# Cluster Server 7.4 Configuration Guide for SAP Web Application Server - Windows

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Last updated: 2018-05-31

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Section 1

# Getting Started


- Chapter 1. Introducing the Veritas High Availability Agent for SAP Web Application Server
- Chapter 2. Installing and configuring the SAP Web Application Server for high availability

Chapter 1

# Introducing the Veritas High Availability Agent for SAP Web Application Server

This chapter includes the following topics:


- About the Veritas High Availability agent for SAP Web Application Server
- How application availability is achieved in a physical environment
- How does the Veritas High Availability solution work
- Agent functions
- Agent attributes for SAP Web Application Server
- Installing the agent for SAP Web Application Server


## About the Veritas High Availability agent for SAP Web Application Server

The Cluster Server agents monitor specific resources within an enterprise application, determine the status of these resources, and start or stop them according to external events.

The Veritas High Availability agent for SAP Web Application Server provides high availability for SAP NetWeaver 7.1, 7.3, and 7.4 in a cluster. The agent is designed to support a wide range of SAP NetWeaver environments which include SAP

NetWeaver 7.1, 7.3, and 7.4; SAP NetWeaver CE 7.1 and 7.3; SAP NetWeaver Mobile 7.1 and 7.3; and SAP NetWeaver PI 7.1 and 7.3.

The Veritas High Availability agent for SAP Web Application Server brings SAP instances online, monitors the instances, and takes the instances offline. The agent monitors the system processes and server states, and can shut down the server in case of a failover.

The agent supports the following SAP instance types:

- Central Services Instance
- Application Server Instance
- Enqueue Replication Server Instance

The agent supports the following SAP Web Application Server Usage Types:

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

## Typical SAP Web Application Server configuration in a VCS cluster

A typical SAP Web Application Server configuration in a VCS cluster has the following characteristics:

- VCS is installed and configured in a two-node cluster.
- The SAP Web Application Server instance binaries are installed locally on both nodes or on shared disks.
- The Veritas High Availability agent for SAP Web Application Server is installed on the both nodes.
- The *drive*:\usr\sap directory is shared with name sapmnt and saploc.

**Figure 1-1** depicts a configuration where SAP Web Application Server instance binaries and SYS are installed completely on shared disks.

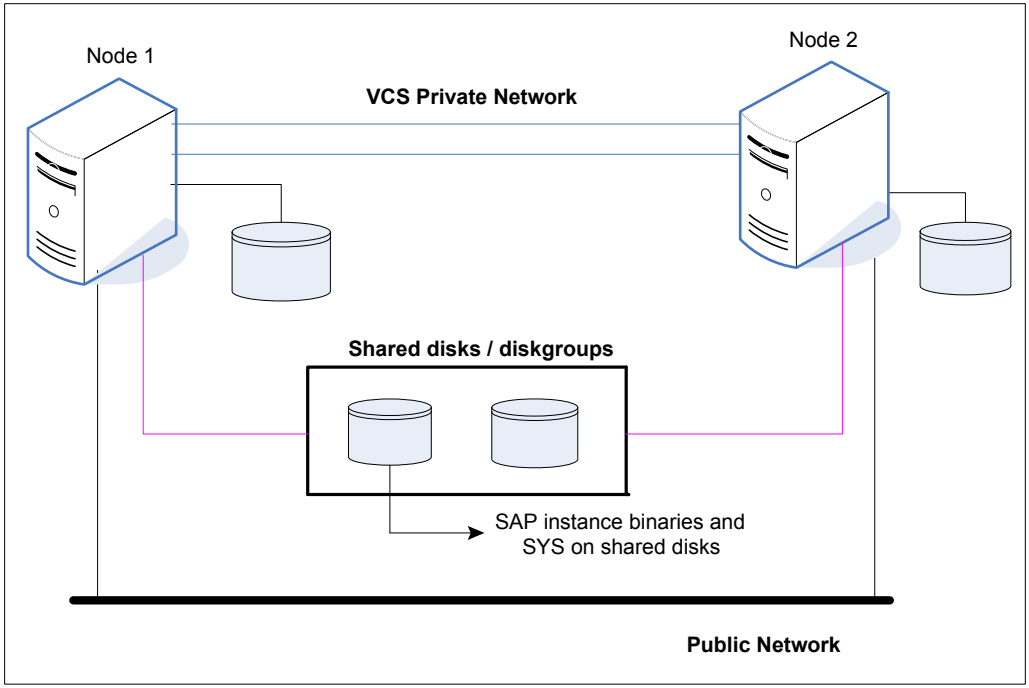
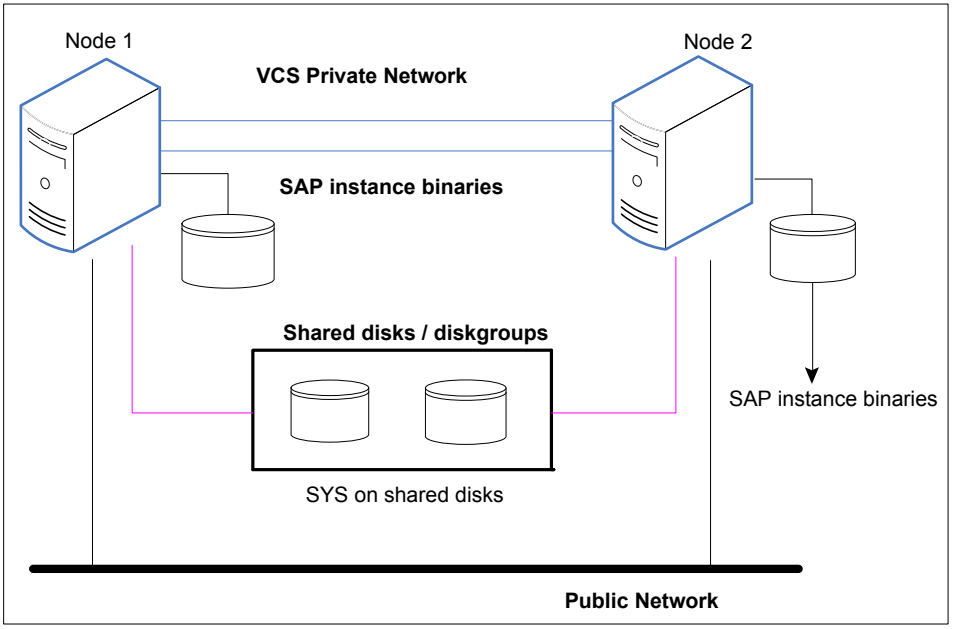


