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

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Chapter 1

Introducing the Veritas High Availability Agent for SAP NetWeaver

This chapter includes the following topics:

- About the Veritas agent for SAP NetWeaver
- What's new in this agent
- Supported software
- About SAP NetWeaver
- SAP NetWeaver agent functions

About the Veritas agent for SAP NetWeaver

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

The Veritas agent for SAP NetWeaver provides high availability for SAP R/3 and SAP NetWeaver in a cluster. The agent for SAP NetWeaver is designed to support a wide range of SAP environments, including the traditional Basis architecture and the SAP J2EE Web Application Server architecture (NetWeaver). The agent also supports standalone Enqueue servers in a distributed SAP installation.

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

http://seer.entsupport.symantec.com/docs/282004.htm

The Veritas agent for SAP NetWeaver brings SAP instances online, monitors the instances, and bring the instances offline. The agent monitors the system processes and server states, and can shutdown the server in case of a fault.

The SAP instances are as follows:

- Central instance
- Dialog instance
- Standalone Enqueue Server
- Enqueue Replication Server

The agent supports the following SAP Web Application Server architectures:

- ABAP
- Java
- Java Add-In (ABAP + Java)

What's new in this agent

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

- Added support for creating and modifying SAP service groups using a wizard.
- Added support for CCMS agents; sapccm4x and sapccmsr.
- Added support for Internationalization (i18n).
- Added support for 'ig' (Internet Graphics Server) process.
- Agent supports Enqueue Server and Enqueue Replication Server inside Solaris 10 non-global zones.
- Agent supports Solaris x64 platform.
- Agent now supports 'ms' (Message Server) process restart.
- Added 'cleanipc' support for Enqueue Replication Server.
- Added support for HP-UX 11iv3
- Added support for RHEL 5.0 and SuSE 10.0

Supported software

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

Veritas Cluster Server	VCS 3.5, 4.0, 4.1, 5.0 **Note:** VCS 3.5 is supported on HP-UX 11i v1 platform only. Apply appropriate Maintenance Pack patches to VCS to support mount agent for NFS mounts inside Solaris non-global zones. Example: VCS 5.0 MP2
ACC Library	5.1.0.0 and later Review the ACC Library version for i18n support. See "Prerequisites for enabling i18n support" on page 24.
Operating Systems	■ AIX 5.1, 5.2 and 5.3 on pSeries ■ HP-UX 11i v1, 11i v2, 11iv3 ■ Red Hat Enterprise Linux 4.0, 5.0 ■ SUSE Linux 9.0, 10.0 ■ Solaris 8, 9, 10 SPARC ■ Solaris 10 x64
SAP R/3	■ 4.6C with a 4.6D Kernel ■ 4.6D ■ 4.7 Enterprise Version
SAP Web AS	6.20, 6.40, 7.00
SAP NetWeaver	2004, 2004s
mySAP Business Suite	Based on SAP NetWeaver Platform.
SAP applications	Applications based on SAP NetWeaver platform.

SAP NetWeaver components compatibility matrix

Table 1-1 lists the compatibility matrix for SAP NetWeaver technology components.

Table 1-1 Compatibility matrix for SAP NetWeaver technology components

EP	BW BI	XI PI	MDM MDS	SAP Kernel/SAP Web AS
7.0	7.0	7.0	5.5	7.00
-	-	-	3.0	6.40

Table 1-1 Compatibility matrix for SAP NetWeaver technology components *(continued)*

EP	BW BI	XI PI	MDM MDS	SAP Kernel/SAP Web AS
6.0	3.5	3.0	-	6.40 6.20
-	3.1	-	-	6.20

Table 1-2 lists the compatibility matrix for SAP NetWeaver application components.

Table 1-2 Compatibility matrix for SAP NetWeaver application components

R/3 and R/3 Enterprise ECC	SCM APO	SRM	CRM EBP	KW	Solution Manger	SAP Kernel/SAP Web AS
6.0	5.0 5.1	5.5	5.0	7.0	4.00	7.00
5.0 4.7x200	4.1	5.0 4.0 SR1	4.0	-	3.20	6.40 6.20
4.7x110	4.0	4.0 3.1	3.0	-	3.10	6.20
4.6C	3.1	-	-	-	-	4.6D

About SAP NetWeaver

All SAP NetWeaver components (example, BI, XI, EP) run on top of the SAP NetWeaver Application Server.

The following SAP system installations are possible with SAP NetWeaver Application Server (AS):

- SAP NetWeaver Application Server ABAP (ABAP only)
- SAP NetWeaver AS Java (Java only)
- SAP NetWeaver Application Server Add-In (ABAP and Java)

Depending on the SAP NetWeaver component to be installed, the Web Application Server type is determined. For example, SAP NetWeaver EP 6.0 requires a Java stack, hence SAP NetWeaver AS Java (or Add-In) needs to be installed. SAP NetWeaver XI 3.0 requires SAP NetWeaver AS Add-In.

SAP system components

An SAP application instance has multiple services or components which are typically deployed across multiple servers.

SAP identifies the following services as critical to the application environment, representing potential single points of failure:

- Database Instance
- Central Instance
- Central Services Instance
- Enqueue Replication Service
- Dialog Instance
- Network File System (NFS) or Common Internet File System (CIFS) services

SAP architecture

Table 1-3 lists the different SAP architectures and its components.

Table 1-3 SAP architecture

Architecture	Component	Service	Functions
SAP NetWeaver AS ABAP	Central Instance Dialog Instance	ABAP Dispatcher	■ Controls program that manages the resources of the R/3 applications. ■ Balances assignment of the transaction load to the work processes. ■ Manages buffers in main memory. ■ Manages connections with the presentation level. ■ Organizes the communication processes.
		ABAP Work processes	■ Acts as a service offered by a server and requested by a client ■ Acts as a special program in charge of some specific tasks.

Table 1-3 SAP architecture *(continued)*

Architecture	Component	Service	Functions
	Central Services Instance	ABAP Enqueue Service	■ Manages logical locks. ■ Ensures server synchronization.
		ABAP Message Service	■ Central service for cluster internal communication, such as event notifications, broadcasts, exchange of cache content, and so on. ■ Provides cluster state information to SAP Web Dispatcher. ■ Keeps a list of application servers that can be reached within the system.
	Enqueue Replication Instance	ABAP Enqueue Replication Service	Enables the lock table to be replicated on a second server, the replication server.
SAP NetWeaver AS Java	Central Instance	Java Dispatcher	Receives client requests and forwards them to the server processes accordingly.
		Java Server Processes	Processes the requests and holds the session data.
		SDM	The Software Deployment Manager (SDM) is a tool with which you can manage and deploy software packages (Software Deployment Archives and Software Component Archives) that you receive from SAP to the Web AS Java.
	Dialog Instance	Java Dispatcher	Receives client requests and forwards them to the server processes accordingly.
		Java Server Processes	Processes the requests and holds the session data.
	Central Services Instance	Java Enqueue Service	■ Manages logical locks. ■ Ensures server synchronization.

Table 1-3 SAP architecture *(continued)*

Architecture	Component	Service	Functions
		Java Message Service	■ Acts as a central service for cluster internal communication, such as event notifications, broadcasts, exchange of cache content, and so on. ■ Provides cluster state information to SAP Web Dispatcher. ■ Keeps a list of application servers that can be reached within the system.
	Enqueue Replication Instance	Java Enqueue Replication Service	Enables the lock table to be replicated on a second server, the replication server.
SAP NetWeaver AS Add-In	Central Instance (ABAP and Java)	ABAP Dispatcher	■ Controls program that manages the resources of R/3 applications. ■ Balances the assignments of the transaction load to the work processes. ■ Manages buffer in main memory. ■ Connects to the presentation level. ■ Organizes the communication processes.
		ABAP Work processes	■ Acts as a service offered by a server and requested by a client. ■ Manages the programs that handle specific tasks.
		Java Dispatcher	■ Receives client requests and accordingly forwards them to the server for further processing.
		Java Server Processes	■ Handles the client-server processes and maintains the session data.
		SDM	■ Manages the software packages received from SAP and deploys them on Web AS Java.
	Dialog Instance (ABAP and Java)	ABAP Dispatcher	■ Controls the programs that manages the resources of R/3 applications. ■ Balances assignment of the transaction load to the work processes. ■ Manages buffer in main memory. ■ Connection with the presentation level. ■ Organizes the communication processes.

Table 1-3 SAP architecture *(continued)*

Architecture	Component	Service	Functions
		ABAP Work processes	■ Acts as a service offered by a server and requested by a client. ■ Acts as a special program in charge of some specific tasks.
		Java Dispatcher	Receives client requests and forwards them to the server processes accordingly.
		Java Server Processes	Processes the requests and holds the session data.
	Central Services Instance ABAP	ABAP Enqueue Service	■ Manages logical locks ■ Ensures server synchronization
		ABAP Message Service	■ Acts as a central service for cluster internal communication, such as event notifications, broadcasts, exchange of cache content, and so on. ■ Provides cluster state information to SAP Web Dispatcher ■ Keeps a list of application servers that can be reached within the system.
	Central Services Instance Java	Java Enqueue Service	■ Manages logical locks. ■ Ensures server synchronization.
		Java Message Service	■ Acts as a central service for cluster internal communication, such as event notifications, broadcasts, exchange of cache content, and so on. ■ Provides cluster state information to SAP Web Dispatcher ■ Keeps a list of application servers that can be reached within the system.
	Enqueue Replication Instance ABAP	ABAP Enqueue Replication Service	Enables the lock table to be replicated on a second server, the replication server.
	Enqueue Replication Instance Java	Java Enqueue Replication Service	Enables the lock table to be replicated on a second server, the replication server.

Single Point of Failures (SPOF)

In a distributed SAP environment, the following components are critical for application availability. Hence, these components need to be protected.

- Database Instance
- Central Instance
- Dialog Instance
- Central Services Instance
- Network File System

Table 1-4 lists the possibilities to eliminate the single point of failures.

Table 1-4 Possibilities to secure the single point of failures

Single Point of Failure	Technical Possibilities to eliminate the SPOF
Central Database	Switch-over solutions
Central Services	Set up an Enqueue Replication Server controlled by a switch-over solution
Central Instance/Dialog Instance	Switch-over solutions
SAP Central File System	■ Cluster File System (CFS) by switch-over solution ■ NFS file share ■ Hardware based highly available Storage Solution

About SAPCPE

SAPCPE is a generic tool developed by SAP. The SAP startup framework launches this tool before starting the actual instance.

SAPCPE is used in every high availability setup to automate the synchronization of binaries and executables from a central location to the local disks. The SAPCPE tool requires the list of target files to enable this synchronization.

SAP NetWeaver agent functions

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

Online

The online function performs the following tasks:

- Performs a preliminary check to ensure that the SAP instance is not online on the specified node in the cluster.
- Removes any SAP processes that remain because of an unclean shutdown as follows:
  - If the SAP instance is Central, Dialog or [A|J]ENQREP, the `cleanipc` utility gets executed. Otherwise, the agent kills all relevant SAP processes.
  - If the `kill.sap` file exists in the /usr/sap/SAPSID/InstName/work directory, the function removes the file from the directory.
  - Removes the SE and CO locks files from the /usr/sap/SAPSID/InstName/data directory.
- Initiates the standard SAP error log process.
- Starts the SAP O/S Collector that pipes the standard output and standard error messages to the SAP error log file.
- Starts the SAP instance using the `sapstart` command.
- Ensures that the instance is fully initialized.

Offline

The offline function performs the following tasks:

- Sends a SIGINT signal to the `sapstart` process, if the process exists. Otherwise, the function sends a SIGINT signal to all running processes that are relevant to the specified SAP instance.
- Waits for the SAP instance to go offline successfully.
- Ensures that no relevant SAP processes are running. If any processes remain, the operation kills the remaining processes using a SIGKILL signal.
- If the `kill.sap` file exists in the /usr/sap/SAPSID/InstName/work directory, the operation removes the file from the directory.
- Removes the SE and CO locks files from the /usr/sap/SAPSID/InstName/data directory.
- If the SAP instance is Central, Dialog, or [A|J]ENQREP the operation executes the `cleanipc` utility.
- Augments the SAP log, with the shutdown information.

Monitor

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

- Depending upon the search criteria that the ProcMon attribute specifies, the monitor function scans the process table to verify the SAP instance processes are running. For more information about setting the ProcMon attribute:
See "Monitoring an SAP instance" on page 37.
- If the SecondLevelMonitor attribute is greater than 0, the monitor function performs a thorough health check of the SAP instance as follows:
  - For Central or Dialog instances, the function uses the following utilities to perform this check:

Server installation type	SAP utility used
SAP Web Application Server as ABAP	sapinfo
SAP Web Application Server as Java	jcmon
SAP Web Application Server as Java Add-In	sapinfo and jcmon

  - For Enqueue Server and Enqueue Replication Server instances, the function uses the `ensmon` utility.
- The monitor function executes a custom monitor utility.
See "Executing a customized monitoring program" on page 41.

Clean

The clean function performs the following tasks:

- Sends a SIGINT signal to the `sapstart` process, if the process exists. Otherwise, the function sends a SIGINT signal to all running processes that are relevant to the specified SAP instance.
- Ensures that no relevant SAP processes are running. If any processes remain, the operation kills all the remaining processes using a SIGKILL signal.
- If the `kill.sap` file exists in the /usr/sap/SAPSID/InstName/work directory, the operation removes the file from the directory.
- Removes the SE and CO lock files from the /usr/sap/SAPSID/InstName/data directory.

- If the SAP Instance is a Central, Dialog, or [A|J]ENQREP instance, the operation executes the `cleanipc` utility.
- Augments the SAP log.

Chapter 2

Installing, upgrading, and removing the agent for SAP NetWeaver

This chapter includes the following topics:

- Before you install the Veritas agent for SAP NetWeaver
- Installing the ACC library
- Installing the agent in a VCS environment
- Removing the agent in a VCS environment
- Removing the ACC library
- Upgrading the agent for SAP NetWeaver

Before you install the Veritas agent for SAP NetWeaver

You must install the Veritas agent for SAP NetWeaver on all the systems that will host a SAP server service group.

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

- Install and configure Veritas Cluster Server.
- Remove any previous version of this agent.
- Install the latest version of ACC Library.

To install or update the ACC Library package, locate the library and related documentation on the agentpack disc.
See "About ACC Library" on page 25.

Prerequisites for enabling i18n support

Perform the following steps to enable i18n support to the agent:

- Install ACCLib version 5.1.2.0 or later.
  You can find the latest version of ACCLib on the agent pack disc at the following location:

Platform	Location
AIX	cd1/platform/application/acc_library/vcs/version_library/pkgs/
HP-UX	cd1/platform/*arch_dist*/application/acc_library/vcs/version_library/pkgs/ where *arch_dist* takes the value 'generic'
Linux	cd1/platform/*arch_dist*/application/acc_library/vcs/version_library/rpms/ where *arch_dist* takes the value 'generic'
Solaris	cd1/platform/*arch_dist*/application/acc_library/vcs/version_library/pkgs/ where *arch_dist* takes the following values: 'sparc' for Solaris SPARC 'sol_x64' for Solaris x64

- Copy the latest ag_i18n_inc.pm module from the following location on the agent pack disc.

Note: Review the readme.txt for instructions to copy this module.

VCS 5.0	cd1/*platform*/*arch_dist*/application/i18n_support/vcs/5.0
VCS 4.1	cd1/*platform*/*arch_dist*/application/i18n_support/vcs/4.1
VCS 4.0	cd1/*platform*/*arch_dist*/application/i18n_support/vcs/4.0

where *arch_dist* takes the following values:
'sparc' for Solaris SPARC
'sol_x64' for Solaris x64
'generic' for HP-UX and Linux

Note: *arch_dist* is not applicable to AIX.

Prerequisites for installing the agent to support Solaris zones

Ensure that you meet the following prerequisites to install the agent for SAP NetWeaver:

- Install SAP NetWeaver to support Solaris zones. Refer to the SAP note 870652.
- Install and configure the VCS 5.0 environment to support Solaris zones. Refer to the VCS user documentation for details.
- Remove any previous version of this agent.

About ACC Library

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

Installing the ACC library

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

To install the ACC library

1. Log in as superuser.
2. Navigate to the pkgs directory (the pkgs directory on the CD).

AIX	*cd_mount*/aix/application/acc_library/vcs/*version*_library/pkgs
HP-UX	*cd_mount*/hpux/generic/application/acc_library/vcs/*version*_library/pkgs
Linux	*cd_mount*/linux/generic/application/acc_library/vcs/*version*_library/rpms
Solaris	*cd_mount*/solaris/*dist_arch*/application/acc_library/vcs/*version*_library/pkgs where *dist_arch* is sparc or sol_x64.

3 Install the package. Enter **Yes** if asked to confirm overwriting of files in the existing package.

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

HP-UX
```
# swinstall -s `pwd` VRTSacclib
```

Linux
```
# rpm -i \
VRTSacclib-VersionNumber-GA_GENERIC.noarch.rpm
```

Solaris
```
# pkgadd -d . VRTSacclib
```

4 For HP-UX, install the HP-UX patch PHCO_29042 if it is not already installed.

Installing the agent in a VCS environment

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

To install the agent

1 Log in as superuser.

2 Navigate to the directory containing the package for the platform running in your environment.

AIX
```
cd_mount/aix/application/sapnw_agent/
vcs_version/version_agent/pkgs
```

HP-UX
```
cd_mount/hpux/generic/application/sapnw_agent/
vcs_version/version_agent/pkgs
```

Linux
```
cd_mount/linux/generic/
application/sapnw_agent/vcs_version/
version_agent/rpms
```

Solaris
```
cd_mount/solaris/dist_arch/application/
sapnw_agent/vcs_version/version_agent/pkgs
```

3 Install the package.

AIX
```
# installp -ac -d VRTSsapnw04.rte.bff VRTSsapnw04.rte
```

HP-UX
```
# swinstall -s 'pwd' VRTSsapnw04
```

Linux
```
# rpm -ihv \
VRTSsapnw04-AgentVersion-GA_GENERIC.noarch.rpm
```

Solaris
```
# pkgadd -d . VRTSsapnw04
```

Removing the agent in a VCS environment

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

To uninstall the agent in a VCS environment

1 Log in as a superuser.

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

```
# haconf -makerw
```

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

```
# hares -list Type=SAPNW04
```

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

```
# hatype -delete SAPNW04
```

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

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

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

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

Execute the following command to uninstall the agent:

AIX	`# installp -u VRTSsapnw04.rte`
HP-UX	`# swremove VRTSsapnw04`
Linux	`# rpm -e VRTSsapnw04`
Solaris	`# pkgrm VRTSsapnw04`

Removing the ACC library

Perform the following steps to remove the ACC library.

