J2EE Engine component can run.

1 Log in to a node as superuser.

2 Bring online the resource group to which the SAP message server belongs.

The SAP web application server component resource is configured to be dependent on the SAP message server resource.

```
# clresourcegroup switch -n node central-rg
```

-n node

Specifies the name of the node or zone on which resource group is to be brought online. This node is the node that you have just logged in to.

central-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP message server belongs.

3 Bring online the resource group to which the SAP web application server or SAP J2EE Engine component belongs.

For SAP web application server component only:

```
# clresourcegroup switch -n node webas-rg
```

-n node

Specifies the name of the node or zone on which the resource group is to be brought online. This node is the node that you have just logged in to.

webas-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP web application server component belongs.

For SAP J2EE Engine component only:

```
# clresourcegroup switch -n node j2ee-rg
```

-n node

Specifies the name of the node or zone on which the resource group is to be brought online. This node is the node that you have just logged in to.

j2ee-rg

Specifies the name of the resource group to be brought online. This group is the resource group to which the SAP J2EE Engine component belongs.

- 4 Terminate the SAP web application server or SAP J2EE Engine component.**
- 5 Confirm that the SAP web application server or SAP J2EE Engine component is restarted locally.**

If the abnormal termination action in [Step 4](#) is repeated a specified number of times within a specified time interval, the resulting behavior depends on whether the SAP web application server or SAP J2EE Engine component resource was configured as a failover or a scalable resource.

- If the SAP web application server or SAP J2EE Engine component resource was configured as a failover resource, the resource fails over to an available node. If no node is available, the SAP web application server or SAP J2EE Engine component is offline.
- If the SAP web application server or SAP J2EE Engine component resource was configured as a scalable resource, the resource is offline on this node.

Run the `clresource status` command to determine the status of the SAP web application server or SAP J2EE Engine component.

Note that the maximum number of times that the application can be abnormally terminated before failing over or becoming offline is specified with the standard property `Retry_count`, and the time interval is specified with the standard property `Retry_interval`. These properties are described in “[Resource Properties](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

Migrating Existing SAP Web Application Server and SAP J2EE Engine Resource Types to Oracle Solaris Cluster 3.3

If you are upgrading the resource types from an earlier version of Oracle Solaris Cluster to Oracle Solaris Cluster 3.3, you need to remove the existing resource types for SAP Web Application Server and SAP J2EE Engine and recreate them with Oracle Solaris Cluster 3.3 resource types. For more information on how to migrate existing resource types to Oracle Solaris Cluster 3.3 resource type, see “[How to Migrate Existing Resources to a New Version of the Resource Type](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

HA for SAP Web Application Server Extension Properties

Extension properties for HA for SAP Web Application Server resource types are described in the following sections:

- “[SUNW.sapenq Extension Properties](#)” on page 77
- “[SUNW.saprepl Extension Properties](#)” on page 80
- “[SUNW.sapses Extension Properties](#)” on page 82
- “[SUNW.sapwebas Extension Properties](#)” on page 85

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

SUNW.sapenq Extension Properties

The `SUNW.sapenq` resource type represents the SAP enqueue server in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

`Child_mon_level`

The child process monitoring level for the Process Monitor Facility (PMF). This property is equivalent to the `-C` option of `pmfadm`.

The default value of `-1` indicates that child process monitoring is not to be performed. Positive values indicate the desired level of child process monitoring.

Data type	Integer
Default	-1
Range	No range defined
Tunable	Any time

`Enqueue_Instance_Number`

The two-digit instance number for the SAP enqueue server. This number is the value of `SAPSYSTEM` in the SAP profile for SAP enqueue server.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

Enqueue_Profile

The full path to the SAP enqueue server profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

Enqueue_Server

The full path to the SAP enqueue server executable.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

Enqueue_Server_Monitor

The full path to the SAP enqueue server monitor executable.

Data type	String
Default	<i>directory</i> /ensmon, where <i>directory</i> is the full path to the directory where the SAP enqueue server executable is stored, as specified by the extension property Enqueue_Server.
Range	Not applicable
Tunable	When disabled

Log_Directory

The directory for the startup and monitor log files.