**Figure 1-2** depicts a configuration where SAP Web Application Server instance binaries are installed locally on each node and SYS is installed on shared disks.




# How application availability is achieved in a physical environment

The VCS agents continuously monitor the application, storage, and network components that the application uses in the cluster. The agents are able to detect failures in all of these components. For example, an application-level failure such as a configured application virtual server or application service becoming unavailable, a fault in the storage such as a configured disk becoming inaccessible, or a network failure.

When a fault occurs, VCS fails over the application service group to the next available system in the application service group's system list. A service group failover means that the VCS storage agents deport and import the disks or LUNs on the new system. The VCS network agents bring the network components online and the application-specific agents then start the application services on the new system.

In a disaster recovery cluster configuration, VCS first attempts to failover the application service group within the local cluster. If all the systems in the local cluster

are unavailable, VCS attempts to failover the service group to a system at the remote site.

In a NetApp environment, the VCS NetApp agents perform the following actions in that order:

- Connect the virtual disks (LUNs) to the target hosts (NetAppSnapDrive agent).
- Perform a mirror break that enables write access to the target (NetAppSnapMirror agent).
- Reverse the direction of replication by demoting the original source to a target, and begin replicating from the new source (NetAppSnapMirror agent).

If replication is set up using Volume Replicator (Volume Replicator), the Volume Replicator replication agents make the Secondary RVG at the remote site write-enabled so that it becomes the new Primary. After the storage is connected, VCS starts the application services on the new system at the remote site. The data that is replicated to the remote site is used to restore the application services to the clients.

# How does the Veritas High Availability solution work

The Veritas High Availability solution for VMware employs Cluster Server (VCS) and its agent framework to monitor the state of applications and their dependent components running on the virtual machines that use non-shared storage. Specific agents are available to monitor the application, storage, and network components. Together, these agents monitor the overall health of the configured applications by running specific commands, tests, or scripts.

The storage configuration in the VMware virtual environment determines how VCS functions differently in a non-shared virtual environment. The non-shared storage configuration in the VMware virtual environment involves the VMware VMDK and RDM disks that reside on the shared datastore. This datastore is accessible to multiple virtual machines. However, the disks are attached to a single virtual machine at any given point of time. VCS provides a new storage agent “VMwareDisks” that communicates with the VMware ESX/ESXi hosts to perform the disk detach and attach operations to move the storage disk between the virtual machines, in a VCS cluster.

**Note:** By default the VMwareDisks agent communicates with the ESX/ESXi host to perform the disk detach and attach operations. However, instead of the ESX/ESXi hosts you can choose to communicate with the vCenter Server to perform these operations.

See "How the VMwareDisks agent communicates with the vCenter Server instead of the ESX/ESXi host" on page 16.