To remove the ACC library

1 Ensure that all agents that use ACC library are removed.

2 Run the following command to remove the ACC library package.

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

Upgrading the agent for SAP NetWeaver

To upgrade the agent, first remove the older version of the agent.

See “Removing the agent in a VCS environment” on page 27.

Then, follow the instructions to install the new agent software.

See “Installing the agent in a VCS environment” on page 26.

Chapter 3

Preparing to configure the agent for SAP NetWeaver

This chapter includes the following topics:

- About configuring the Veritas agent for SAP NetWeaver
- Importing the agent types files for VCS
- SAP NetWeaver agent attributes
- Generating environments file for SAP
- Uniquely identifying SAP server instances
- Monitoring an SAP instance
- Setting the SAPMonHome attribute
- Configuring the SAP NetWeaver agent for message server restart
- Executing a customized monitoring program
- Preventing early faulting of Java and Add-in instances
- Using Perl in the VCS 3.5 environment
- Copying ag_i18n_inc.pm module for VCS 3.5
- Setting up zones on Solaris 10 for SAP Enqueue and Enqueue Replication Servers

About configuring the Veritas agent for SAP NetWeaver

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

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

See "About sample configurations for the agent for SAP NetWeaver" on page 97.

Importing the agent types files for VCS

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

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

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

VCS 4.x	/etc/VRTSvcs/conf/sample_SAPNW04/SAPNW04Types.cf
VCS 5.0	/etc/VRTSagents/ha/conf/SAPNW04/SAPNW04Types.cf
For Solaris zone support	/etc/VRTSagents/ha/conf/SAPNW04/SAPNW04Types_zones.cf

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

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

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

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

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

```
# mkdir ./temp
# cd ./temp
```

3. Copy the sample file Types.cf from the following location:

VCS 4.x	/etc/VRTSvcs/conf/sample_SAPNW04/SAPNW04Types.cf
VCS 5.0	/etc/VRTSagents/ha/conf/SAPNW04/SAPNW04Types.cf
VCS 5.0 under Solaris zones	/etc/VRTSagents/ha/conf/SAPNW04/SAPNW04Types_zones.cf

   The following example assumes VCS 5.0 is installed:

```
# cp /etc/VRTSagents/ha/conf/SAPNW04/SAPNW04Types.cf .
```

4. Create a dummy main.cf file:

```
# echo 'include "SAPNW04Types.cf"' > main.cf
```

5. Create the SAP resource type as follows:

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

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

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

SAP NetWeaver agent attributes

Table 3-1 shows the required attributes for configuring a SAP NetWeaver instance.

Table 3-1 Required attributes

Required attributes	Description
EnqSrvResName	The name of the standalone ENQUEUE server cluster resource. This attribute is used only by an Enqueue Replication Server. Using this attribute the replication server queries the ENQUEUE server resource state while searching for a fail over target and vice a versa. Type and dimension: string-scalar Default: "" Example: SAP70_ERPASCS_sapnw04
EnvFile	The absolute path to the file that must be sourced with the UNIX shell. You must source this file to set the environment before executing SAP scripts for online, offline, monitor, and clean operations. Supported shell environments are ksh, sh, and csh. **Note:** Ensure that the syntax of this file is in accordance with the user shell that the SAPAdmin attribute specifies. Review the information on how to generate environments file for SAP. See "Generating environments file for SAP" on page 35. Symantec recommends that you store this file on shared disk so that the file is always available to an online system. Type and dimension: string-scalar Default: "" Example: /usr/sap/ERP/DVEBMGS00/saperp.env
InstName	Identifies a SAP server instance. Review the information about setting this attribute: See "Uniquely identifying SAP server instances" on page 36. Type and dimension: string-scalar Default: "" Example: DVEBMGS00

Table 3-1 Required attributes *(continued)*

Required attributes	Description
InstType	An identifier that classifies and describes the SAP server instance type. Valid values are: ■ CENTRAL: SAP Central instance ■ DIALOG: SAP Dialog instance ■ ENQUEUE: Standalone Enqueue Server instance or SAP Central Services instance for ABAP only or Java only installation ■ AENQUEUE: ABAP SAP Standalone Enqueue instance for an Add-In installation ■ JENQUEUE: Java SAP Standalone Enqueue instance for an Add-In installation ■ ENQREP: SAP Enqueue Replication Server for an Add-In installation for ABAP only or Java only installation ■ AENQREP: ABAP SAP Enqueue Replication Server for an Add-In installation ■ JENQREP: Java SAP Enqueue Replication Server for an Add-In installation **Note:** The value of this attribute is not case-sensitive. Type and dimension: string-scalar Default: CENTRAL Example: DIALOG
ProcMon	The list of SAP processes to monitor. The entries in this list are separated using space and can be specified in any order. Review the information about how the monitor operation uses this attribute: See "Monitoring an SAP instance" on page 37. Type and dimension: string-scalar Default: "" Example: dw se jc
ResLogLevel	The logging detail performed by the agent for the resource. Valid values are: ERROR: Only logs error messages. WARN: Logs above plus warning messages. INFO: Logs above plus informational messages. TRACE: Logs above plus trace messages. TRACE is very verbose and should only be used during initial configuration or for troubleshooting and diagnostic operations. Type and dimension: string-scalar Default: INFO Example: TRACE

Table 3-1 Required attributes *(continued)*

Required attributes	Description
SAPAdmin	SAP System administrator for SAPSID. This user name is usually a concatenation of the SAPSID attribute and the adm string 'sidadm'. This user name is stored in one or more system naming services, for example, NIS, NIS+, and LDAP servers. The agent operations use this user name to execute their respective core subroutines. Type and dimension: string-scalar Default: "" Example: erpadm
SAPMonHome	The location of the directory that contains the binary used for second level monitoring process. Review the information about setting the SAPMonHome attribute. See "Setting the SAPMonHome attribute" on page 38. Type and dimension: string-scalar Default: "" Example: /usr/sap/ERP/SYS/exe/runU
SAPSID	SAP system name. This attribute must have three alpha-numeric characters, and must begin with an alphabet. The value of this attribute is defined during the SAP installation. Review the information about setting this attribute: See "Uniquely identifying SAP server instances" on page 36. Type and dimension: string-scalar Default: "" Example: ERP
StartProfile	The full path to the SAP Instance Start Profile. The Start Profile is found in /usr/sap/*SAPSID*/SYS/profile directory, with the file name START_*InstName_virtualhostname*. The virtual hostname must resolve into a valid IP address that is used to cluster the SAP instance. Type and dimension: string-scalar Default: "" Example: /usr/sap/ERP/SYS/profile/START_DVEBMGS00_saperpci

Table 3-2 lists the optional attributes.

Table 3-2 Optional attributes

Optional attribute	Description
MonitorProgram	Absolute path name of an external, user-supplied monitor executable. Review the information about setting this attribute: ■ See "Executing a customized monitoring program" on page 41. ■ See "Setting the SAPMonHome attribute" on page 38. Type and dimension: string-scalar Default: "" Example 1: /usr/sap/ERP/DVEBMGS00/work/myMonitor.sh Example 2: /usr/sap/ERP/DVEBMGS00/work/myMonitor.sh arg1 arg2
SecondLevelMonitor	Used to enable second-level monitoring. Second-level monitoring is a deeper, more thorough state check of the SAP instance. The numeric value specifies how often the monitoring routines must run. 0 means never run the second-level monitoring routines, 1 means run routines every monitor interval, 2 means run routines every second monitor interval, and so on. **Note:** Exercise caution while setting SecondLevelMonitor to large numbers. For example, if the MonitorInterval is set to 60 seconds and the SecondLevelMonitor is set to 100, then sapinfo is executed every 100 minutes, which may not be as often as intended. For maximum flexibility, no upper limit is defined for SecondLevelMonitor. Type and dimension: integer-scalar Example: 1 Default: 0

Generating environments file for SAP

Symantec recommends using a custom generated environments file to configure the EnvFile attribute of the SAPNW04 agent. The steps to generate the environments file for SAP applications are given as follows.

To generate the environments file for SAP applications

1 Login as *SAPAdmin* user.

```
su - erpadm
```

2 Capture the environment with the following command.

```
env > /home/erpadm/saperp.env
```

3 Adopt this file according to the *SAPAdmin* user shell environment.

For example, if the generated file contains environments for bash shell and SAPAdmin user shell is C shell, convert the file to C shell environments with the following steps:

- Edit the saperp.env file to add string ‘setenv’ at the beginning of each line.
- Replace the '=' with space " " in the file.

4 Copy the saperp.env file to shared directory and use it as the SAP instance’s environments file in EnvFile attribute. Ensure that the permissions are set properly for user SAPAdmin.

```
chmod 755 saperp.env
```

Uniquely identifying SAP server instances

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

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

Each instance has a unique instance name. The instance names may follow the conventional form. For example, Dialog instances begin with 'D', and Central instances are typically named DVEBMGS.

Instance names often include an instance ID suffix which is an integer between 00-97. For example, a Central instance with an instance ID = 00 may have an instance name of DVEBMGS00.

The SAPSID and InstName form a unique identifier that can identify the processes running for a particular instance.

Some examples of SAP instances are given as follows:

SAP Instance name	SAP Instance type
DVEBMGS00	SAP BASIS Central instance - ABAP
DVBGS01	SAP BASIS Central instance without Enqueue and ABAP Message Server
JC02	SAP Central instance - Java
ASCS03	SAP Standalone Enqueue Server or SAP Central Services-ABAP
SCS04	SAP Central Services - Java

D05	SAP Dialog instance - ABAP
J06	SAP Dialog instance - Java
ERS07	SAP Enqueue Replication Server

Differentiating SAP instances is important to identify each instance uniquely. When the agent kills the processes of a non-responsive or failed instance in absence of unique names for each server, the agent may kill processes for more than one SAP instance during a clean operation.

Note: The instance name for Enqueue Replication Server can be REP or ERS. These two names can be interchangeably used to represent the Enqueue Replication Server.

Monitoring an SAP instance

The monitor operation performs process level check to ensure the proper functioning of an SAP instance.

The ProcMon attribute specifies the processes that must be running successfully for a particular SAP instance type. The monitor operation uses this list of processes to scan the process table, and verify that the processes are running successfully.

Table 3-3 lists valid values of the ProcMon attribute

Table 3-3 Values of ProcMon attribute

SAP installation type	SAP instance type	Value of ProcMon attribute
ABAP	Central	dw ms* ig co se are optional
ABAP	Dialog	dw ig se are optional
ABAP	Enqueue Server	en ms
ABAP	Enqueue Replication Server	er OR enr**
Java	Central	jc ig is optional

Table 3-3 Values of ProcMon attribute *(continued)*

SAP installation type	SAP instance type	Value of ProcMon attribute
Java	Dialog	jc ig is optional
Java	Enqueue Server	en ms
Java	Enqueue Replication Server	er OR enr**
Add-In (ABAP +Java)	Central	dw jc ig co se are optional
Add-In (ABAP +Java)	Dialog	dw jc ig se are optional
Add-In (ABAP +Java)	Enqueue Server-ABAP	en ms
Add-In (ABAP +Java)	Enqueue Replication Server-ABAP	er OR enr**
Add-In (ABAP +Java)	Enqueue Server- Java	en ms
Add-In (ABAP +Java)	Enqueue Replication Server-Java	er OR enr**

* If a standalone Enqueue Server is configured, then 'ms' is not part of ProcMon attribute.

** For Enqueue Replication Server, either one of the values er or enr is valid at a time, based on the Enqueue Replication Server configuration. See "Configuring the Enqueue Replication Server for SAP NetWeaver " on page 72.

The monitor operation takes a snapshot of the running processes table. The operation compares the processes that the ProcMon attribute specifies, to the set of running UNIX processes. If any process is missing, the operation declares the SAP instance as offline, and bypasses further monitor operations.

Setting the SAPMonHome attribute

The SAPMonHome attribute contains the absolute path to the directory that contains the binary used for second level monitoring process.

The binaries that are used during second level monitoring for different installation types and SAP instances are as follows:

- For ABAP: sapinfo
  sapinfo is not a standard binary shipped by SAP with installation media. Customers need to download the latest rfcsdk kit from the following site: http://service.sap.com/swdc -> Support Packages and Patches -> Entry by Application Group -> Additional Components
  For more information on selecting the right RFCSDK for your SAP application, refer to SAP notes 1005832, 825494 and 413708.
- For Java: jcmon
- For Add-In (ABAP + Java) : sapinfo, jcmon

Table 3-4 shows recommended values for the SAPMonHome attribute.

Table 3-4 Recommended values for SAPMonHome attribute

SAP installation type and instance	Format	Value of the SAPMonHome attribute
SAP ABAP For all instances	Unicode and non-Unicode	/usr/sap/SAPSID/SYS/exe/run
SAP Java For all instances	Unicode	/usr/sap/SAPSID/SYS/exe/run
SAP Java Add-In When InstType is equal to CENTRAL, DIALOG, AENQUEUE, or AENQREP	Unicode and non-Unicode	/usr/sap/SAPSID/SYS/exe/run
SAP Java Add-In When InstType is equal to JENQUEUE or JENQREP	Unicode and non-Unicode	/usr/sap/SAPSID/SYS/exe/runU

Configuring the SAP NetWeaver agent for message server restart

In case the message server process fails, the Veritas High Availability agent for SAP NetWeaver supports the message server restart through sapstart.

In case of unexpected termination, to avail the advantage of this restart technology without failing over the entire (A)SCS instance, the SAP administrator must modify the START profile for (A)SCS instance and set the new profile parameters.

Note: Restart of enqueue server process "en" is not supported by the Veritas High Availability agent for SAP NetWeaver.

To restart message server, use the following syntax in the start profile:

```
Restart_Program_xx = local program name program arguments
```

For example following is the modified syntax for message server with instance name ASCS00 and SAPSID ERP

```
Restart_Program_00 = local $(_MS)

pf=$(DIR_PROFILE)/ERP_ASCS00_saperpascs
```

By default sapstart restarts the message server without any delay. To determine under which circumstances a program must be restarted, sapstart uses a signal mask.

The default signal mask consists of the following signals:

- SIGABRT
- SIGBUS
- SIGFPE
- SIGILL
- SIGPIPE
- SIGSEGV
- SIGSYS
- SIGXCPU
- SIGXFSZ

This mask is extendable using the parameter SignalMask_xx. This parameter consists of a list separated by commas which define the additional signals required by sapstart.

For more information on how to set signal mask and additional information on the restart process of a program through sapstart, refer to SAP Note 768727 and related notes.

Note: Symantec recommends to carefully study the SAP note before you modify the profile files for (A)SCS instance.

Executing a customized monitoring program

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

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

- The specified utility is a valid executable file.
- The first level process check indicates that the SAP server instance is online.
- The SecondLevelMonitor attribute is either set to 0 or 1, and the second level check indicates that the SAP server instance is online.
- The SecondLevelMonitor attribute is set to greater than 1, but the second level check is deferred for this monitoring cycle.

The monitor function interprets the utility exit code as follows:

110 or 0	SAP server instance is online
100 or 1	SAP server instance is offline
99	SAP server instance is unknown
Any other value	SAP server instance is unknown

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

Preventing early faulting of Java and Add-in instances

When you start a SAP Java or a SAP Add-In instance, SAP automatically starts processes such as jc and jlaunch. Depending upon the available resources, starting these processes takes some finite time.

The agent for SAP NetWeaver allows enough time for SAP to start these processes successfully. The agent checks the status of these processes in definite intervals. While checking the status of these processes, if the processes are missing, the agent pauses for a time period that is equal to one-tenth of the value of the MonitorTimeout attribute before re-checking the status of the processes.

Symantec strongly recommends that the administrator set the MonitorTimeout attribute, such that the agent gives enough time for these processes to restart if a failure occurs.

For example, if an add-in server instance takes 9 seconds to restart a failed jc process, you must set the value of the MonitorTimeout attribute to at least 90 seconds.

Using Perl in the VCS 3.5 environment

The agent for SAP NetWeaver uses Perl for performing the agent operations. VCS 3.5 does not include the required version of Perl as part of the standard installation. With the agent for SAP Netweaver, you require Perl version 5.8.6 or later.

You must separately install Perl version 5.8.6 on the system. You must also create a symbolic link that points to the Perl distribution that you installed.

To create a symbolic link for Perl distribution

1. Install Perl version 5.8.6 or later.
2. Stop VCS.
3. Remove the symbolic link that the VCS 3.5 installer creates:

   ```
   rm /opt/VRTSvcs/bin/perl5
   ```

4. Create a new symbolic link from /opt/VRTSperl/bin/perl to the new Perl distribution that you installed in step 1.

   For example, if the Perl binary is present in the /usr/local/bin/perl directory:

   ```
   ln -s /usr/local/bin/perl /opt/VRTSperl/bin/perl
   ```

5. Restart VCS.

Copying ag_i18n_inc.pm module for VCS 3.5

The Veritas agent for SAP NetWeaver 5.0 uses VCS unified logging for log messages. Unified messaging is not available on VCS 3.5 . The perl module ag_i18n_inc.pm helps in using unified logging in VCS 3.5 for SAP NetWeaver agent.

Use the following procedure to copy the ag_i18n_inc.pm module:

To copy the ag_i18n_inc.pm module

1. Verify if you have ag_i18n_inc.pm and ag_i18n_inc_v35.pm files under /opt/VRTS/.ACCLib/compat directory.
2. If you have only ag_i18n_inc_v35.pm, then copy it to ag_i18n_inc.pm

```
# cp /opt/VRTS/.ACCLib/compat/ag_i18n_inc_v35.pm
/opt/VRTS/.ACCLib/compat/ag_i18n_inc.pm
```

Setting up zones on Solaris 10 for SAP Enqueue and Enqueue Replication Servers

The Veritas High Availability agent for SAP NetWeaver now supports Enqueue and Enqueue Replication servers running inside Solaris 10 non-global zones.