Data type	String
Default	The home directory of the administration user, as specified by the extension property SAP_User.
Range	Not applicable
Tunable	When disabled

Monitor_retry_count

The maximum number of restarts by the Process Monitor Facility (PMF) that are allowed for the SAP enqueue server fault monitor.

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

Monitor_retry_interval

The interval in minutes between restarts of the SAP enqueue server fault monitor.

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

Probe_timeout

The timeout value in seconds that the SAP enqueue server fault monitor uses to probe an SAP enqueue server instance.

Data type	Integer
Default	120
Range	Minimum = 2; no maximum defined
Tunable	Any time

SAP_User

The administration user for the SAP enqueue server.

Data type	String, where letters are in lowercase
Default	No default defined
Range	Not applicable
Tunable	When disabled

Stop_signal

The signal that is sent to the application to stop the SAP enqueue server application.

Data type	Integer
Default	2 (equivalent to SIGINT)
Range	1–37
Tunable	When disabled

SUNW.saprepl Extension Properties

The `SUNW.saprepl` resource type represents the SAP replica server in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

Child_mon_level

The child process monitoring level for the Process Monitor Facility (PMF). This property is equivalent to the `-C` option of `pmfadm`.

The default value of `-1` indicates that child process monitoring is not to be performed. Positive values indicate the desired level of child process monitoring.

Data type	Integer
Default	-1
Range	No range defined
Tunable	Any time

Log_Directory

The directory for the startup and monitor log files that are created by the SAP replica server application.

Data type	String
Default	The home directory of the administration user, as specified by the extension property <code>SAP_User</code> .
Range	Not applicable
Tunable	When disabled

Monitor_retry_count

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

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

Monitor_retry_interval

The interval in minutes between restarts of the SAP replica server fault monitor.

Data type	Integer
Default	2
Range	No range defined

Tunable Any time

Probe_timeout

Currently unused. The timeout value in seconds that the SAP replica server fault monitor uses to probe an SAP replica server instance. The SAP replica server is started by PMF and monitored by PMF. No additional probing is currently performed by the fault monitor.

Data type Integer

Default 30

Range Minimum = 2; no maximum defined

Tunable Any time

Replica_Profile

The full path to the SAP replica server profile.

Data type String

Default No default defined

Range Not applicable

Tunable When disabled

Replica_Server

The full path to the SAP replica server executable.

Data type String

Default No default defined

Range Not applicable

Tunable When disabled

SAP_User

The administration user for the SAP replica server.

Data type String, where letters are in lowercase

Default No default defined

Range Not applicable

Tunable When disabled

Stop_signal

The signal that is sent to the application to stop the SAP replica server application.

Data type Integer

Default 2 (equivalent to SIGINT)

Range 1–37

Tunable Any time

SUNW.sapscs Extension Properties

The SUNW.sapscs resource type represents the SAP message server, as well as some associated utilities, in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

Failover_Enabled

Specifies whether to fail over when Retry_count is exceeded during Retry_interval. The possible values of this extension property are as follows:

- True – Specifies that the resource group is to fail over when Retry_count is exceeded during Retry_interval
- False – Specifies that the resource group is *not* to fail over when Retry_count is exceeded during Retry_interval

Data type Boolean
Default TRUE
Range Not applicable
Tunable Any time

Monitor_retry_count

The maximum number of restarts by the Process Monitor Facility (PMF) that are allowed for the SAP message server fault monitor.

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

Monitor_retry_interval

The interval in minutes between restarts of the SAP message server fault monitor.

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

Msg_Server_Monitor

The SAP message server probe executable.

Data type	String
Default	/usr/sap/SAPSID/SYS/exe/run/msprot, where <i>SAPSID</i> is the SAP system identification
Range	Not applicable
Tunable	When disabled

Msg_Server_Port

The listen port of the SAP message server.