In event of an application failure, the agents attempt to restart the application services and components for a configurable number of times. If the application fails to start, they initiate an application fail over to the failover target system. During the fail over, the VMwareDisks agent moves the storage disk to the failover target system, the network agents bring the network components online, and the application-specific agents then start the application services on the failover target system.

In case of a virtual machine fault, the VCS agents begin to fail over the application to the failover target system. The VMwareDisks agent sends a disk detach request to the ESX/ESXi host. After the detach operation is successful, the agent proceeds to attach the disks to the new failover target system.

In a scenario where the ESX/ESXi host itself faults, the VCS agents begin to fail over the application to the failover target system that resides on another host. The VMwareDisks agent communicates with the new ESX/ESXi host and initiates a disk detach operation on the faulted virtual machine. The agent then attaches the disk to the new failover target virtual machine.

In event of a failure in a site recovery configuration, the following tasks are performed for application monitoring continuity:

- The virtual machines at the protected site are failed over to the recovery site.
- The pre-online script defined in the form of a command in the SRM recovery plan applies the specified attribute values for the application components.
- The status monitoring script retrieves the application status.
- The network agents bring the network components online and the application-specific agents start the application services on the failover target system.

For details on the VCS configuration concepts and clustering topologies, refer to the *Cluster Server Administrator's Guide*.

For details on the application agents, refer to the application-specific agent guide.

For details on the storage agents, refer to the *Cluster Server Bundled Agents Reference Guide*.

# How the VMwareDisks agent communicates with the vCenter Server instead of the ESX/ESXi host

In addition to the ESX hosts the VMwareDisks agent can also communicate the disk deatch and attach operations with the vCenter Server to which the virtual machines belong.

In this scenario, in event of a failure, the VMwareDisks agent sends the disk detach and attach requests to the vCenter Server (instead of the ESX hosts). The vCenter Server then notifies the ESX host for these operations. Since the communication is directed through the vCenter Server, the agent successfully detaches and attaches the disks even if the ESX host and the virtual machines reside in a different network.

In a scenario where the host ESX/ESXi itself faults, the VMareDisks agent from the target virtual machine sends a request to the vCenter Server to detach the disks from the failed virtual machine. However, since the host ESX has faulted, the request to detach the disks fails. The VMwareDisks agent from the target virtual machine now sends the disk attach request. The vCenter Server then processes this request and disks are attached to the target virtual machine. The application availability is thus not affected.

## Limitation

The configuration of VMwareDisks agent to communicate with the vCenter Server has the following limitation:

If VMHA is not enabled and the host ESX faults, then even after the disks are attached to the target virtual machine they remain attached to the failed virtual machine. This issue occurs because the request to detach the disks fails since the host ESX itself has faulted. The agent then sends the disk attach request to the vCenter Server and attaches the disks to the target virtual machine.

Even though the application availability is not impacted, the subsequent power ON of the faulted virtual machine fails. This issue occurs because of the stale link between the virtual machine and the disks attached. Even though the disks are now attached to the target virtual machine the stale link with the failed virtual machine still exists.

## Workaround

As a workaround, you must manually detach the disks from the failed virtual machine and then power ON the machine.

## About the vCenter Server user account privileges

You must have the administrative privileges or must be a root user to communicate the disk detach and attach operations through the vCenter Server. If the vCenter

Server user account fails to have the administrative privileges or is not a root user, then the disk detach and attach operation may fail, in event of a failure.

If you do not want to use the administrator user account or the root user, then you must create a role and add the following privileges to the created role:

- "Low level file operations” on datastore
- “Add existing disk” on virtual machine
- “Change resource” on virtual machine
- “Remove disk” on virtual machine

After you create a role and add the required privileges, you must add a local user to the created role. You can choose to add an existing user or create a new user.

Refer to the VMware product documentation for details on creating a role and adding a user to the created role.

## Typical VCS cluster configuration in a virtual environment

A typical VCS cluster configuration in a VMware virtual environment involves two or more virtual machines. The virtual machine on which the application is active, accesses a non-shared VMware VMDK or RDM disk that resides on a VMware datastore.

The virtual machines involved in the VCS cluster configuration may belong to a single ESX host or could reside on separate ESX hosts. If the virtual machines reside on separate ESX hosts, the datastore on which the VMware VMDK or RDM disks (on which the application data is stored) reside must be accessible to each of these ESX hosts.

The application binaries are installed on the virtual machines and the data files are installed on the VMware disk drive. The VCS agents monitor the application components and services, and the storage and network components that the application uses.