An example of creating a zone for SAP Enqueue/Enqueue Replication on Solaris 10 is shown as follows.

Step1: Create the zone.

```
bash-3.00# zonecfg -z enqueue_zone1
enqueue_zone1: No such zone configured
Use 'create' to begin configuring a new zone.
zonecfg:enqueue_zone1> create

zonecfg:enqueue_zone1> set zonepath=/export/zones/enqueue_zone1
```

Step2: Add all the required loop back file systems (LOFS) to the zone configuration.

```
zonecfg:enqueue_zone1> add fs
zonecfg:enqueue_zone1:fs> set dir=/usr/sap/ERP
zonecfg:enqueue_zone1:fs> set special=/usr/sap/ERP
zonecfg:enqueue_zone1:fs> set type=lofs
zonecfg:enqueue_zone1:fs> end
zonecfg:enqueue_zone1> add fs
zonecfg:enqueue_zone1:fs> set dir=/usr/sap/trans
zonecfg:enqueue_zone1:fs> set special=/usr/sap/trans
zonecfg:enqueue_zone1:fs> set type=lofs
zonecfg:enqueue_zone1:fs> end
zonecfg:enqueue_zone1> add fs
zonecfg:enqueue_zone1:fs> set dir=/usr/sap/ccms
zonecfg:enqueue_zone1:fs> set special=/usr/sap/ccms
zonecfg:enqueue_zone1:fs> set type=lofs
zonecfg:enqueue_zone1:fs> end
```

```
zonecfg:enqueue_zone1> add fs
zonecfg:enqueue_zone1:fs> set dir=/usr/sap/tmp
zonecfg:enqueue_zone1:fs> set special=/usr/sap/tmp
zonecfg:enqueue_zone1:fs> set type=lofs
zonecfg:enqueue_zone1:fs> end
```

Step 3: Add the network information to the zone configuration.

```
zonecfg:enqueue_zone1> add net
zonecfg:enqueue_zone1:net> set address=10.212.98.193
zonecfg:enqueue_zone1:net> set physical=bge0
zonecfg:enqueue_zone1:net> end
```

Step 4: Add a comment for the zone. This step is optional.

```
zonecfg:enqueue_zone1> add attr
zonecfg:enqueue_zone1:attr> set name=comment
zonecfg:enqueue_zone1:attr> set type=string
zonecfg:enqueue_zone1:attr> set value="This is
enqueue_zone1 zone for SAP System ERP."
zonecfg:enqueue_zone1:attr> end
```

Step 5: Verify and commit the zone configuration.

```
zonecfg:enqueue_zone1> verify

zonecfg:enqueue_zone1> commit

zonecfg:enqueue_zone1> exit

bash-3.00# zoneadm list -cv
  ID NAME            STATUS       PATH
   0 global          running      /
   - enqueue_zone1   configured   /export/zones/enqueue_zone1
```

Step 6: Install the zone.

```
bash-3.00# zoneadm list -cv
  ID NAME             STATUS       PATH
   0 global           running      /
   - enqueue_zone1    configured   /export/zones/enqueue_zone1

bash-3.00# zoneadm -z enqueue_zone1 install
Preparing to install zone <enqueue_zone1>.
Creating list of files to copy from the global zone.
Copying <6208> files to the zone.
```

```
Initializing zone product registry.
Determining zone package initialization order.
Preparing to initialize <1420> packages on the zone.
Initialized <1420> packages on zone.
Zone <enqueue_zone1> is initialized.
Installation of <113> packages was skipped.
Installation of these packages generated warnings: <VRTSat>
The file </export/zones/enqueue_zone1/root/var/sadm/system/\
logs/install_log> contains a log ofthe zone installation.

bash-3.00# zoneadm list -cv
  ID NAME            STATUS       PATH
   0 global          running      /
   - enqueue_zone1   installed    /export/zones/enqueue_zone1
```

Step 7: Configure the zone.

To configure the zone for the first time do the following. Login to the zone console from the first terminal with the following command:

```
bash-3.00# zlogin -C enqueue_zone1
[Connected to zone 'enqueue_zone1' console]
```

Now, from the second terminal, start the zone.

```
bash-3.00# zoneadm -z enqueue_zone1 boot
```

You will see the following message on the first terminal.

```
[NOTICE: Zone booting up]

SunOS Release 5.10 Version Generic_118833-36 64-bit
Copyright 1983-2006 Sun Microsystems,Inc. All rights reserved.
Use is subject to license terms.
Hostname: enqueue_zone1
Loading smf(5) service descriptions: 25/25

Select a Language

  0. English
  1. Japanese
  2. Korean
  3. Simplified Chinese
  4. Traditional Chinese

Please make a choice (0 - 4), or press h or ? for help:
```

For more information on setting up zones, refer to the *Solaris 10 Administration Guide*.

Similarly, configure another zone with name “enqueue_zone2” on the second node, a zone with name “enqueue_zone3” on the third node, and so on, if you have more than three nodes in your cluster configuration and would like to use all the systems for Enqueue and Enqueue Replication server failover targets.

You must create a zone with a different name on each of the system where Enqueue will run.

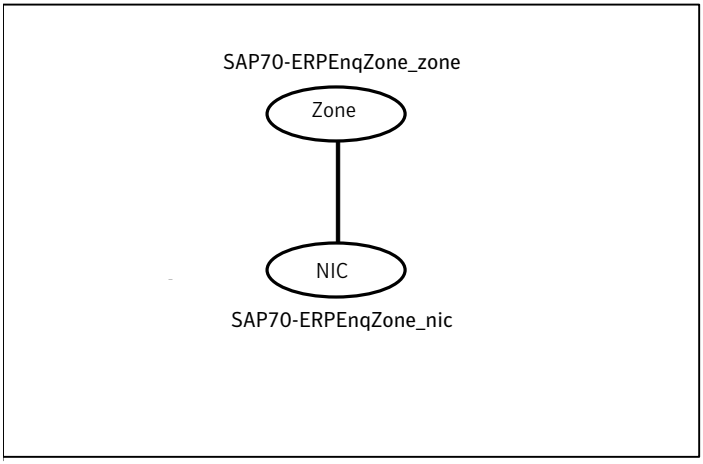
After installing and configuring a zone on each of the cluster nodes where Enqueue and Enqueue Replication Server is running, you must configure Veritas Cluster Server to run under Solaris 10 non-global zones.

Before configuring VCS in non-global zones, create a service group for the zone resource with the following resources and dependencies.

The zone and Enqueue server should have different IPs as Enqueue server will fail over between zones, whereas zone will not failover. The application running inside the zone will fail over and not the zone itself.

Figure 3-1 shows the zone service group configuration for Enqueue and Enqueue Replication Server. This service group is a parallel service group with localized ZoneName attribute for each cluster system.

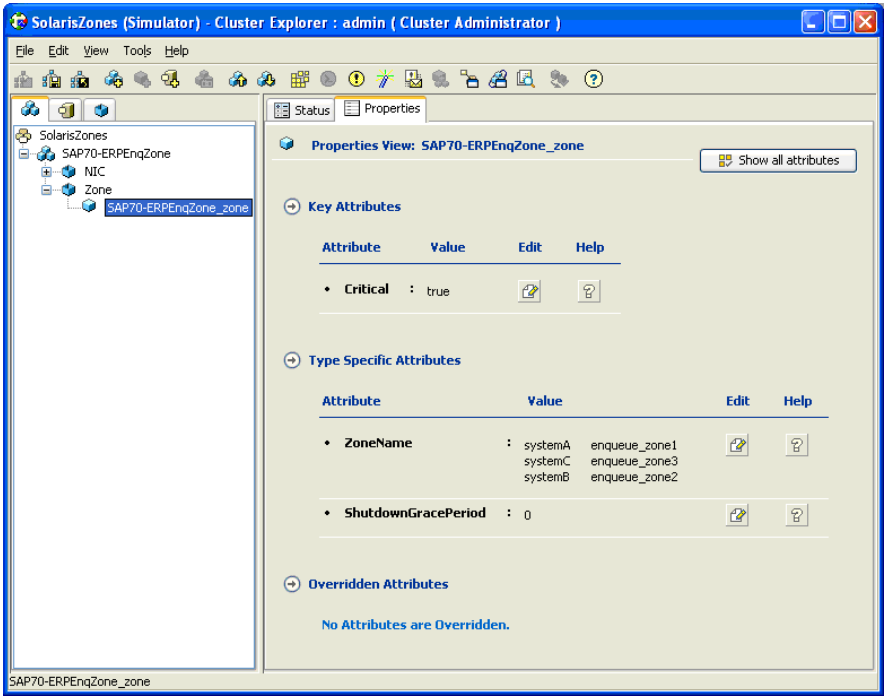
Figure 3-1 Zone service group configuration for Enqueue and Enqueue Replication Server



You need not have the IP resource configured for the IP used for zone. When you start the zone, the IP is brought online automatically. When the zone is shut down, the IP is taken offline automatically.

Figure 3-2 shows the Properties view for the zone service group.

Figure 3-2 Properties view for the zone service group



Following is the sample main.cf for Zone service group.

```
group SAP70-ERPEnqZone (
 SystemList = { systemA = 0, systemB = 1, systemC = 2 }
 Parallel = 1
 )

 NIC SAP70-ERPEnqZone_nic (
  Device = bge0
  NetworkType = ether
  )

 Zone SAP70-ERPEnqZone_zone (
  ZoneName @systemA = enqueue_zone1
```

```
 ZoneName @systemB = enqueue_zone2
 ZoneName @systemC = enqueue_zone3
 )

requires group SAP70-ERPNFS online global soft
SAP70-ERPEnqZone_mnt requires SAP70-ERPEnqZone_zone
SAP70-ERPEnqZone_zone requires SAP70-ERPEnqZone_nic


// resource dependency tree
//
// group SAP70-ERPEnqZone
// {
// Mount SAP70-ERPEnqZone_mnt
//     {
//     Zone SAP70-ERPEnqZone_zone
//         {
//         NIC SAP70-ERPEnqZone_nic
//         }
//     }
// }
```

For the full description of VCS in Solaris non-global zones, refer to the *Veritas Cluster Server User's Guide*. Specifically, refer to the section Configuring VCS in non-global zones.

Perform the following steps to configure zones on each cluster node:

- Setup the non-global zone configuration.
  `hazonesetup` *`servicegroup_name zoneres_name zone_name password systems`*
  Example: `hazonesetup SAP70-ERPEnqZone SAP70-ERPEnqZone_zone enqueue_zone1 XXXXX vcssun70`
- Verify the non-global zone configuration
  `hazoneverify` *`servicegroup_name`*
  Example: `hazoneverify SAP70-ERPEnqZone`

Whenever you make a change that effects the zone configuration, run the `hazonesetup` command to reconfigure the zones in VCS.

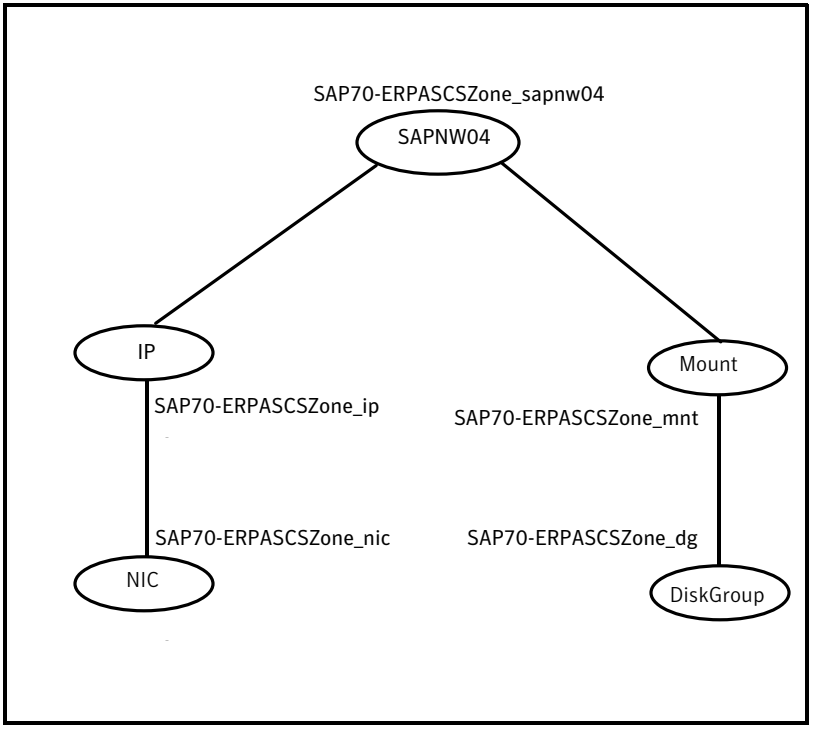
Make sure that the zone configuration files are consistent on all nodes at all times. The file is located at /etc/zones/zone_name.xml.

Make sure that the application is identical on all nodes. If you update the application configuration on one node, apply the same updates to all nodes.

After you configure the service group for zone resource, you can configure the service groups for Enqueue server and Enqueue Replication Server.

Figure 3-3 shows the resource dependencies for Enqueue Server.

Figure 3-3 Resource dependencies for Enqueue Server



The service group is a failover service group with localized attribute ContainerName for its IP and SAPNW04 type resources.

The sample main.cf for the Enqueue Service group is as follows:

```
include "types.cf"
include "SAPMaxDBTypes.cf"
include "SAPNW04Types_zones.cf"

cluster SolarisZones (
 UserNames = { admin = ElmElgLimHmmKumGlj }
 ClusterAddress = "127.0.0.1"
```

```
 Administrators = { admin }
 )

system systemA (
 )

system systemB (
 )

system systemC (
 )

group SAP70-ERPASCSZone (
 SystemList = { systemA = 0, systemB = 1, systemC = 2 }
 )

 DiskGroup SAP70-ERPASCSZone_dg (
  DiskGroup = saperpascs_dg
  )

 IP SAP70-ERPASCSZone_ip (
  Device = bge0
  Address = "10.212.98.200"
  NetMask = "255.255.254.0"
  ContainerName @systemA = enqueue_zone1
  ContainerName @systemB = enqueue_zone2
  ContainerName @systemC = enqueue_zone3
  )

 Mount SAP70-ERPASCSZone_mnt (
  MountPoint = "/usr/sap/ERP/ASCS20"
  BlockDevice = "/dev/vx/dsk/saperpascs_dg/saperpascs_vol"
  FSType = vxfs
  FsckOpt = "-y"
  )

 NIC SAP70-ERPASCSZone_nic (
  Device = bge0
  NetworkType = ether
  )

 SAPNW04 SAP70-ERPASCSZone_sapnw04 (
  EnvFile = "/home/erpadm/saperp.env"
```

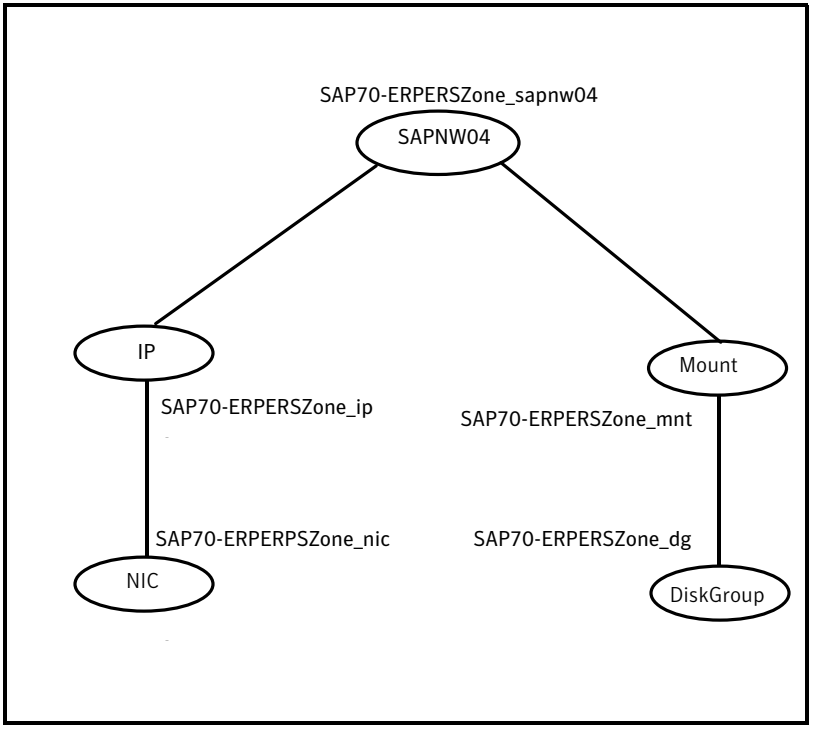
```
 InstName = ASCS00
 InstType = ENQUEUE
 ProcMon = "ms en"
 SAPAdmin = erpadm
 SAPMonHome = "/usr/sap/ERP/ASCS20/exe"
 SAPSID = ERP
 StartProfile = "/usr/sap/ERP/SYS/profile/START_ASCS20_saperpascs"
 ContainerName @systemA = enqueue_zone1
 ContainerName @systemB = enqueue_zone2
 ContainerName @systemC = enqueue_zone3
 )

requires group SAP70-ERPEnqZone online local firm
SAP70-ERPASCSZone_mnt requires SAP70-ERPASCSZone_dg
SAP70-ERPASCSZone_ip requires SAP70-ERPASCSZone_nic
SAP70-ERPASCSZone_sapnw04 requires SAP70-ERPASCSZone_mnt
SAP70-ERPASCSZone_sapnw04 requires SAP70-ERPASCSZone_ip


// resource dependency tree
//
// group SAP70-ERPASCSZone
// {
// SAPNW04 SAP70-ERPASCSZone_sapnw04
//     {
//     Mount SAP70-ERPASCSZone_mnt
//         {
//         DiskGroup SAP70-ERPASCSZone_dg
//         }
//     IP SAP70-ERPASCSZone_ip
//         {
//         NIC SAP70-ERPASCSZone_nic
//         }
//     }
// }
```

Figure 3-4 shows the resource dependencies for Enqueue Replication Server.