If no value is specified for this property, the initial default value is 0, and a derived default value is calculated to be $3600 + \text{SAP_Instance_Number}$. Specify a value for this property if the listen port of the SAP message server to be probed is not equivalent to $3600 + \text{SAP_Instance_Number}$. For example, if two SAP message servers exist, specify a value for this property.

Data type	Integer
Default	0
Range	0 — 65535
Tunable	When disabled

Probe_timeout

The timeout value in seconds that the SAP message server fault monitor uses to probe an SAP message server instance.

Data type	Integer
Default	120
Range	Minimum 2
Tunable	Any time

SAP_Instance_Name

The name of the SAP message server instance. This name is `INSTANCE_NAME` in the SAP profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

SAP_Instance_Number

The two-digit SAP system number for the SAP message server instance. This number is `SAPSYSTEM` in the SAP profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

SAP_SID

The SAP system ID. This ID is SAPSYSTEMNAME in the SAP profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

SAP_User

The administration user for the SAP message server.

Data type	String, where letters are in lowercase
Default	SAPSIDadm, where SAPSID is the SAP system identification, converted to lowercase
Range	Not applicable
Tunable	When disabled

Scs_Shutdown_Script

The full path to the shutdown script for the instance.

Data type	String
Default	/usr/sap/SAPSID/SYS/exe/run/stopsap
Range	Not applicable
Tunable	When disabled

Scs_Startup_Script

The full path to the startup script for the instance.

Data type	String
Default	/usr/sap/SAPSID/SYS/exe/run/startsap
Range	Not applicable
Tunable	When disabled

SUNW.sapwebas Extension Properties

The SUNW.sapwebas resource type represents the SAP web application server component in a Oracle Solaris Cluster configuration. The extension properties of this resource type are as follows:

Monitor_retry_count

The maximum number of restarts by the Process Monitor Facility (PMF) that are allowed for the SAP web application server component fault monitor.

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

Monitor_retry_interval

The interval in minutes between restarts of the SAP web application server component fault monitor.

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

Probe_timeout

The timeout value in seconds that the SAP web application server component fault monitor uses to probe an SAP web application server component instance.

Data type	Integer
Default	120
Range	Minimum 2
Tunable	Any time

SAP_Instance_Name

The name of the SAP web application server component instance. This name is INSTANCE_NAME in the SAP profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

SAP_Instance_Number

The two-digit SAP system number for the SAP web application server component instance. This number is SAPSYSTEM in the SAP profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

SAP_SID

The SAP system ID. This ID is SAPSYSTEMNAME in the SAP profile.

Data type	String
Default	No default defined
Range	Not applicable
Tunable	When disabled

SAP_User

The administration user for the SAP web application server component.

Data type	String, where letters are in lowercase
Default	SAPSIDadm, where SAPSID is the SAP system identification, converted to lowercase
Range	Not applicable
Tunable	When disabled

SAP_Instance_Type

The Instance type on the specified host. The possible values of this extension property are as follows:

- ABAP - specifies that SAP Web Application Server ABAP central instance is installed on the host.
- J2EE - specifies that SAP Web Application Server Java engine is installed on the host.
- ABAP_J2EE - specifies that SAP Web Application Server ABAP and SAP Web Application Server Java engine are installed on the host.

Data type	Enum
Default	ABAP
Range	Not applicable
Tunable	When disabled

SAP_Logdir

The SAP log files directory.

Data type	String
Default	Null
Range	Not applicable
Tunable	Any time

Webas_Shutdown_Script

The full path to the shutdown script for the instance.

Data type	String
Default	/usr/sap/SAPSID/SYS/exe/run/stopsap
Range	Not applicable
Tunable	When disabled

Webas_Startup_Script

The full path to the startup script for the instance.

Data type	String
Default	/usr/sap/SAPSID/SYS/exe/run/startsap
Range	Not applicable
Tunable	When disabled

Webas_Use_Pmf

Determines if the startup script process tree is run under PMF. The possible values of this extension property are as follows:

- True – Specifies that the startup script process tree is run under PMF
- False – Specifies that the startup script process tree is *not* run under PMF

Data type	Boolean
Default	TRUE
Range	Not applicable
Tunable	When disabled

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