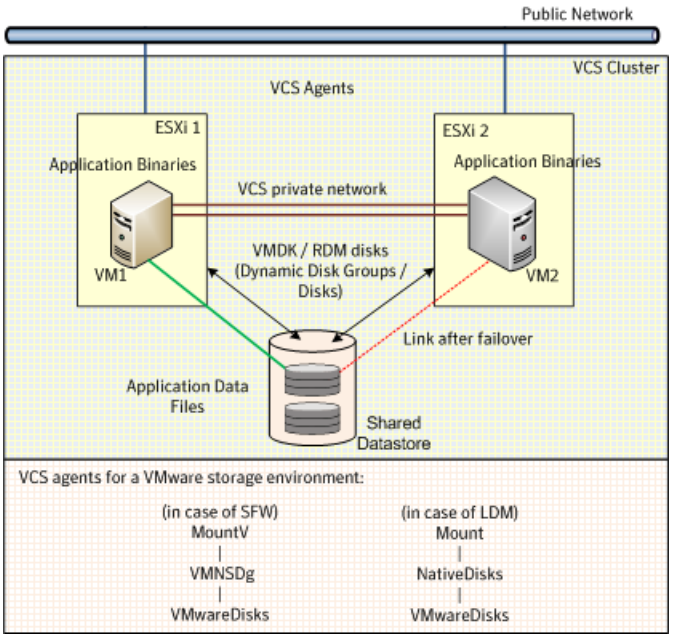
During a failover, the VCS storage agents (MountV-VMNSDg-VMwareDisks in case of SFW storage, Mount-NativeDisks-VMwareDisks in case of LDM storage) move the VMware disks to the new system. The VCS network agents bring the network components online, and the application-specific agents then start the application services on the new system.

In a site recovery environment, Veritas High Availability solution additionally provides script files for the following tasks. These files are invoked when the SRM recovery plan is executed.

- Set up communication between the vCenter Server and the SRM Server at the recovery site and the virtual machines at the protected site.

- Assign a SiteID to both the sites.
- Specify attribute values for the application components at the respective site.
- Retrieve the application status in the SRM recovery report, after the virtual machine is started at the recovery site.

**Figure 1-3** Typical cluster configuration in a VMware virtual environment




# Agent functions

## Online

The online function performs the following tasks:

- Validates the values of the agent attributes required to bring the SAP instance online.
- Performs a preliminary check to ensure that the SAP instance is not running already on the specified node in the cluster.
- Starts the SAP Windows service SAP*SAPSID_InstID*, where *InstID* is the last two characters of the InstName attribute.
- Starts the SAP instance using the startsap.exe utility.

- Ensures that the instance is initialized successfully.

## Offline

The offline function performs the following tasks:

- Validates the values of the agent attributes required to bring the SAP instance offline.
- Performs a preliminary check to ensure that the SAP instance is not already offline.
- Stops the SAP instance using the stopsap.exe utility.
- Stops the SAP Windows service. *SAPSID_InstID*, where *InstID* is the last two characters of the InstName attribute.
- Kills any remaining SAP instance processes to ensure that the instance processes are removed completely.

## Monitor

The monitor function performs the following tasks:

- Validates the values of the agent attributes required to monitor the SAP instance.
- Performs a first-level monitor check as follows:
  - The function verifies that the SAP Windows service SAP*SAPSID_InstID* is running, where InstID is the last two characters of the InstName attribute.
  - Verifies that all processes that the ProcMon attribute lists are running.
- If the value of SecondLevelMonitor attribute is greater than 0, the monitor function performs a more thorough check of the SAP instance as follows:
  - For APPSERV instances, the function uses the following utilities to perform this check:

| Server type | SAP utility used |
|---|---|
| SAPWeb Application Server as ABAP | sapcontrol.exe |
| SAPWeb Application Server as Java | sapcontrol.exe |
| SAPWeb Application Server as Add-In | sapcontrol.exe |

  - For an Enqueue or Enqueue Replication server instance, the function uses the ensmon.exe utility.
- If the MonitorProgram attribute specifies a custom monitor program, the monitor function executes the specified program.
  See "Executing a custom monitor program" on page 90.

## Clean

- Uses SAP's sapsrvkill.exe utility to stop all processes of the particular SAP instance.
- Stops SAP*SAPSID_InstID*, the SAP Windows service for the instance.
- The clean function identifies and kills any remaining SAP instance processes using the unique combination of the SAPSID attribute and InstID, that is the last two characters of the InstName attribute. All these processes must also belong to the SAPService*SAPSID* or *sapsid*adm user.

## Online

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- Validates the values of the agent attributes required to bring the SAP instance online.
- Performs a preliminary check to ensure that the SAP instance is not running already on the specified node in the cluster.
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- Starts the SAP instance using the startsap.exe utility.
- Ensures that the instance is initialized successfully.