Figure 3-4 Resource dependencies for Enqueue Replication Server



The sample main.cf for Enqueue Replication Server group is shown as follows.

```
include "types.cf"
include "SAPMaxDBTypes.cf"
include "SAPNW04Types_zones.cf"

cluster SolarisZones (
 UserNames = { admin = ElmElgLimHmmKumGlj }
 ClusterAddress = "127.0.0.1"
 Administrators = { admin }
 )

system systemA (
 )

system systemB (
 )
```

```
system systemC (
 )

group SAP70-ERPERSZone (
 SystemList = { systemA = 0, systemB = 1, systemC = 2 }
 )

 DiskGroup SAP70-ERPERSZone_dg (
  DiskGroup = saperpers_dg
  )

 IP SAP70-ERPERSZone_ip (
  Device = bge0
  Address = "10.212.98.202"
  NetMask = "255.255.254.0"
  ContainerName @systemA = enqueue_zone1
  ContainerName @systemB = enqueue_zone2
  ContainerName @systemC = enqueue_zone3
  )

 Mount SAP70-ERPERSZone_mnt (
  MountPoint = "/usr/sap/ERP/ERS23"
  BlockDevice = "/dev/vx/dsk/saperpers_dg/saperpers_vol"
  FSType = vxfs
  FsckOpt = "-y"
  )

 NIC SAP70-ERPERSZone_nic (
  Device = bge0
  NetworkType = ether
  )

 SAPNW04 SAP70-ERPERSZone_sapnw04 (
  EnqSrvResName = SAP70-ERPASCSZone_sapnw04
  EnvFile = "/home/erpadm/saperp.env"
  InstName = ERS23
  InstType = ENQREP
  ProcMon = er
  SAPAdmin = erpadm
  SAPMonHome = "/usr/sap/ERP/ERS23/exe"
  SAPSID = ERP
  StartProfile = "/usr/sap/ERP/SYS/profile/START_ERS23_saperpers"
  ContainerName @systemA = enqueue_zone1
```

```
 ContainerName @systemB = enqueue_zone2
 ContainerName @systemC = enqueue_zone3
 )

requires group SAP70-ERPEnqZone online local firm
SAP70-ERPERSZone_sapnw04 requires SAP70-ERPERSZone_ip
SAP70-ERPERSZone_sapnw04 requires SAP70-ERPERSZone_mnt
SAP70-ERPERSZone_ip requires SAP70-ERPERSZone_nic
SAP70-ERPERSZone_mnt requires SAP70-ERPERSZone_dg


// resource dependency tree
//
// group SAP70-ERPERSZone
// {
// SAPNW04 SAP70-ERPERSZone_sapnw04
//     {
//     IP SAP70-ERPERSZone_ip
//         {
//         NIC SAP70-ERPERSZone_nic
//         }
//     Mount SAP70-ERPERSZone_mnt
//         {
//         DiskGroup SAP70-ERPERSZone_dg
//         }
//     }
// }
```

Mounting NFS file system inside Solaris 10 non-global zone

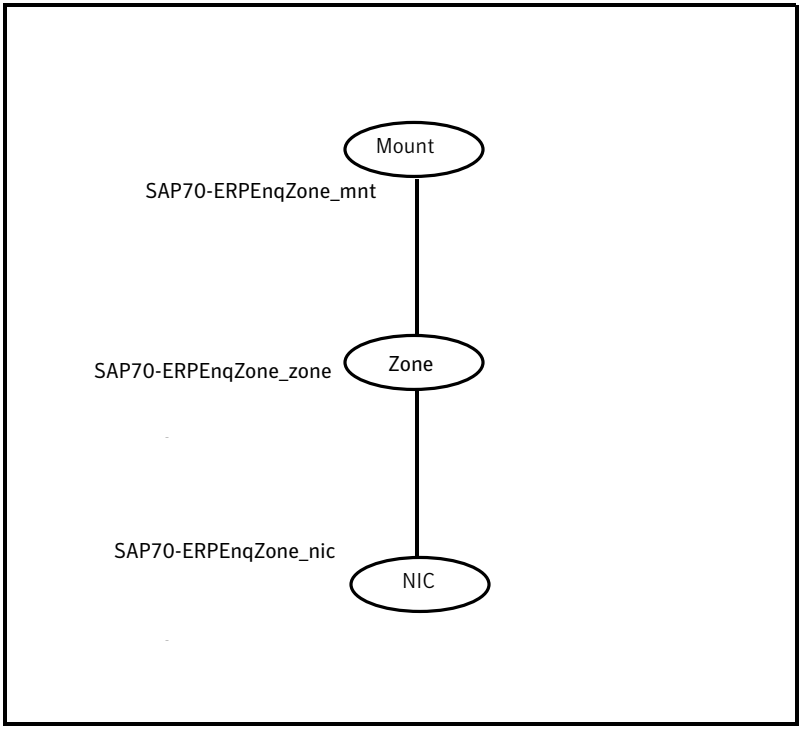
For SAP to function inside Solaris 10 non-global zones the SAP central file system must be available inside the zone. To achieve this, share the SAP central file system on all the client machines using Network File Systems (NFS). One system exports and shares the central file system and others access the file system using NFS mount.

This process is tricky in Solaris 10 non-global zones. If you mount the central file system in the global zone using NFS and try to access it in the non-global zone using loop back filesystem (lofs), NFS will not allow this. Due to limitations in NFS protocol you cannot loop back file system (lofs) for already NFS mounted file system.

To overcome this issue, you must mount the central file system directly inside the non-global zone using NFS. Alternatively, you can use Veritas Cluster File Systems (CFS).

Following is the sample service group for the Zone resource with NFS mount in the non-global zone with localized ContainerName attribute.

Figure 3-5 Service group for the Zone resource with NFS mount




```
include "types.cf"

group SAP70-ERPEnqZone (
 SystemList = { systemA = 0, systemB = 1, systemC = 2 }
 Parallel = 1
 )

 Mount SAP70-ERPEnqZone_mnt (
  MountPoint = "/sapmnt/ERP"
  BlockDevice = "saperpnfs:/export/sapmnt/ERP"
  FSType = nfs
  MountOpt = rw
```

```
 ContainerName @systemA = enqueue_zone1
 ContainerName @systemB = enqueue_zone2
 ContainerName @systemC = enqueue_zone3
 )

NIC SAP70-ERPEnqZone_nic (
 Device = bge0
 NetworkType = ether
 )

Zone SAP70-ERPEnqZone_zone (
 ZoneName @systemA = enqueue_zone1
 ZoneName @systemB = enqueue_zone2
 ZoneName @systemC = enqueue_zone3
 )

requires group SAP70-ERPNFS online global soft
SAP70-ERPEnqZone_mnt requires SAP70-ERPEnqZone_zone
SAP70-ERPEnqZone_zone requires SAP70-ERPEnqZone_nic


// resource dependency tree
//
// group SAP70-ERPEnqZone
// {
// Mount SAP70-ERPEnqZone_mnt
//     {
//     Zone SAP70-ERPEnqZone_zone
//         {
//         NIC SAP70-ERPEnqZone_nic
//         }
//     }
// }
```

Chapter 4

Configuring the service groups for SAP server

This chapter includes the following topics:

- Configuring SAP NetWeaver for high availability
- Configuring service groups for SAP NetWeaver
- Configuring CCMS Monitoring Agent for SAP instance
- Configuring SAP server instances for cluster support
- Configuring the Enqueue Replication Server for SAP NetWeaver
- Configuring the service group using the agent configuration wizard

Configuring SAP NetWeaver for high availability

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

- Keep SPOFs as slim as possible and watch the startup time.
- Assign a virtual hostname to the component within the switchover envionment. Since the physical hostname changes with the switchover, this is a must have requirement.
- Based on the expected failover time configure the reconnection parameters for all software components and enable its automatic reconnection.
- Configure sapcpe tool to load the executables from central file share to instance specific directory.

Configuring service groups for SAP NetWeaver

A cluster must have spare capacity to handle SAP instance failover scenarios. For example, in case of a backend database failure, the cluster must be able to run another database instance, in conjunction with other running applications. Review the information about data protection.

See *Veritas Cluster Server Agent Installation and Configuration Guide*.

A cluster can provide application failover by encapsulating the resources required for an application into a service group. A service group is a virtualized application that can move among cluster nodes. A service group can contain a set of dependent resources, such as disk groups, disk volumes, file systems, IP addresses, NIC cards, and dependent application processes.

A cluster can start, stop, monitor, and switch service groups within the cluster, depending upon server or resource faults. An administrator can proactively move a service group between cluster nodes to perform preventative maintenance or apply patches. The service group includes logic about the dependencies between application components.

Configuring CCMS Monitoring Agent for SAP instance

CCMS agents are independent processes with an interface through RFC to a central monitoring system and an interface to the shared memory.

The monitoring architecture of CCMS agents provide an infrastructure for monitoring your IT environment and its components. The data monitored is stored in the shared memory of every server, with a running SAP instance or a running agent.

You can have the read and write access to the monitored data from the central monitoring system, using the following:

- A defined ABAP interface, in case of a SAP instance.
- The CCMS agent, in case of any server on which the agent is installed and active.

Functional principle of CCMS Agents

The CCMS agents process the following tasks simultaneously:

- Collect data automatically.
- Process requests as an RFC server.
- Send data to the central system as an RFC client.

The runtime information for the monitoring objects is stored in monitoring segments.

The following CCMS agents monitor either the local process memory or local shared memory for SAP instance.

- SAPCCMSR: Monitors components on which there is no active SAP instance.
- SAPCCMSR-j2ee: Monitors SAP Java and ABAP + Java components.
- SAPCCM4X: Monitors ABAP instances with SAP Basis 4.x or higher.
- SAPCM3X: Monitors SAP instances with SAP Basis 3.x

A CCMS agent communicates with the central monitoring system using RFC.

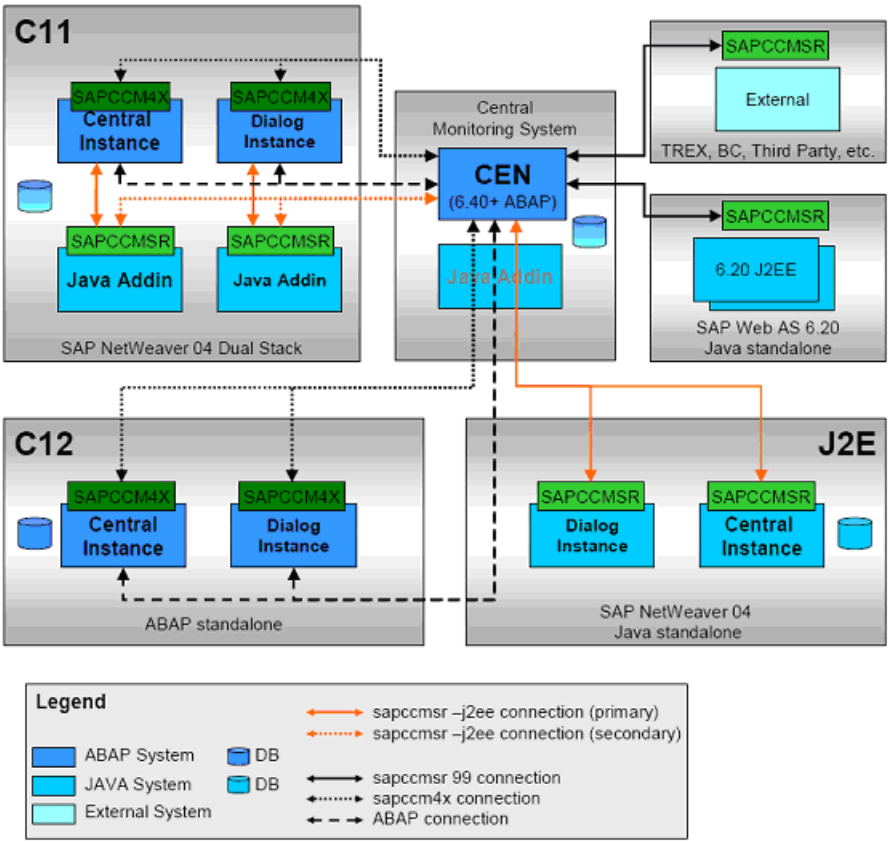
As an RFC server, it provides access to the data in the monitoring segment. For example, you can access this data using transaction RZ20. The agent then automatically creates the local configuration file and the RFC destination in the central system during its registration.

As an RFC client, it independently sends alerts and values for the monitoring attributes to the central monitoring SAP System (push technology). This data is then stored in a cache to allow the system for quick display or is triggered to central auto-reaction methods. This improves performance since the central monitoring system no longer needs to periodically query the agents.

Possible Central Monitoring Scenarios with CCMS Agents

Figure 4-1 shows the central monitoring scenarios possible with different SAP NetWeaver components like ABAP, Java and Add-In (dual stack).

Figure 4-1 Central monitoring scenarios possible with different SAP NetWeaver components



Prerequisites for installing and registering the CCMS Monitoring Agent

Ensure that you meet the following prerequisites to install and register the CCMS Monitoring Agent:

- Make sure that you have a Central Monitoring System (CEN) configured. If possible, use a dedicated SAP system as CEN.
- Check if the CSMREG user is created in the central monitoring system. If not, perform the following steps.
  - In central monitoring system, call the transaction RZ21 and choose Technical Infrastructure > Configure Central Sytem > Create CSMREG User.

- Enter the login credentials for this user.
- Choose CSMREG.

- In the central monitoring system, generate the connection data in a CSMCONF file.

  To generate this data, perform the following steps:

  - In the central monitoring system, call the transaction RZ21 and choose Technical Infrastructure > Configure Central System > Create CSMCONF Start File for Agents.
  - Save the file in a central location.

Configuring CCMS Agents to work with Veritas agent for SAP NetWeaver

The Veritas agent for SAP NetWeaver supports the following SAP CCMS agents:

SAPCCMSR -j2ee	Monitors SAP Java and ABAP+Java components
SAPCCM4X	Monitors ABAP instances with SAP Basis 4.x or later

To install and register the CCMS agents with Central Monitoring System refer to, http://service.sap.com/monitoring.

After you install and register the CCMS agent with Central Monitoring System, perform the following steps to configure the CCMS agent with the Veritas agent for SAP NetWeaver.

To configure the CCMS agent with the Veritas agent for SAP NetWeaver

1. Log on to the host of SAP instance as `<sid>adm`.
2. Stop the SAP instance for which you are configuring the CCMS agent.
3. Using the following command, stop the CCMS agent, if already started.

   ```
   sapccm4x -stop pf=<Instance_Profile_Path>
   ```

   or

   ```
   sapccmsr -stop -j2ee pf=<Instance_Profile_Path>
   ```

Note: The `<Instance_Profile_Path>` specifies the profile of the monitored instance. The default value is `/usr/sap/<SID>/SYS/profile/<SID>_<InstName>_<VHost>`.

---

4 Add the CCMS Agent's start specific information to SAP Instance's START profile. To do this, edit the Start Profile of the SAP Instance as follows:

For sapccm4x, add the following lines at the end of the START profile:

```
#-----------------------------------------------------------------------
# Start CCMS sapccm4x agent
#-----------------------------------------------------------------------
_CM = cm.sap$(SAPSYSTEMNAME)_$(INSTANCE_NAME)
Execute_xx = local rm -f $(_CM)
Execute_yy = local ln -s -f $(DIR_EXECUTABLE)/sapccm4x $(_CM)
Start_Program_zz = local $(_CM) -DCCMS pf=$(DIR_PROFILE)/ \
$(SAPSYSTEMNAME)_$(INSTANCE_NAME)_$(SAPLOCALHOST)

#-----------------------------------------------------------------------
```

For sapccmsr, add the following lines at the end of the START profile:

```
#-----------------------------------------------------------------------
# Start CCMS sapccmsr agent
#-----------------------------------------------------------------------
_CS = cs.sap$(SAPSYSTEMNAME)_$(INSTANCE_NAME)
Execute_xx = local rm -f $(_CS)
Execute_yy = local ln -s -f $(DIR_EXECUTABLE)/sapccmsr $(_CS)
Start_Program_zz = local $(_CS) -DCCMS pf=$(DIR_PROFILE)/ \
$(SAPSYSTEMNAME)_$(INSTANCE_NAME)_$(SAPLOCALHOST)-j2ee

#-----------------------------------------------------------------------
```

Where,

xx, yy and zz denotes the next available number for the programs in the start profile.

5 Start the SAP instance.

An additional connection route gets set between the monitored SAP instance and the Central Monitoring System using the CCMS agent SAPCCM4X or SAPCCMSR

Configuring SAP server instances for cluster support

This section describes pointers to configure a SAP server instance to run properly with a cluster.

Synchronizing accounts and services

Synchronize user and group accounts as follows:

- Ensure that you synchronize the SAPAdmin account user name, UNIX uid, the group name, and UNIX gid across all nodes in the cluster.
- Verify that you either place the SAPAdmin account home directory on shared storage, or copy the home directory contents to each node.
  If you copy the home directory and place on each node, ensure that you sync the contents over time, and guarantee that the SAP environment is consistent from node to node.

Synchronize services as follows:

- Ensure that the /etc/services entries are consistent on all cluster nodes.

Removing physical host dependencies from environment setup scripts

You can create a node-independent set of script files that can setup the SAP environment. You can run these files on each node in the cluster to setup identical SAP environment on all nodes.

Note: Verify that the Bourne shell and C-shell versions on each node are identical.

An example of a Bourne shell script to create such script files for a SAP APO module follows.

```
#! /bin/sh
# ----------------------------------------
#  Setup the environment file list and
#  determine the name of the local system
# ----------------------------------------
ENVFILELIST=".sapenv .apoenv .j2eeenv .dbenv"
LOCALHOSTNAME='uname -n'
# ----------------------------------------
#   Create the backup directory
# ----------------------------------------
if [ ! -d ./backup ]
then
   echo "Create backup Directory"
   mkdir ./backup
fi
# ----------------------------------------
#  loop thru the env file list and
```

```
#  copy the environment setup file making
#  a backup of the original
# ----------------------------------------
for i in $ENVFILELIST
do
   FILENAME="./${i}_${LOCALHOSTNAME}.sh"
   if [ -f ${FILENAME} ]
   then
      echo "Making backup of $FILENAME"
      cp $FILENAME ./backup/$FILENAME
      echo "Changing file name to be host independent"
      mv $FILENAME ${i}_ALLHOSTS.sh
   fi
done
```

You can also create a master environment setup script file that sources all separate setup scripts, such as .sapenv, .apoenv, .j2eeenv, .dbenv, and so on. You can configure the EnvFile attribute so that each agent operation uses this master script to setup the SAP environment.