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two characters of the InstName attribute. All these processes must also belong to the SAPService*SAPSID* or *sapsid*adm user.

# Agent attributes for SAP Web Application Server

In a virtual environment, the Veritas High Availability Configuration Wizard discovers the required attributes. You can use CLI commands to configure any of the optional attributes.

Table 1-1 shows the required attributes for configuring a SAP Web Application Server instance.

**Table 1-1** Required attributes

| Required attributes | Description |
|---|---|
| ResLoglevel | The logging detail performed by the agent for the resource. The valid values are:<br>INFO: Logs error messages<br>TRACE: Logs error and trace messages. TRACE is very verbose and should only be used during initial configuration or for troubleshooting and diagnostic operations.<br>Type and dimension: string-scalar<br>Default: INFO<br>Example: TRACE |
| SAPAdmin | Windows user name used to start the SAP instance. This user must be dedicated to all the SAP instances within an SAP system. The format is *sapsid*adm.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: piladm |
| SAPAdminDomain | Windows domain name to which the SAPAdmin user belongs.<br>**Note:** If SAPAdmin does not belong to a Windows domain, use the cluster localization settings to specify the local computer name for each system.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: SYMCORP |

**Table 1-1** Required attributes *(continued)*

| Required attributes | Description |
|---|---|
| SAPAdminPassword | Password for the SAPAdmin user.<br>Use the `vcsencrypt` utility to encrypt the password. If you are using the VCS GUI, the GUI automatically encrypts the password. For more information about encrypting agent passwords, see the *Cluster Server Administrator's Guide*.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: vxfgh28skbsj |
| SAPHost | Virtual IP host name (LANMAN name) for the SAP instance. If the instance is installed with location hostname, use the local system name as this attribute value.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: sappi1scs |
| SAPHome | The absolute path to the SAP base directory. This attribute is used to locate programs that the agent uses for start, stop, and clean functions.<br>Example 1: C:\usr\sap\PI1\DVEBMSG00\exe<br>Example 2: C:\usr\sap\PI1\ASCS01\exe<br>Default: No default value |
| SAPServiceUser | Windows user name used to start the SAP Windows service for an SAPSID. This user must be dedicated to all the SAP services under one SAP system, and must not be used by any other SAP service or instance under a different SAP system, even in the same cluster.<br>**Note:** Do not include the domain name in the value for this attribute. Use the SAPAdminDomain attribute to specify domain information.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: SAPServicePI1 |

**Table 1-1** Required attributes *(continued)*

| Required attributes | Description |
|---|---|
| SAPSID | SAP system name. This attribute starts with an alphabetic character and is exactly 3 characters in length. Ensure that the alphabetic characters used in this attribute are in uppercase only. SAPSID is defined during the SAP installation.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: PI1 |
| InstType | String identifier that classifies and describes the SAP server instance type. The InstType values are not case sensitive.<br>The valid values are:<br>APPSERV: SAP Application Server<br>ENQUEUE: SAP Central Services<br>ENQREP: SAP Enqueue Replication Server<br>SMDA: Solution Manager Diagnostics Agent<br>Type and dimension: string-scalar<br>Default: APPSERV<br>Example: ENQUEUE |
| InstName | Uniquely identifies an SAP server instance, along with the SAPSID attribute. The last two characters of this attribute specify the value of the InstID attribute. The InstID and SAPSID attributes together uniquely identify an SAP instance.<br>Some examples include the following:<br>■ ASCS03: SAP Central Services (ABAP)<br>■ SCS07: SAP Central Services (Java)<br>■ DVEBMGS00: SAP Primary Application Server (ABAP)<br>■ D05: SAP Additional Application Server (ABAP)<br>■ J06: SAP (Primary/Additional) Application Server (Java)<br>■ ERS04: SAP Enqueue Replication server<br>■ SMDA97: Solution Manager Diagnostics Agent<br>Type and dimension: string-scalar<br>Default: ""<br>Example: DVEBMGS00 |

**Table 1-1** Required attributes *(continued)*

| Required attributes | Description |
|---|---|
| InstProfile | Specifies the full path and file name of the SAP Instance Profile. Typically the InstProfile is found in `C:\usr\sap\SAPSID\SYS\profile` and has a name of `SAPSID_InstName_hostname`.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: C:\usr\sap\PI1\SYS\profile\PI1_DVEBMGS00_sappi1pas |
| ProcMon | The list of SAP processes that the monitor function must monitor during a first-level check of an SAP instance. The entries in this list are separated by a space and can be specified in any order. The valid values are:<br>APPSERV: disp+work.exe igswd.exe jstart.exe gwrd.exe icman.exe<br>ENQUEUE: msg_server.exe enserver.exe gwrd.exe<br>ENQREP: enrepserver.exe<br>SMDA: jstart.exe<br>Type and dimension: vector-scalar<br>Default: No default value<br>Example: disp+work.exe |
| SAPMonHome | The directory that defines the location of the sapcontrol.exe or ensmon.exe commands. The agent for SAP WebAS uses these commands for second-level monitoring.<br>This functionality is not a part of the base SAP installation. Hence, the value of this attribute may be different from the SAPHome attribute.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: C:\usr\sap\AAV\SYS\exe\uc\NTAMD64 |