A script to configure SAPAdmin accounts to use the Bourne shell as default, is provided as an example.

```
# ----------------------------------------
#  Set the environment file list
#  Determine the OS
# ----------------------------------------
ENVFILELIST=".sapenv .apoenv .j2eeenv .dbenv"
# ----------------------------------------
#  loop thru the env file list and source
#  the os dependent env file
# ----------------------------------------
for i in $ENVFILELIST
do
FILENAME="${HOME}/${i}_ALLHOSTS.sh"
if [ -f $FILENAME ]
then
. $FILENAME
fi
done
```

Removing physical host dependencies from profile file names

Ensure that the start and instance profile names in /usr/sap/SAPSID/SYS/profile append the virtual host names, instead of machine dependent host name values.

An example of a profile directory populated with start and instance profiles, appended with virtual host names are as follows.

```
bash-3.00$ ls -l /sapmnt/ERP/profile/
-rw-r--r--  1 erpadm   sapsys    481 Feb 21 15:09 DEFAULT.PFL
-rw-r--r--  1 erpadm   sapsys    904 Feb  6 15:53 ERP_ASCS20_saperpascs
-rw-r--r--  1 erpadm   sapsys    420 Feb 21 15:10 ERP_D22_saperpdi
-rw-r--r--  1 erpadm   sapsys    485 Feb 20 17:56 ERP_DVEBMGS21_saperpci
-rw-r--r--  1 erpadm   sapsys   1199 Feb  6 16:22 ERP_ERS23_saperpers
-rw-r--r--  1 erpadm   sapsys   1469 Feb  5 16:40 START_ASCS20_saperpascs
-rw-r--r--  1 erpadm   sapsys   1988 Feb 21 15:10 START_D22_saperpdi
-rw-r--r--  1 erpadm   sapsys   2363 Feb 20 17:56 START_DVEBMGS21_saperpci
-rw-r--r--  1 erpadm   sapsys   1353 Feb  6 17:22 START_ERS23_saperpers
```

Removing physical host dependencies from profiles

Note: Changing the physical hostname to a virtual hostname is supported for Web AS ABAP installation type only. Please refer SAP notes 8307, 757692, 803018 and relevant notes while making changes.

Removing physical host dependencies from profiles involves the following steps:

- Edit the start profile /sapmnt/SAPSID/profile/START_InstName_VirtualHostName to replace all physical hostnames with their equivalent virtual hostname.
- Edit the instance profile /sapmnt/SAPSID/profile/SAPSID_InstName_VirtualHostName as follows:
  - Add the following lines:

    ```
    SAPGLOBALHOST = VirtualHostName
    SAPLOCALHOST = VirtualHostName
    SAPLOCALHOSTFULL = VirtualHostName
    ```

  - Replace all physical hostnames with the equivalent virtual host name.
- Edit the default profile /usr/sap/SAPSID/SYS/profile/DEFAULT.PFL as follows:
  - Set SAPDBHOST equal to the virtual hostname of the database server.

- Replace all instances of the physical hostname of the SAP Central instance, with the equivalent virtual host name.
- Verify that all physical hostnames are replaced with equivalent virtual hostnames.

Installing SAP using SAPINST_USE_HOSTNAME

SAP can be installed in HA environment directly using virtual hostnames. To install SAP using virtual hostname, perform the following steps:

Note: Before installing SAP system refer to SAP Installation documentation.

To install SAP using SAPINST_USE_HOSTNAME

1. Go to the directory where sapinst tool is present in the Master DVD.
2. Launch the SAPInst GUI using the following command:

```
sapinst SAPINST_USE_HOSTNAME=VirtualHostName
```

3. From installation GUI, select **High Availability System >Based on [AS ABAP/AS Java/AS ABAP and AS Java]** based on the usage type of system you are planning to install.

Configuring SAPNW04 preonline script

In a clustered environment, the SAP administrator installs and configures the SAP standalone Enqueue and SAP Enqueue Replication server. The SAP Enqueue and Enqueue Replication Servers have the following requisites:

- If a standalone Enqueue server instance fails, the server must failover to the node in which the Enqueue Replication server instance is running.
- If the Enqueue Replication server instance fails, the instance must failover to a node where Enqueue Server is not running.

The SAPNW04 preonline script facilitates proper Enqueue server failover behavior. The existing VCS preonline script calls the SAPNW04 preonline script.

The SAPNW04 preonline script performs the following tasks:

- If the service group for which the script is running does not have an Enqueue server or an Enqueue Replication server resource, the script returns the control back to the VCS preonline script.
- If the service group has an Enqueue server or Enqueue Replication server resource, the script determines the node on which the online operation can

be performed. The script also ensures that the online operation does not execute the VCS preonline script again.

To accomplish this failover behavior, you must configure the VCS preonline script.

To configure the VCS preonline script in the VCS 4.x and 5.0 environments

1 For the service group, set the preonline flag to true.

```
hagrp -modify service_group PreOnline 1
```

2 Go to the $VCS_HOME/bin/triggers directory.

3 In the preonline file, add these lines to integrate the call to the SAPNW04 preonline trigger, in the main trigger script.

If you do not find the preonline file, proceed to step 4.

```
eval 'exec /opt/VRTSperl/bin/perl -Sw $0 ${1+"$@"}'
        if 0;
use strict;
use vars;
my $vcs_home = $ENV{"VCS_HOME"};
if (!defined ($vcs_home)) {
        $vcs_home="/opt/VRTSvcs";
}
use ag_i18n_inc;
VCSAG_SET_ENVS();
if (!defined $ARGV[0]) {
        VCSAG_LOG_MSG ("W",

"Failed to continue; undefined system name", 15028);
        exit;
} elsif (!defined $ARGV[1]) {
        VCSAG_LOG_MSG ("W",

"Failed to continue; undefined group name", 15031);
        exit;
}
# Add the SAPNW04 Trigger Call here….
#--------------------
# Define variables..
#--------------------
my $sCmd = '/opt/VRTSvcs/bin/SAPNW04/preonline';
```

For VCS 5.0, the value of $sCmd must be equal to /opt/VRTSagents/ha/bin/SAPNW04/preonline.

```
my $sResLogLevel = 'TRACE'; # Define logging level..
my @lsCmdArgs = ( @ARGV, $sResLogLevel ); # Insert logging level..
my $sArgs = join ( ' ', @lsCmdArgs);
my $iExitCode = undef;
#----------------------------------------
# Pass control to preonline, if it exists..
#----------------------------------------
if ( -x $sCmd ) {
  VCSAG_LOG_MSG ("I", "Preonline Cmd [$sCmd]
  Args [$sArgs]", 15031);
```

```
  system ( $sCmd, @lsCmdArgs );
#-------------------
# Exit if successful..
#----------------------------
  exit $iExitCode unless ( $iExitCode = $?>> 8 );
}
# give control back to HAD.
if (defined $ARGV[3]) {
   system("$vcs_home/bin/hagrp -online -nopre $ARGV[1] -sys
 $ARGV[0] -checkpartial $ARGV[3]");
   exit;
}
system("$vcs_home/bin/hagrp -online -nopre $ARGV[1]
-sys $ARGV[0]");
exit;
```

4 If the VCS preonline trigger script is not present, you can do the following:

- Pick the sample preonline script present in the following directory.

4.x	/etc/VRTSvcs/conf/sample_SAPNW04
5.0	/etc/VRTSagents/ha/conf/SAPNW04

- Copy this file in the $VCS_HOME/bin/triggers directory.
- Ensure that the file is executable, and accessible to the "root" user.
- Create a symlink for the preonline script to the monitor script by running the following commands.

4.x	cd /opt/VRTSvcs/bin/SAPNW04
	ln -s /opt/VRTSvcs/bin/SAPNW04/monitor preonline
5.0	cd /opt/VRTSagents/ha/bin/SAPNW04
	ln -s /opt/VRTSagents/ha/bin/SAPNW04/monitor preonline

The preonline script is now configured to facilitate Enqueue server behavior. To configure the logging level used in the preonline script, you can set the ResLogLevel attribute in the preonline wrapper. You can then view the logs in the VCS engine log, /var/VRTSvcs/log/engine_A.log.

To configure the VCS preonline script in the VCS 3.5 environment

1 For the service group, set the preonline flag to true.

```
hagrp -modify service_group preonline 1
```

2 Go to the /opt/VRTSvcs/bin/triggers directory.

3 In the preonline file, add these lines to integrate the call to the SAPNW04 preonline trigger:

In the main trigger script, after the #Put your code here... line, add these lines:

```
# Add the SAPNW04 Trigger Call here….
#-------------------
# Define variables..
#-------------------
my $sCmd = '/opt/VRTSvcs/bin/SAPNW04/preonline';
my $sResLogLevel = 'INFO';          # Define logging level..
my @lsCmdArgs = ( @ARGV, $sResLogLevel ); # Insert logging level..
my $iExitCode = undef;

#----------------------------------------
# Pass control to preonline, if it exists..
#----------------------------------------
if ( -x $sCmd ) {
  system ( $sCmd, @lsCmdArgs );

  #----------------------------
  # Exit if we were successful..
  #----------------------------
  exit $iExitCode unless ( $iExitCode = $?>> 8 );
}
```

4 If the VCS 3.5 preonline trigger script is not present, you can do the following:

- Pick the sample preonline script present in the /opt/VRTSvcs/bin/sample_triggers directory.Copy this file in the /opt/VRTSvcs/bin/triggers directory.
- Ensure that the file is executable, and accessible to the "root" user.
- Create a symlink for the preonline script to the monitor script by running these commands:
  cd /opt/VRTSvcs/bin/SAPNW04
  ln -s /opt/VRTSvcs/bin/SAPNW04/monitor preonline

The preonline script is now configured to facilitate Enqueue server behavior in the VCS 3.5 environment. To configure the logging level used in the preonline script, you can set the ResLogLevel attribute in the preonline wrapper. You can then view the logs in the VCS engine log, /var/VRTSvcs/log/engine_A.log.

Clustering shared file systems

Depending upon the database that you use with the SAP application, you can decide upon the architecture of the file system that the SAP Central instance shares with the database or with other application servers.

For Oracle databases only

The SAP Central instance runs on a separate machine, while the Oracle database is mounted on /oracle/*SAPSID* by default. The database has its own /oracle/*SAPSID* file system, but also requires SAP executables. These executables are usually NFS-mounted from SAP Central File Share /sapmnt/*SAPSID*/exe.

Symantec recommends the following:

- maintaining local copies of /oracle/*SAPSID* and /sapmnt/*SAPSID*/exe on the Central instance and the database, instead of sharing them through NFS.
- keeping database files on shared disk.
- controlling the /oracle/*SAPSID* and /sapmnt/*SAPSID*/exe file systems through the operating system, instead of the cluster.

For non-Oracle databases

The database requires SAP executables. These executables are usually NFS-mounted from Central File Share /sapmnt/*SAPSID*/exe.

For other application servers

The application servers require /usr/sap/trans, /sapmnt/*SAPSID*/global, and /sapmnt/*SAPSID*/profile to be NFS-mounted from the Central instance.

Therefore you must share these resources using NFS. But Symantec recommends to maintain a local copy of /sapmnt/*SAPSID*/, instead of sharing the resource through NFS. For more information, refer to the SAP white paper, *SAP Web Application Server in Switchover Environments (UNIX Platforms).*

Configuring the Enqueue Replication Server for SAP NetWeaver

Perform the following steps to configure the Enqueue Replication Server for SAP NetWeaver:

- Enable replication in the (A)SCS instance by adding the following parameter to the instance profile of (A)SCS instance (SAPSID_InstName_VirtualHostname).

  ```
  enque/server/replication = true
  ```

  You have to restart the (A)SCS instance to make the change effective. Assume a two-node software failover cluster (running on the physical hosts host A and host B) and a clustered (A) SCS instance with the following parameters.

  SCS SAPSID = PLL

  SCS INSTNO = 01

  SCS HOST = sapscshost (virtual host name)

  This instance (namely, the enqueue server's lock table) should be protected with an ERS instance as follows:

  ERS SAPSID = PLL

  ERS INSTNO = 11 (a free instance number)

  ERS HOST = sapershost (virtual hostname)

- On one of the physical host (host A or host B) perform the following steps as user *sid*adm:

  Create the directory structure as follows:

  /usr/sap/PLL/ERS11/exe

  /usr/sap/PLL/ERS11/log

  /usr/sap/PLL/ERS11/data

  /usr/sap/PLL/ERS11/work

- Copy the following binaries from (A)SCS instance exe directory into the ERS instance exe directory:
  - enqt
  - enrepserver
  - ensmon
  - libicudata.so.30
  - libicui18n.so.30
  - libicuuc.so.30
  - libsapu16_mt.so

- librfcum.so
- sapcpe
- sapstart
- sapstartsrv
- sapcontrol

Note: The binary extensions vary for different operating systems. The naming conventions followed in the above binaries are applicable to Solaris platform.

For each binary, ensure that the access and execute permissions are correctly set for *sid*adm.

- Create a sapcpe list file `ers.lst` with the following names.
  - cleanipc
  - enqt
  - enrepserver
  - ensmon
  - libsapu16_mt.so
  - libicudata.so.30
  - libicui18n.so.30
  - libicuuc.so.30
  - libsapu16.so
  - librfcum.so
  - sapcpe
  - sapstart
  - sapstartsrv
  - sapcontrol
  - stopsap
  - ers.lst

  The binary extensions may vary for different operating systems
- Create a new start profile in /usr/sap/PLL/SYS/profile.

```
SAPSYSTEMNAME = PLL
SAPSYSTEM = 11
INSTANCE_NAME = ERS11
#-----------------------------------------------------------
# Special settings for this manually set up instance
#-----------------------------------------------------------
SCSID = 01
DIR_EXECUTABLE = $(DIR_INSTANCE)/exe
DIR_PROFILE = $(DIR_INSTALL)/profile
DIR_CT_RUN = $(DIR_EXE_ROOT)/run
SAPGLOBALHOST = sapscshost
SAPLOCALHOST = sapershost

SETENV_00 = PATH=$(DIR_INSTANCE)/exe:%(PATH)
SETENV_01 = LD_LIBRARY_PATH=$(DIR_EXECUTABLE):%(LD_LIBRARY_PATH)
SETENV_02 = SHLIB_PATH=$(DIR_LIBRARY):%(SHLIB_PATH)
SETENV_03 = LIBPATH=$(DIR_LIBRARY):%(LIBPATH)
_PF = $(DIR_PROFILE)/PLL_ERS11_sapershost

#-----------------------------------------------------------
# Copy SAP Executables
#-----------------------------------------------------------
_CPARG0 = list:$(DIR_EXECUTABLE)/ers.lst
Execute_00 = immediate $(DIR_EXECUTABLE)/sapcpe$(FT_EXE)\

 $(_CPARG0) pf=$(_PF)

#-------------------------------------------------------------
# Start enqueue replication server
#-------------------------------------------------------------

_ER = er.sap$(SAPSYSTEMNAME)_$(INSTANCE_NAME)
Execute_01 = immediate rm -f $(_ER)
Execute_02 = local ln -s -f $(DIR_EXECUTABLE)/enrepserver $(_ER)
Start_Program_00 = local $(_ER) pf=$(_PF) NR=$(SCSID)
```

For DIR_CT_RUN in this ERS profile, take the value DIR_CT_RUN from the (A)SCS instance profile. If the (A)SCS instance has not configured DIR_CT_RUN in its profiles, take the value specified for DIR_EXECUTABLE from the (A)SCS instance profile.

It is essential that the binaries from (A)SCS and ERS instance are from the same binary set.

- Create an instance profile in /usr/sap/*SID*/SYS/profile directory

For example, if you have an (A)SCS instance with the following parameters.
SCS SAPSID = PLL
SCS INSTNO = 01
SCS HOST = sapscshost
Protect it with an ERS instance as follows
ERS SAPSID = PLL
ERS INSTNO = 11
ERS HOST = sapershost
An instance profile PLL_ERS11_sapershost would look like:

```
#-----------------------------------------------------------------------
# System settings
#-----------------------------------------------------------------------
SAPSYSTEMNAME = PLL
SAPSYSTEM = 11
INSTANCE_NAME = ERS11
SCSID = 01
SAPGLOBALHOST = sapscshost
SAPLOCALHOST = sapershost
#-----------------------------------------------------------------------
# Special settings for this manually set up instance
#-----------------------------------------------------------------------
DIR_EXECUTABLE = $(DIR_INSTANCE)/exe
DIR_CT_RUN = $(DIR_EXE_ROOT)/run
#-----------------------------------------------------------------------
# Settings for enqueue monitoring tools (enqt, ensmon)
#-----------------------------------------------------------------------
enque/process_location = REMOTESA
rdisp/enqname = $(rdisp/myname)
#-----------------------------------------------------------------------
# Standalone enqueue details from (A)SCS instance
#-----------------------------------------------------------------------
enque/serverhost = $(SAPGLOBALHOST)
enque/serverport = 32$(SCSID)
enque/serverinst = $(SCSID)
enque/poll_interval = 0
enque/poll_timeout = 120
enque/enrep/inactive_actio = sleep
enque/table_size = 4096
```

For DIR_CT_RUN in this ERS profile, take the value DIR_CT_RUN from the (A)SCS instance profile. If the (A)SCS instance has not configured DIR_CT_RUN

in its profiles, take the value specified or DIR_EXECUTABLE from the (A)SCS instance profile.
It is essential that the binaries from (A)SCS and ERS instance are from the same binary set.

- Control the life time of Enqueue Replication Server using switchover solution.

Configuring the service group using the agent configuration wizard

Veritas Cluster Server provides an agent configuration wizard that directs you to configure the service group for SAP applications.

Using the wizard you can perform the following, for an instance of type CENTRAL, DIALOG, ENQUEUE and ENQREP.

- Create a new SAPNW04 service group for SAP ABAP, Java and Add-In architectures.
- Modify an existing SAP service group.