**Table 1-1** Required attributes *(continued)*

| Required attributes | Description |
|---|---|
| EnqSrvResName | Specifies the SAP Central Services instance resource name in VCS. This attribute is set only for Enqueue Replication Server (ERS) and will be used by both Enqueue and Enqueue Replication Servers to query others status during startup and failover.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example: SAPPI1SCS_scs |

Table 1-2 shows the optional attributes for configuring an SAP Web Application Server instance.

**Table 1-2** Optional attributes

| Attribute | Description |
|---|---|
| SecondLevelMonitor | Used to enable second-level monitoring and specify the interval for the same. Second-level monitoring is a deeper, more thorough state check of the configured SAP instance. The numeric value specifies how often the second-level monitoring routines are 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.<br><br>**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 sapcontrol is executed every 100 minutes, which may not be as often as intended. For maximum flexibility, no upper limit is defined for SecondLevelMonitor.<br><br>For Java and Add-In systems, if SecondLevelMonitor is enabled and if resources are going to unknown state, change ResLogLevel to TRACE. After you change ResLogLevel to TRACE, you might encounter the following error message:<br><br>`J2EEGetProcessList FAIL: HTTP error, HTTP/1.1 401 Unauthorized`.<br><br>If you encounter the above-mentioned error message, edit the instance profile, add the following parameter, and restart the instance service:<br><br>`service/protectedwebmethods =`<br><br>Type and dimension: integer-scalar<br><br>Default: 0<br><br>Example: 1 |

**Table 1-2** Optional attributes *(continued)*

| Attribute | Description |
|---|---|
| MonitorProgram | Full path and file name of an external, user-supplied monitor program. If specified, the monitor function executes this file to perform an additional server state check. There are no restrictions for what actions the external monitor program performs, to determine the state of a SAP instance server. The only constraint is that the external monitor program must return one of the following integer values:<br>■ 0 (server is online)<br>■ 110 (server is online)<br>■ 100 (server is offline)<br>■ 1 (server is offline)<br>■ 99 or anything else (server state is unknown)<br>**Note:** Veritas recommends storing the external monitor program in the shared disk directory to ensure the file is always available on the online system. Arguments are supported.<br>Type and dimension: string-scalar<br>Default: No default value<br>Example 1: C:\usr\sap\PI1\DVEBMGS00\work\mymonitor.bat<br>Example 2: C:\usr\sap\PI1\DVEBMGS00\work\mymonitor.exe arg1 arg2 |

# Installing the agent for SAP Web Application Server

During the installation of the VCS server components, the High Availability application agents are also installed. These High Availability application agents are also available in the form of an agent pack, which is released on a quarterly basis. The agent pack includes support for new applications as well as fixes and enhancements to existing agents. You can install the agent pack on an existing VCS installation.

You can download and install the latest agent pack from the Veritas Operations Readiness Tools (SORT) site: https://sort.veritas.com/agents.

Refer to the product installation guide for instructions on installing and upgrading VCS.

Chapter 2

# Installing and configuring the SAP Web Application Server for high availability

This chapter includes the following topics:


- Monitoring an SAP instance
- About installing SAP Web Application Server for high availability
- About configuring SAP Web Application Server for high availability
- Setting up SAP systems for clustering
- Installing SAP system using Virtual Hostname
- Configuring the agent for message server restart
- Configuring the Enqueue Replication Server
- Clustering an SAP instance
- Configuring the SAP systems on Windows Server 2008/2012


## 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 2-1 lists valid values of the ProcMon attribute

**Table 2-1** Values of ProcMon attribute

| SAP usage type | SAP instance type | Value of ProcMon attribute |
|---|---|---|
| ABAP | ENQREP | enrepserver.exe |
| Java | APPSERV | jstart.exe<br>igswd.exe and icman.exe are optional |
| Java | ENQUEUE | enserver.exe<br>msg_server.exe<br>gwrd.exe is optional |
| Java | ENQREP | enrepserver.exe |
| Add-In (ABAP + Java) | APPSERV | disp+work.exe<br>jstart.exe<br>igswd.exe, icman.exe and gwrd.exe are optional |
| Add-In (ABAP +Java) | ENQUEUE (ABAP) | enserver.exe<br>msg_server.exe |
| Add-In (ABAP +Java) | ENQREP (ABAP) | enrepserver.exe |
| Add-In (ABAP +Java) | ENQUEUE (Java) | enserver.exe<br>msg_server.exe<br>gwrd.exe is optional |
| Add-In (ABAP +Java) | ENQREP (Java) | enrepserver.exe |
| Java | SMDA | jstart.exe |
| Add-In (ABAP +Java) | SMDA | jstart.exe |

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 processes. If any process is missing, the operation declares the SAP instance as offline, and bypasses further monitor operations.

# About installing SAP Web Application Server for high availability

In a VCS environment, you can install SAP NetWeaver in the following ways:

| | |
|---|---|
| SAP instance on shared disk | Install the SAP instance binaries and SYS directory on shared disks |
| SAP instance on shared disk | Install the SAP instance binaries on local disk and SYS directory on shared disks |

When installing SAP NetWeaver, ensure that the login_name, group_name for the *sid*adm and SAPService*SID* is the same on all the nodes.

For more details refer to SAP documentation.

# About configuring SAP Web Application Server for high availability

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

- In a service group, keep the single point of failure as minimal as possible and watch the application startup time.
- Assign a virtual hostname to the component within the switchover environment. Since the physical hostname changes with the switchover, this is a must have requirement.
- Based on the expected failover time configure the reconnection parameters for all software components and enable its automatic reconnection.
- Configure sapcpe to copy the instance specific executables and binaries from a central file system to the instance executable directory, during the instance startup.

# Setting up SAP systems for clustering

This topic describes the procedure to install and configure SAP NetWeaver on a Windows system, so that you can cluster the system in a Cluster Server (VCS) environment.

Veritas recommends installing and clustering a database server for SAP to minimize SAP system downtime. An SAP system downtime may happen due to database unavailability.

In this installation, it is assumed that you are setting up the system on two or more nodes, and clustering these nodes in a VCS environment.

**Note:** Veritas strongly recommends that a trained SAP consultant be involved in performing the installation procedure.

# Installing SAP systems using a virtual hostname

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

**Note:** Before installing an SAP system refer to the SAP installation documentation.

**To install an SAP system using a virtual hostname**

1. Log in as a user with domain administrator rights.
2. Create a service group with IP and Lanman resources for SAP instance.
3. Bring the service group online.
4. On the node that has the service group online, start the SAP instance installation.

   **Note:** Do not double-click the `sapinst.exe` file to launch the SAP installation GUI. Use the SAPINST_USE_HOSTNAME parameter to launch the SAP installation GUI in a virtual environment.

5. On the Master DVD, navigate to the directory having`sapinst.exe` tool.

   At the command prompt, run the command:

   *path*\sapinst.exe SAPINST_USE_HOSTNAME=*Virtual Host Name*

   Where,

   *Virtual Host Name* is the virtual Lanman name that you created in step 2 above.

6. From the installation GUI, select **High Availability System** >**Based on [AS ABAP/AS Java/AS ABAP and AS Java]**.

   Select the appropriate option based on the usage type of the system you are planning to install and follow the instructions to complete the installation.

## Installing SAP systems using a virtual hostname

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

---

**Note:** Before installing an SAP system refer to the SAP installation documentation.

---

**To install an SAP system using a virtual hostname**

1. Log in as a user with domain administrator rights.
2. Create a service group with IP and Lanman resources for SAP instance.
3. Bring the service group online.
4. On the node that has the service group online, start the SAP instance installation.

   ---

   **Note:** Do not double-click the `sapinst.exe` file to launch the SAP installation GUI. Use the SAPINST_USE_HOSTNAME parameter to launch the SAP installation GUI in a virtual environment.

   ---

5. On the Master DVD, navigate to the directory having`sapinst.exe` tool.

   At the command prompt, run the command:

   *path*`\sapinst.exe SAPINST_USE_HOSTNAME=`*`Virtual Host Name`*

   Where,

   *Virtual Host Name* is the virtual Lanman name that you created in step 2 above.

6. From the installation GUI, select **High Availability System** >**Based on [AS ABAP/AS Java/AS ABAP and AS Java]**.

   Select the appropriate option based on the usage type of the system you are planning to install and follow the instructions to complete the installation.

# Installing SAP system using Virtual Hostname

An SAP system can be installed directly using virtual hostnames. To install SAP system using virtual hostname, perform the following steps:

---

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

---

**To install SAP instances using Virtual Hostname**

1. Log in as a user that has domain administrator rights.
2. Create a VCS Service Group with IP and Lanman resources for SAP instance.