Prerequisites for configuring the service group using the wizard

Ensure that you meet the following prerequisites to configure the service group, using the wizard:

- The SAP instances are running before you start the wizard.
- The SAP instance binaries are located on a shared disk that is mounted at /usr/sap/<SID>/<InstName>.
- The agent for SAP NetWeaver is installed on the system.
- The agent types file is imported in to the cluster.
  See "Importing the agent types files for VCS" on page 30.

Creating the service group

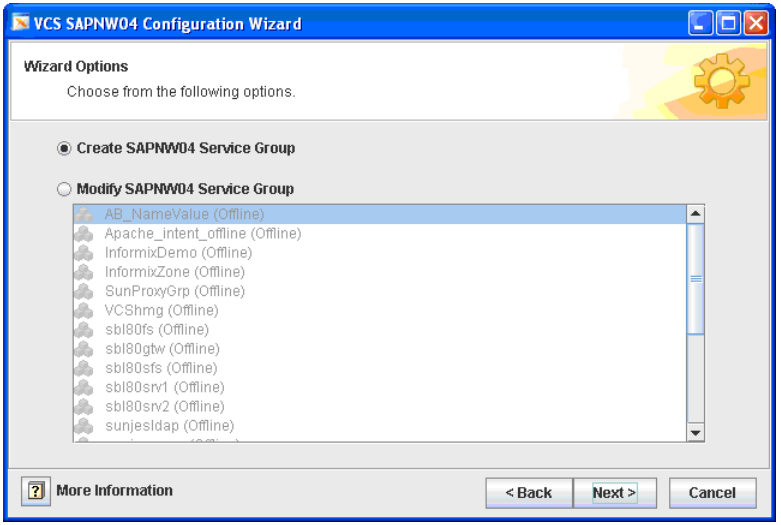
To create the service group using the agent configuration wizard, perform the following steps:

1. Log in as a root user.
2. Start the SAP Wizard with the following command on the cluster node where the SAP Instance is running.

```
# hawizard SAPNW04
```

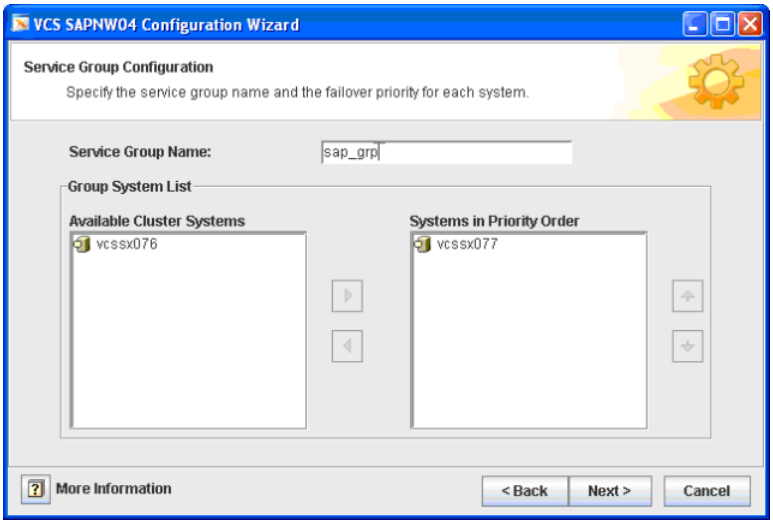
Note: If you are launching the wizard from a remote terminal, set the DISPLAY environment variable to your local system.

3. On the **Welcome** window, refer to the prerequisites and user input information and click **Next**.
4. On the **Wizard Options** window, select **Create SAPNW04 Service Group**.



5. Click **Next**

6 On the **Service Group Configuration** window, specify the following information in the respective fields.

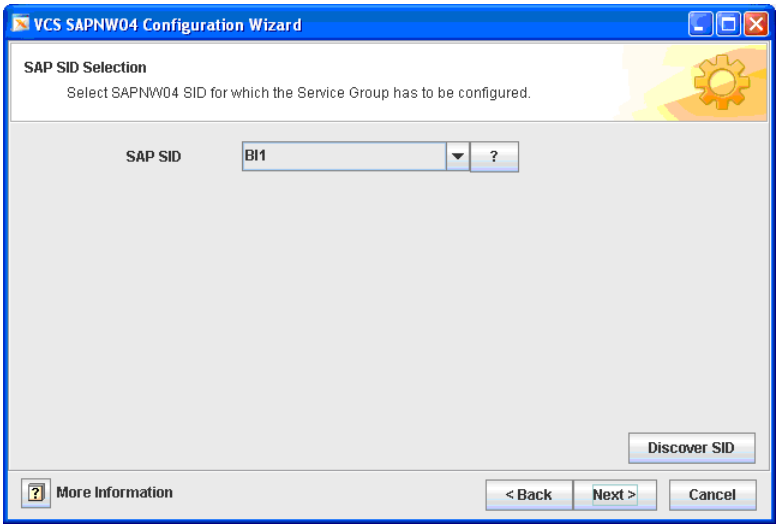


Service Group Name	Enter a name for the SAPNW04 service group.
Available Cluster Systems	Select the systems on which the service group needs to be configured and move them to **Systems in Priority Order**, using the right arrow.
Systems in Priority Order	To remove a system from the list, select the system and move it to **Available Cluster Systems**, using the left arrow.

The selected systems are arranged in the descending order of their priority. To change the priority order, select the system and change the order using the up and down arrows.

7 Click **Next**.

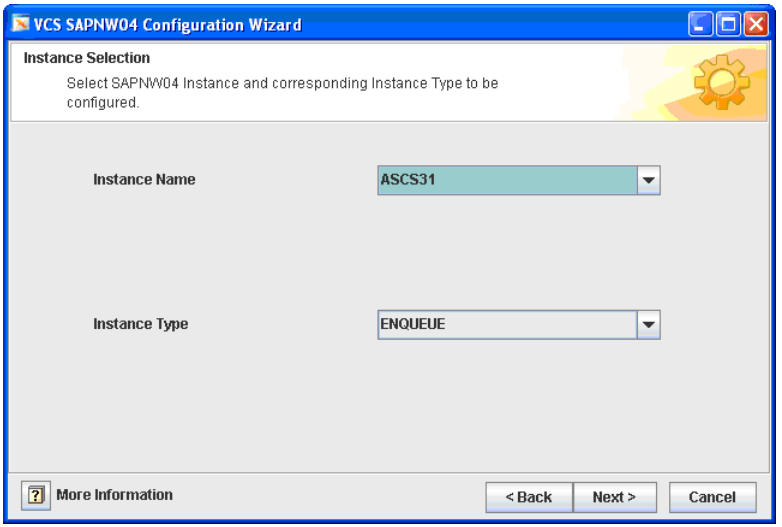
8 On the **SAP SID Selection** window, select the SID to be configured from the **SAP SID** drop-down list.



The wizard displays the list of SIDs for which at least one SAP instance is running on the system.

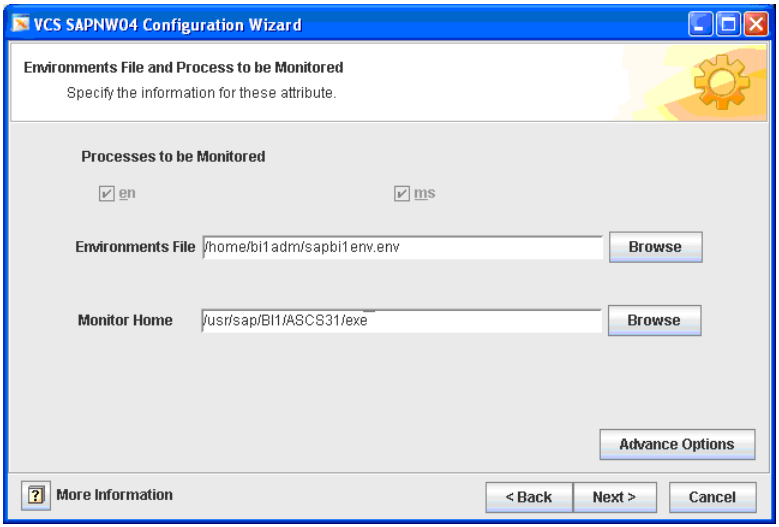
9 Click **Next**.

10 On the **Instance Selection** window, select the SAP instance and its corresponding type from the **Instance Name** and **Instance Type** drop-down list, respectively.



11 Click **Next**.

12 On the **Environments File and the Processes to be Monitored** window, specify the following information in the respective fields.

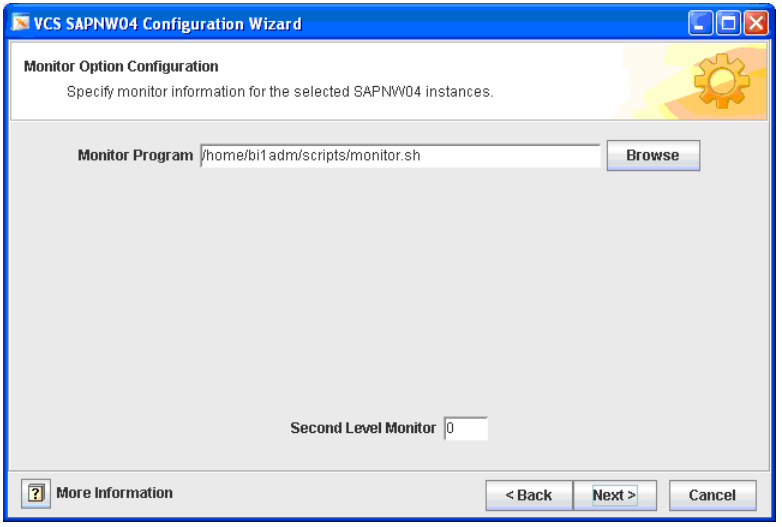


Processes to be Monitored	Select the processes to be monitored **Note:** The mandatory processes are selected by default.
Environments File	Enter or browse to the location of the environment file, for the selected instance.
Monitor Home	Optionally, enter or browse to the monitor home location, for the selected instance. This option is displayed only if the wizard fails to locate the corresponding monitor utility.

13 Optionally, click **Advance Options**.

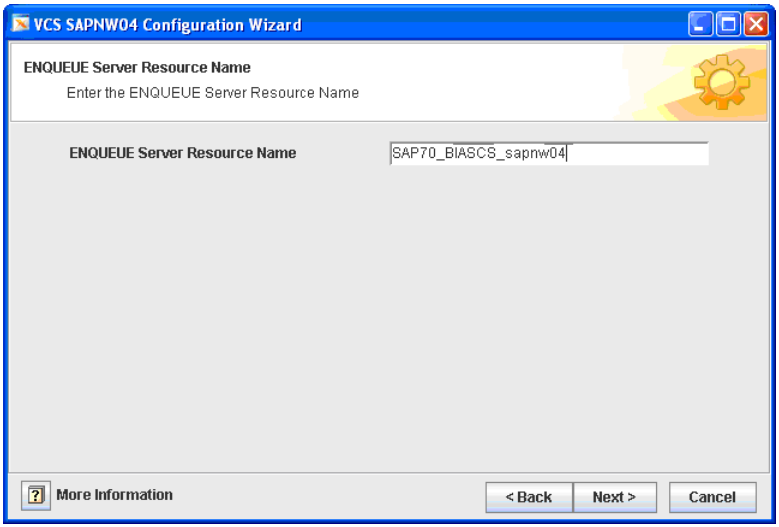
On the **Monitor Option Configuration** window, enter or browse to the custom script file for monitoring process and specify the value for second level monitoring in the **Monitor Program** and **Second Level Monitor** text box, respectively.

The value for second level monitoring must be a positive integer.



14 Click **Next**.

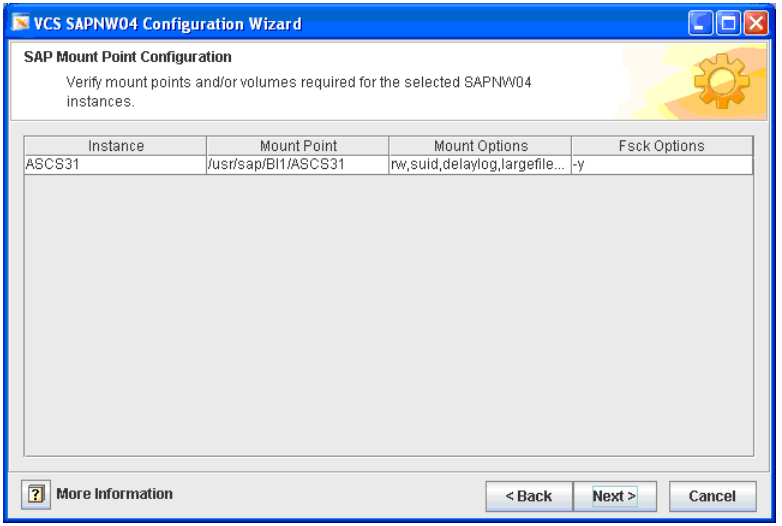
15 On the **ENQUEUE Server Resource Name** window, specify the VCS resource name for the corresponding Enqueue Server (A)SCS.



This option is available only if the selected Instance Type is ENQREP or AENQREP or JENQUREP.

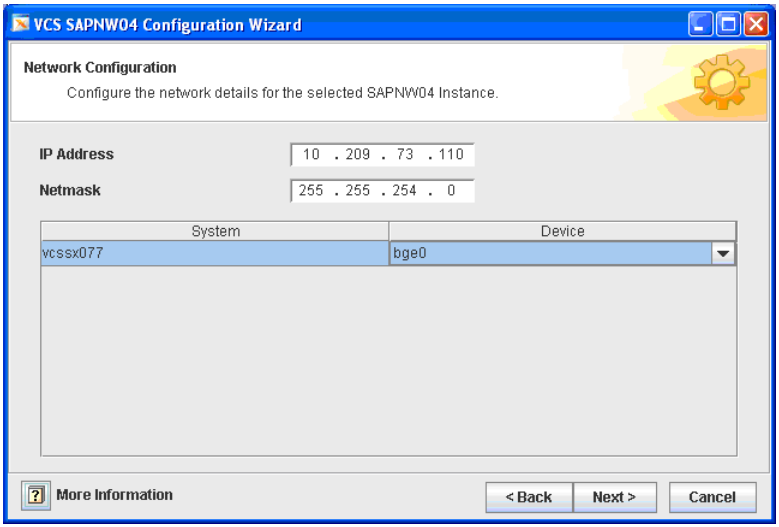
16 Click **Next**.

17 Optionally, on the **SAP Mount Point Configuration** window, edit the **Mount** and **Fsck Options**, if required.



18 Click **Next**.

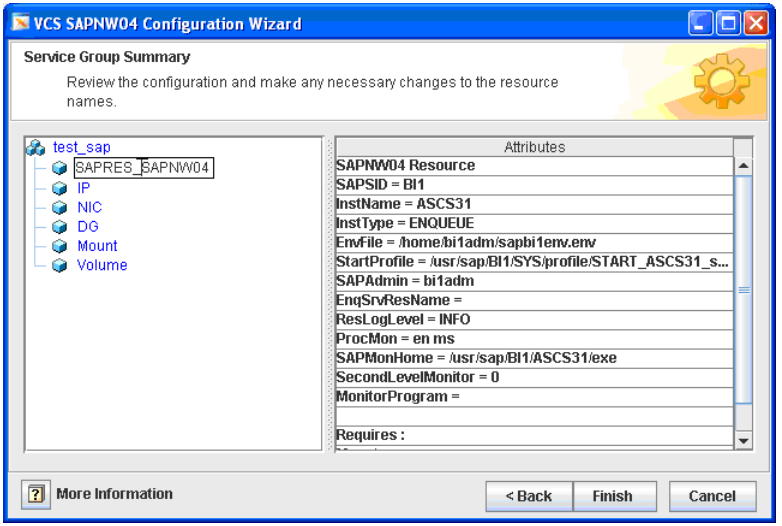
19 On the **Network Configuration** window, specify the following information in the respective fields.



IP Address	Enter the virtual IP address of the selected SAP instance.
Netmask	Enter the netmask for the selected IP.
Device	Select an NIC device for each system.

20 Click **Next**.

21 On the **Service Group Summary** window, review your configuration settings.



22 In the resource tree, click on a resource to view its attributes.

You can edit the resource names, if required. To perform the same, follow the steps below:

- Double-click on a resource in the resource tree.
- Rename the resource.
- Press **Enter**.

23 Click **Finish**.

24 On the **Completing the SAPNW04 Configuration Wizard** window, select **Bring the Service Group Online**.

25 Click **Close**.

Modifying a service group configuration

To modify a SAPNW04 service group using the cluster configuration wizard, perform the following steps:

1 Start the SAPNW04 Configuration wizard.

```
# hawizard sapnw04
```

2 Review the information on the **Welcome** window.

3 Click **Next**.

4 On the **Wizard Options** window, select **Modify Service Group**.

5 Select the service group to be modified.

6 Click **Next**.

7 Follow steps 6 through 25 from "Create a service group configuration".

See “Creating the service group” on page 77.

Limitations with the agent configuration wizard

The agent configuration wizard has the following limitations in this release.

- Provides support only on Solaris SPARC
- Enables to configure or modify only one SAPNW04 resource in a service group
- Does not support creating service group dependencies between different SAP service groups and the database.

Chapter 5

Troubleshooting the agent for SAP NetWeaver

This chapter includes the following topics:

- Using correct software and operating system versions
- Meeting prerequisites
- Configuring SAP server resources
- Starting the SAP server instance outside a cluster
- Reviewing error log files
- Checks for an SAP Java Add-in instance
- Configuration checks for Solaris zones support
- Configuration checks for using the agent in the VCS 3.5 environment

Using correct software and operating system versions

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

See "Supported software" on page 12.

Meeting prerequisites

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

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

See "Before you install the Veritas agent for SAP NetWeaver" on page 23.

Configuring SAP server resources

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

See "SAP NetWeaver agent attributes" on page 31.

Starting the SAP server instance outside a cluster

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

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

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

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

To restart the SAP instance outside the cluster framework

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

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

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

4 Start the SAP server to run the instance:

```
$ sapstart pf=StartProfile
```

For SAP NetWeaver 2004s, execute the `sapstartsrv` command before executing the `sapstart` command:

```
$ sapstartsrv pf=StartProfile -D -u SAPAdmin
```

5 Ensure that the SAP instance is running successfully by running the grep command for InstName.

For example, for a SAP Central instance:

```
$ ps -ef | grep InstName
```

You must see the dw processes running on the system.

- For a SAP Java instance, you must look for jc processes. For example:

  ```
  jc.sapSAPSID_InstNamepf=/usr/sap/SAPSID/SYS/profile/
  SAPSID_InstName_VirtualHostName
  ```

- For a SAP Java Add-In instance, you must specify dw jc in the value of the ProcMon attribute. Then, you can look for jcontrol processes to ensure that the instance is running. For example:

  ```
  jcontrol pf=/usr/sap/SAPSID/SYS/profile/
  SAPSID_InstName_VirtualHostName
  ```

  If the SAP instance is working outside the cluster framework, you can attempt to restart the SAP server within the framework.

Reviewing error log files

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

Using SAP server log files

If a SAP server is facing problems, you can access the server log files to further diagnose the problem. The SAP log files are located in the /usr/sap/SAPSID/InstName/work directory.

Reviewing cluster log files

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

Additionally, you can also refer to the latest SAPNW04 agent log files located at /var/VRTSvcs/log/SAPNW04_A.log

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

Reviewing agent log files

In case of problems while using the agent for SAP NetWeaver, you can access the agent log files for the SAP instance for more information. The agent saves output of all agent operation processes in the /usr/sap/SAPSID/InstName/log directory. The format of the log file is SAPSID_InstName.log.

Using trace level logging

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

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

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

Warning: You may consider to temporarily increase the timeout values for SAPNW04 for debugging purposes. After the debugging process is complete, you can revert back to the original timeout values.

To localize ResLogLevel attribute for a resource

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

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

3. Set the ResLogLevel attribute to TRACE for the identified resource:

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

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

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

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

   You can also contact Symantec support for more help.

Using trace level logging for preonline trigger

While executing the preonline trigger, you can set the ResLogLevel attribute to TRACE, to enable detailed logging.

See "Configuring SAPNW04 preonline script" on page 66.

To set the ResLogLevel attribute for preonline trigger

1. Go to the $VCS_HOME/bin/triggers directory.
2. Open the preonline file, and go to this section:

   ```
   #--------------------
   # Define variables..
   #--------------------
   my $sCmd = '/opt/VRTSagents/ha/bin/SAPNW04/preonline';
   my $sResLogLevel = 'INFO'; # Define logging level..
   my @lsCmdArgs = ( @ARGV, $sResLogLevel ); # Insert logging level..
   my $sArgs = join ( ' ', @lsCmdArgs );
   my $iExitCode = undef;
   ```

3 Edit the value of the ResLogLevel attribute:

```
#-------------------
# Define variables..
#-------------------
my $sCmd = '/opt/VRTSagents/ha/bin/SAPNW04/preonline';
my $sResLogLevel = 'TRACE'; # Define logging level..
my @lsCmdArgs = ( @ARGV, $sResLogLevel ); # Insert logging level..
my $sArgs = join ( ' ', @lsCmdArgs );
my $iExitCode = undef;
```

4 Save and close the preonline file.

You can view the logs in the VCS engine log, /var/VRTSvcs/log/engine_A.log.

Checks for an SAP Java Add-in instance

For an SAP Java Add-In instance, you must perform the following checks before further investigations:

- The SAP resources running the ABAP and Java Standalone Enqueue server instances are in the same Service Group, preferably configured in different service groups.
- The SAP resources running the ABAP and Java Enqueue Replication server instances, are in the same Service Group, preferably configured in different service group.

Note: Symantec recommends to configure the ABAP Enqueue and Java Enqueue Replication server instances in different service groups.

- For the Standalone Enqueue server instances, the value of the InstType attribute is not ENQUEUE, if they are configured in the same VCS Service Group. The values are as follows:
  - For ABAP: AENQUEUE
  - For Java: JENQUEUE
- For the Enqueue Replication server instances, the value of the InstType attribute is not ENQREP, if they are configured in the same VCS Service Group. The values are as follows:
  - For ABAP: AENQREP
  - For Java: AENQREP

- Ensure the following:
  - The EnqSrvResName attribute of the Java Enqueue Replication server instance is set to the VCS resource that is running the corresponding Java Standalone Enqueue server instance.
  - The EnqSrvResName attribute of the ABAP Enqueue Replication server instance is set to the VCS resource that is running the corresponding ABAP Standalone Enqueue server instance.

Configuration checks for Solaris zones support

If you have configured VCS to support Solaris zones, ensure that you have followed all the configuration steps described in the following sections:

- Prerequisites for enabling Solaris zone support
  See "Before you install the Veritas agent for SAP NetWeaver" on page 23.
- Importing the types.cf file for Solaris zone support
  See "Importing the agent types files for VCS" on page 30.
- Configuring the SAP resources for Solaris zone support
  See "Setting up zones on Solaris 10 for SAP Enqueue and Enqueue Replication Servers" on page 43.

Configuration checks for using the agent in the VCS 3.5 environment

On the HP-UX platform, if you are using VCS in the VCS 3.5 environment, ensure that you perform the following configuration steps:

- Install the correct version of Perl while using VCS in the VCS 3.5 environment.
  See "Preventing early faulting of Java and Add-in instances" on page 41.
- If you are using the preonline trigger, configure the preonline trigger file correctly.
  See "Configuring SAPNW04 preonline script" on page 66.

Appendix A

Sample Configurations

This appendix includes the following topics:

- About sample configurations for the agent for SAP NetWeaver
- Sample agent type definition for SAP NetWeaver
- Sample SAP resource configuration
- Sample service group configuration for ABAP and Java architectures
- Sample service group configuration for Add-in (ABAP + Java) installation type
- Sample SAP NetWeaver service group configurations for Solaris zone support

About sample configurations for the agent for SAP NetWeaver

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

Sample agent type definition for SAP NetWeaver

After importing the agent types into the cluster, if you save the configuration on your system disk using the `haconf -dump` command, you can find the SAPNW04Types.cf file in the /etc/VRTSvcs/conf/config cluster configuration directory.

An excerpt from this file follows.

```
type SAPNW04 (
                static str ArgList[] = { ResLogLevel, State, IState,
                EnqSrvResName, EnvFile, InstName, InstType,
                MonitorProgram, ProcMon, SAPAdmin, SAPMonHome,
                SAPSID, SecondLevelMonitor, StartProfile }
    str ResLogLevel = INFO
    str EnqSrvResName
    str EnvFile
    str InstName
    str InstType = CENTRAL
    str MonitorProgram
    str ProcMon
    str SAPAdmin
    str SAPMonHome
    str SAPSID
    int SecondLevelMonitor = 0
    str StartProfile
)
```

Sample SAP resource configuration

Given the number of possible SAP resource configurations, this section provides sample working examples that configure a specific SAP instance for Add-In installations.

The four basic configurations include a Central instance, a Dialog instance, an Enqueue server and an Enqueue Replication server.

Sample SAP Central instance

An excerpt of the main.cf file for a SAP Central instance is as follows.

```
SAPNW04 SAP70-ERPCI_sapnw04 (
              EnvFile = "/usr/sap/ERP/saperp.env"
              InstName = DVEBMGS05
              InstType = CENTRAL
              MonitorProgram = "/home/erpadm/scripts/\
              MonitorProgram.sh"
              ProcMon = "dw ig se co"
              ResLoglevel = INFO
              SAPAdmin= erpadm
              SAPMonHome = "/usr/sap/ERP/sapinfo/rfcsdk/bin"
              SAPSID = ERP
```

```
                SecondLevelMonitor = 1
                StartProfile = "/usr/sap/ERP/SYS/profile/\
                START_DVEBMGS05_saperpci"
)
```

Sample SAP Dialog instance

An excerpt of the main.cf file for a SAP Dialog instance is as follows.

```
SAPNW04 SAP70-ERPDI_sapnw04 (
                EnvFile = "/usr/sap/ERP/saperp.env"
                InstName = D006
                InstType = DIALOG
                MonitorProgram = "/home/erpadm/scripts/\
                MonitorProgram.sh"
                ProcMon = "dw ig se"
                ResLoglevel = INFO
                SAPAdmin= erpadm
                SAPMonHome = "/usr/sap/ERP/sapinfo/rfcsdk/bin"
                SAPSID = ERP
                SecondLevelMonitor = 1
                StartProfile = "/usr/sap/ERP/SYS/profile/\
                START_D06_saperpdi"
)
```

Sample SAP Enqueue Server instance

An excerpt of the main.cf file for an SAP Enqueue Server instance is as follows.

```
SAPNW04 SAP70-ERPASCS_sapnw04 (
                EnvFile = "/usr/sap/ERP/saperp.env"
                InstName = ASCS04
                InstType = ENQUEUE
                MonitorProgram = "/home/erpadm/scripts/\
                MonitorProgram.sh ASCS04"
                ProcMon = "ms en"
                ResLoglevel = INFO
                SAPAdmin= erpadm
                SAPMonHome = "/usr/sap/ERP/SYS/exe/run"
                SAPSID = ERP
                SecondLevelMonitor = 1
                StartProfile = "/usr/sap/ERP/SYS/profile/\
                START_ASCS04_saperpascs"
)
```

Sample SAP Enqueue Replication Server instance

An excerpt of the main.cf file for a SAP Enqueue Replication server instance is as follows.

```
SAPNW04 SAP70-ERPERS_sapnw04 (
              EnvFile = "/usr/sap/ERP/saperp.env"
              InstName = ERS08
              InstType = ENQREP
              MonitorProgram = "/home/erpadm/scripts/\
              MonitorProgram.sh ERS08"
              ProcMon = "er"
              ResLoglevel = INFO
              SAPAdmin= erpadm
              SAPMonHome = "/usr/sap/ERP/SYS/exe/run"
              SAPSID = ERP
              SecondLevelMonitor = 1
              StartProfile = "/usr/sap/ERP/SYS/profile/\
              START_ERS08_saperpers"
)
```

Sample service group configuration for ABAP and Java architectures

The service group configuration in a cluster depends on some common characteristics that must be part of the configuration design.

These characteristics include the following:

- The SAP Central instance server or the Enqueue server must be dependent on the database server.
- Each SAP instance (Central, Dialog, Enqueue, and Enqueue Replication) should have a separate virtual IP address assigned to facilitate network transparency.
- Each SAP instance (Central, Dialog, Enqueue and Enqueue Replication) should be placed on shared disk to facilitate cluster node transparency.
- Common file systems to include the profile, global and transaction file systems should be managed from one or more shared disk objects. These systems must be available to the SAP application via NFS or any application such as Veritas Foundation Suite's Cluster File System (CFS).

Figure A-1 shows a sample service group configuration for Central instance.

Figure A-1 Service group configuration for Central instance

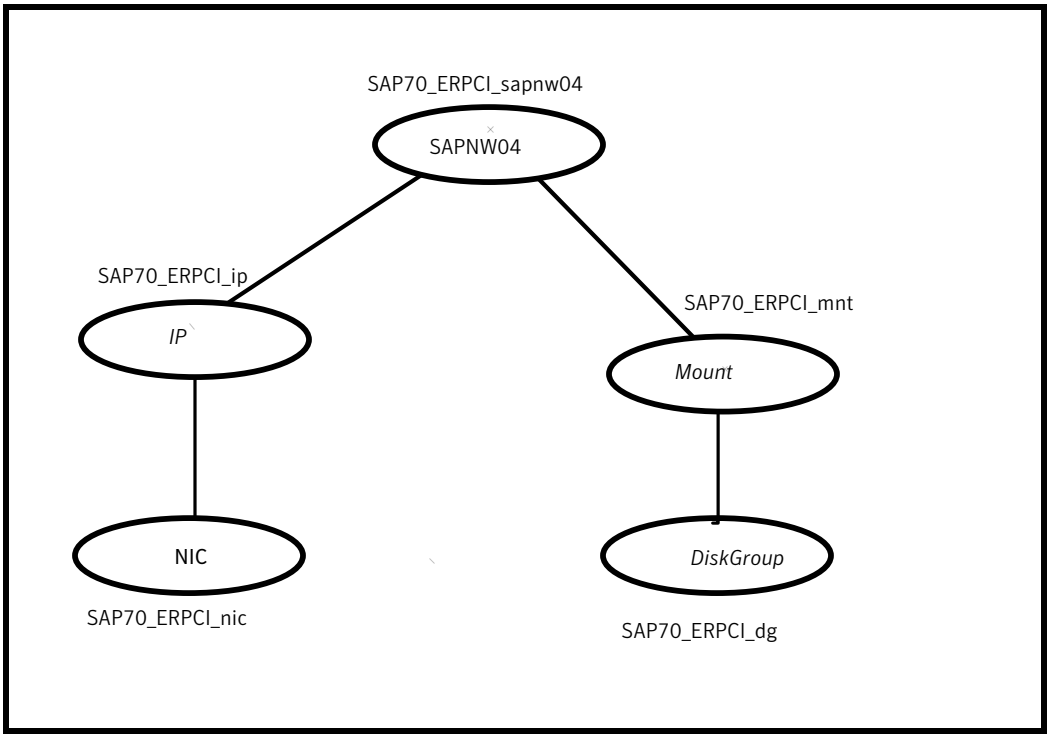


Figure A-2 shows a sample service group configuration for Dialog instance.

Figure A-2 Service group configuration for Dialog instance

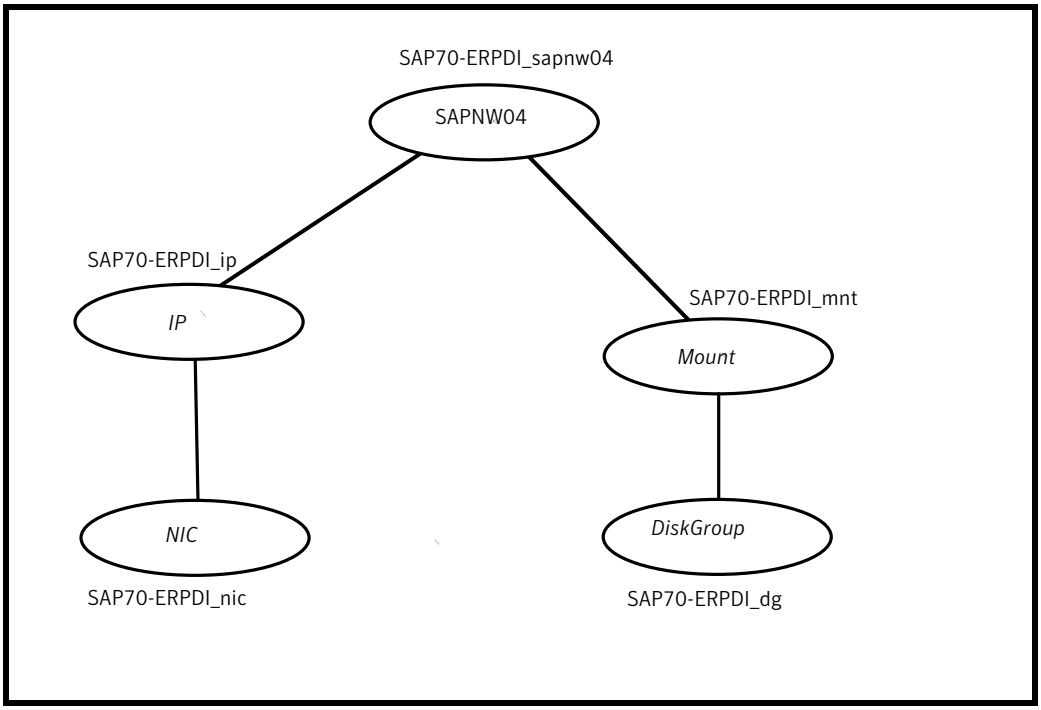


Figure A-3 shows a sample service group configuration for Enqueue Server instance.

Figure A-3 Service group configuration for Enqueue Server instance

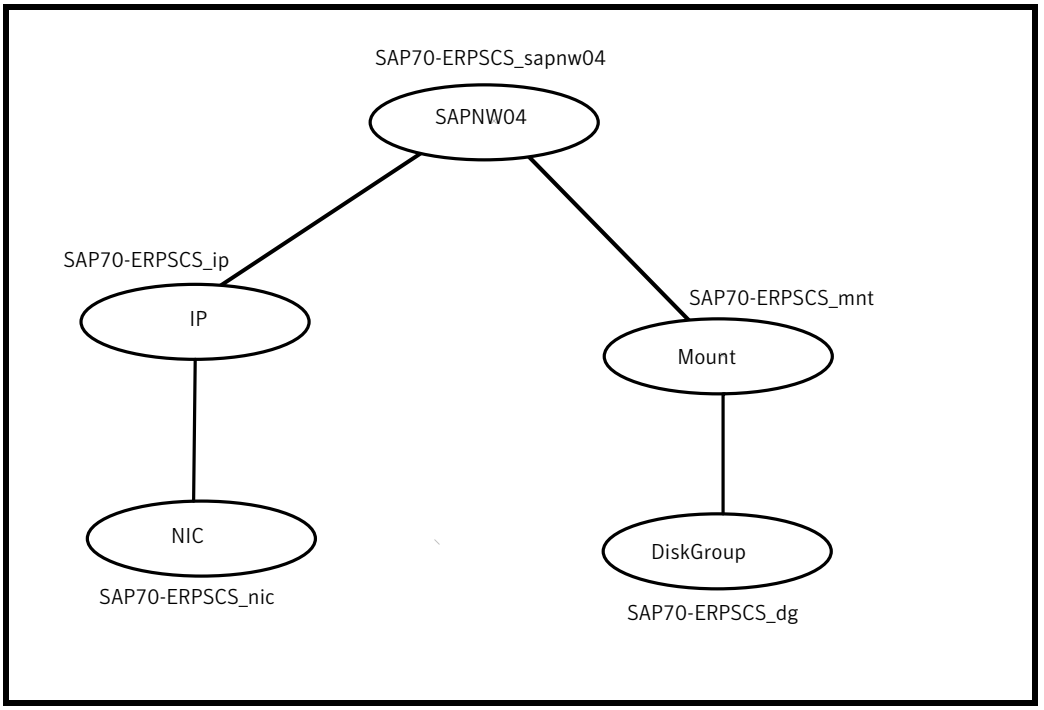
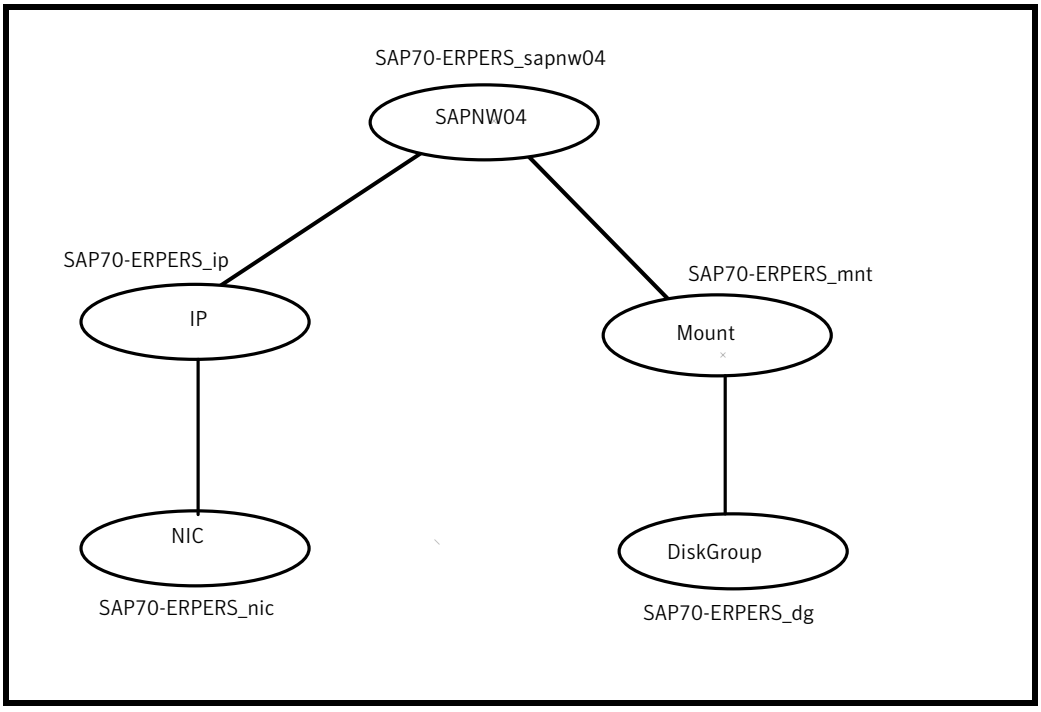


Figure A-4 shows a sample service group configuration for Enqueue Replication Server instance.

Figure A-4 Service group configuration for Enqueue Replication Server instance



Sample service group configuration for Add-in (ABAP + Java) installation type

The common characteristics that must be part of the configuration design in this installation are as follows:

- The Central instance server, and Java and ABAP Enqueue server Service Group must be globally dependent on the database server Service Group.
- The Java and ABAP Enqueue servers and the Central instance optionally configured in one Service Group.

Note: Symantec recommends configuring Enqueue servers and Central instance in separate service groups.

- If Enqueue Servers are configured on different service groups, the ABAP and Java Enqueue Replication servers must be configured in two different service groups.
- To facilitate network transparency, the following holds true:
  - Each SAP server that hosts a Central or Dialog instance must have a separate virtual IP address.
  - The ABAP and Java Enqueue Server, and the Central instance optionally have the same Virtual IP address.

    Note: Symantec recommends having two different virtual IPs for Enqueue servers and Central instance.

  - The ABAP and Java Enqueue Replication servers must have different virtual IP address, if they are configured in different service groups.
- To facilitate cluster node transparency, each SAP server that hosts a Central, Dialog, ABAP Enqueue, Java Enqueue, Java and ABAP Enqueue Replication instances must be placed on shared disk.
- Common file systems that include profile, global, and transaction file systems must be managed from one or more shared disk objects. These systems must be available to the SAP application through applications, such as NFS, Cluster File System, and so on.

Figure A-5 shows a sample service group configuration for Java Add-in Enqueue Server and Central instances.

Figure A-5 Java Add-in Enqueue Server and Central instance configuration

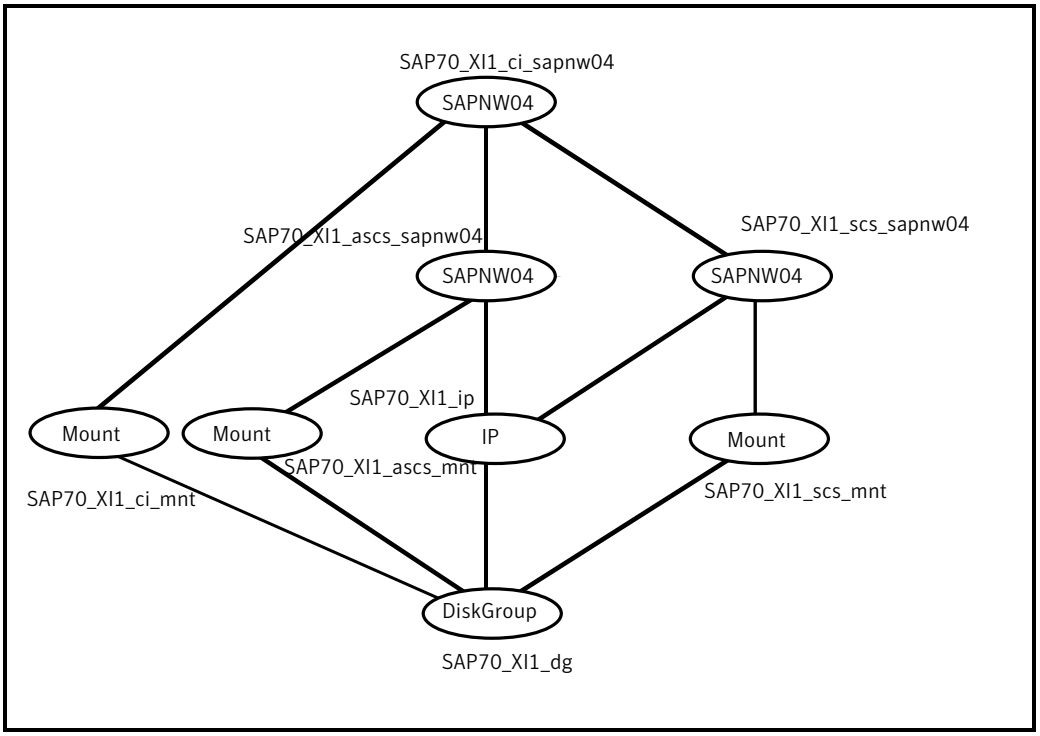
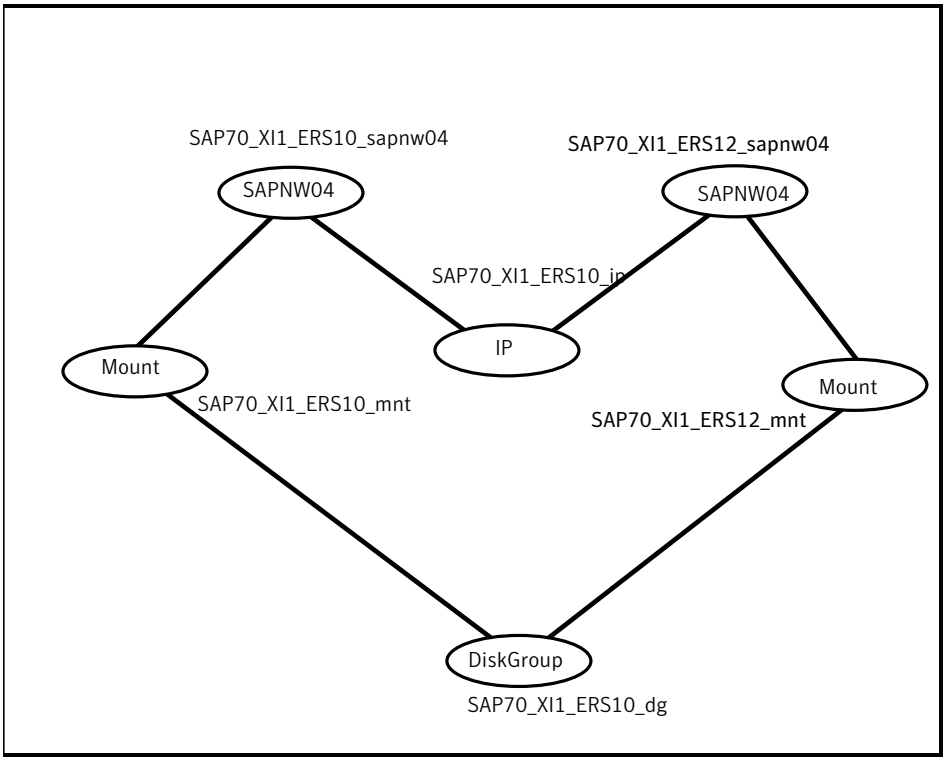


Figure A-6 shows a sample service group configuration for Java Add-in Enqueue Replication Server.

Figure A-6 Java Add-in Enqueue Replication Server configuration



Sample SAP NetWeaver service group configurations for Solaris zone support

This section includes sample service groups with Solaris zone support.

Figure A-7 shows a service group with loop back file systems for Central and Database instances running in a non-global zone, and zone binaries are present on the local disk.

Figure A-7 Service group with loop back file systems for Central and Database instances running in a non-global zone

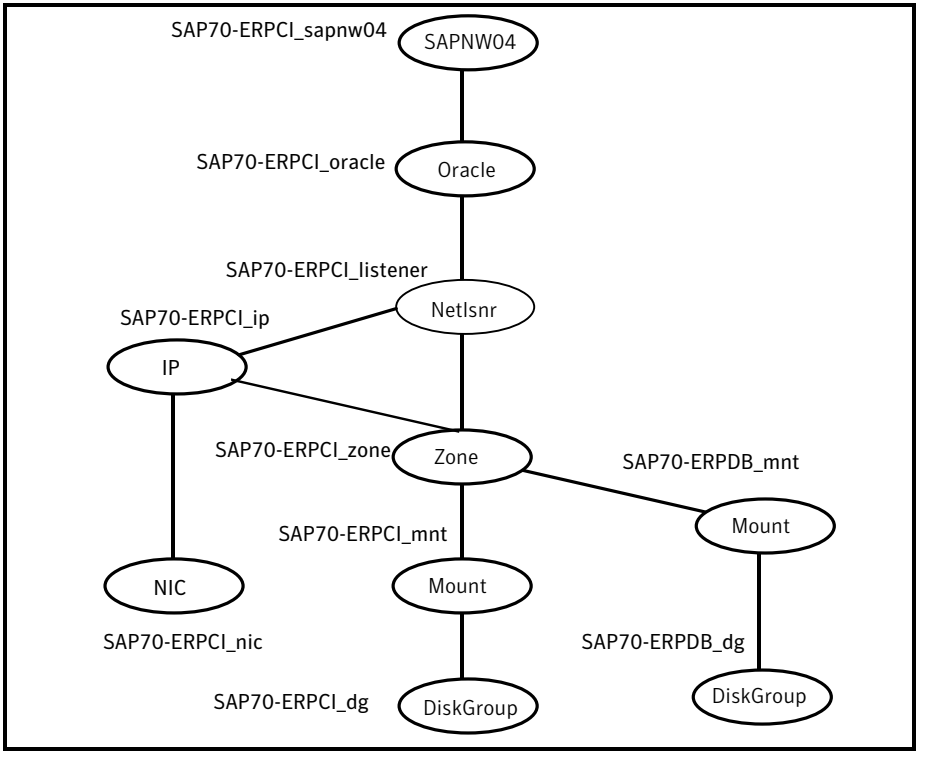


Figure A-8 shows a Service Group with loop back file systems for Central and Database instances running in a non-global zone, and the zone binaries are on the shared disk.

Figure A-8 Service group with loop back file systems for Central and Database instances running in a non-global zone

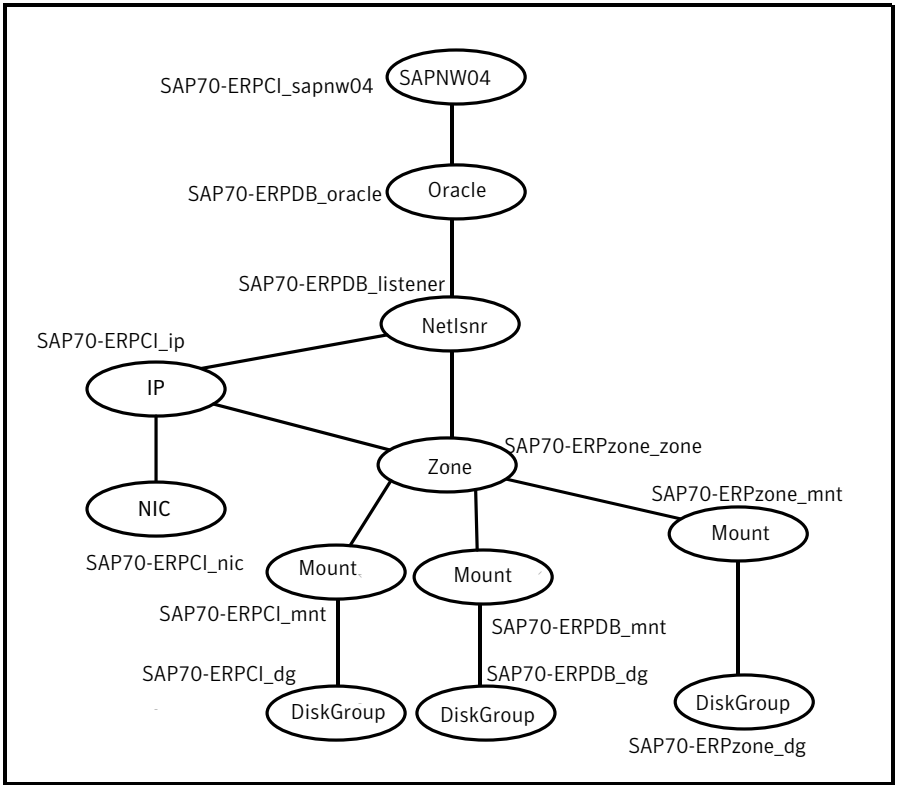


Figure A-9 shows a service group with a Central instance running in a local zone, and the zone binaries are on the shared disk.

Figure A-9 Service group with a central instance running in a local zone

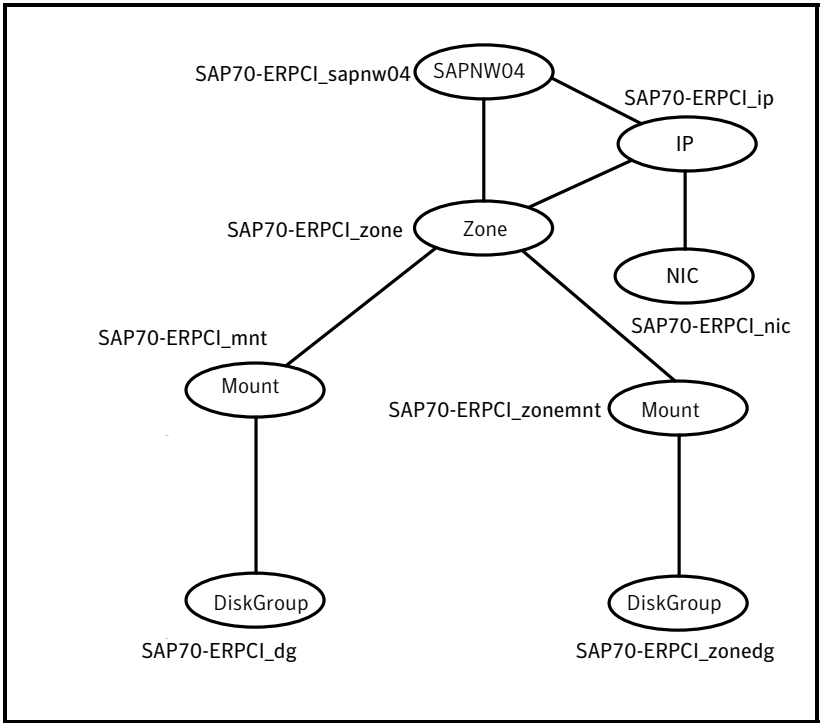
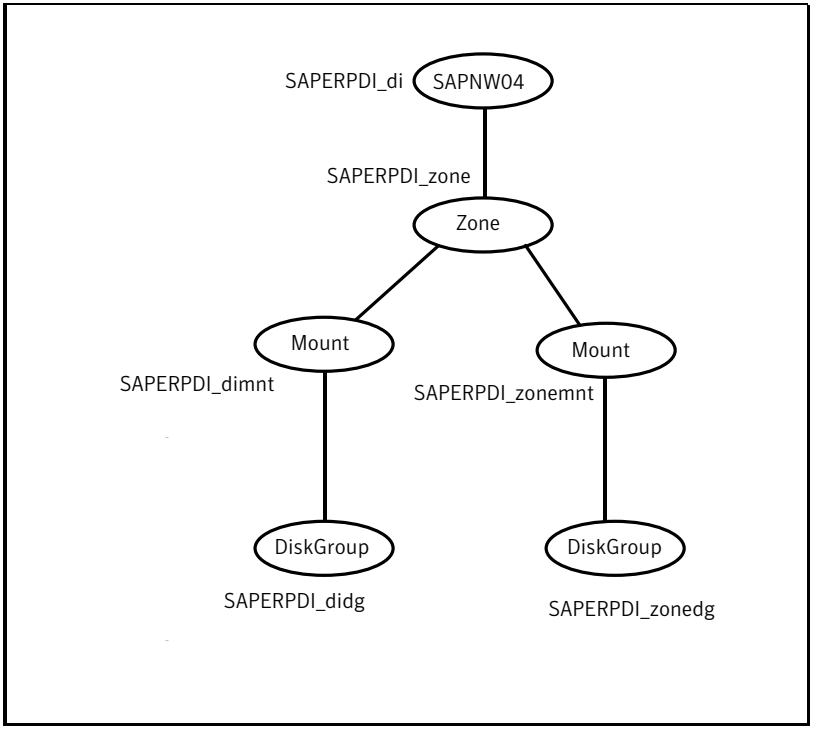


Figure A-10 shows a service group with a Dialog instance running in a local zone, and the zone binaries are on the shared disk.

Figure A-10 Service group with a dialog instance running in a local zone



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