   For details about creating VCS Service Groups, refer to the VCS user documentation.
3. Before beginning to install the SAP instance, bring the Service Group online.
4. On the node that has the Service Group online, start the SAP instance installation.

   **Note:** Do not double-click the sapinst.exe file to launch the SAP installation GUI. Use the SAPINST_USE_HOSTNAME parameter to launch the SAP installation GUI in a virtual environment.
5. Navigate to the directory where sapinst.exe tool is present in the Master DVD.

   At the command prompt, run the following command:

   ```
   path\sapinst.exe SAPINST_USE_HOSTNAME=Virtual Host Name
   ```

   where,

   *Virtual Host Name* is the virtual Lanman name that you created in step 2.
6. From the installation GUI, select the usage type of system you are planning to install and follow the instructions to complete the installation.

# Configuring the agent for message server restart

In case the message server process fails, the Veritas High Availability agent for SAP Web Application Server supports the message server restart through SAP service (SAP*SID_InstID*) process sapstartsrv.exe

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 Instance profile for (A)SCS instance and set the new profile parameters.

**Note:** The Veritas High Availability agent for SAP Web Application Server does not support restart of the ‘enserver.exe’ Enqueue server process.

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

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

For example, the modified syntax for the message server is as follows:

```
Restart_Program_02 = local $(_MS) pf=$(_PF)
```

By default sapstartsrv.exe restarts the message server without any delay.

For more information on how to restart the process of a program through sapstartsrv.exe, refer to SAP Note 729945 and related notes.

---

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

---

# Configuring the Enqueue Replication Server

Configuration of the Enqueue Replication Server for SAP Web Application Server can either be done manually, or by using SAPInst.

## Configuring the Enqueue Replication Server manually

**To manually configure the Enqueue Replication Server for SAP Web Application Server**

1. 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
   ```

   Restart the (A)SCS instance to make the change effective.

   Let us 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 (that is, the Enqueue Server's lock table) must be protected with an ERS instance as follows:

   - ERS SAPSID = PLL
   - ERS INSTNO = 11 (a free instance number)

- ERS HOST = sapershost (virtual hostname)

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

Create the directory structure as follows:

*drive*:\usr\sap\PLL\ERS11\exe

*drive*:\usr\sap\PLL\ERS11\log

*drive*:\usr\sap\PLL\ERS11\data

*drive*:\usr\sap\PLL\ERS11\work

**3** Copy all the binaries from (A)SCS instance exe directory into the ERS instance exe directory.

**4** Create a new ERS instance profile in *drive*:\usr\sap\PLL\SYS\profile.

```
SAPSYSTEMNAME = PLL
SAPSYSTEM = 11
INSTANCE_NAME = ERS11

DIR_CT_RUN = $(DIR_EXE_ROOT)\$(OS_UNICODE)\NTAMD64
DIR_INSTANCE = <drive>:\usr\sap\$(SAPSYSTEMNAME)\$(INSTANCE_NAME)
DIR_EXECUTABLE = $(DIR_INSTANCE)\exe
DIR_PROFILE = $(DIR_INSTALL)/profile
_PF = $(DIR_PROFILE)\PLL_ERS11_sapershost

SAPGLOBALHOST = sapscshost
SAPLOCALHOST = sapershost

#-----------------------------------------------------------------
# Copy SAP Executables
#-----------------------------------------------------------------
_CPARG0 = list:$(DIR_CT_RUN)/scs.lst
Start_Program_01 = immediate $(DIR_CT_RUN)\sapcpe$(FT_EXE) pf=$(_PF)
$(_CPARG0)
#-----------------------------------------------------------------
# Settings for enqueue monitoring tools (enqt, ensmon)
#-----------------------------------------------------------------
enque/process_location = REMOTESA
rdisp/enqname = $(rdisp/myname)

#-----------------------------------------------------------------
# standalone enqueue details from (A)SCS instance
#-----------------------------------------------------------------
SCSID = 01
SCSHOST = sapscshost
enque/serverinst = $(SCSID)
enque/serverhost = $(SCSHOST)
enque/serverport = 32$(SCSID)

enque/enrep/poll_interval = 0
enque/enrep/poll_timeout = 120
enque/enrep/inactive_action = sleep

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

```
_ER = $(DIR_EXECUTABLE)\enrepserver$(FT_EXE)
Start_Program_02 = local $(_ER) pf=$(_PFL) 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.

5 Use the `sapstartsrv.exe` command to create an SAP Windows Service for the Enqueue Replication Server instance.

6 Start the SAP instance for the Enqueue Replication Server. Ensure that the instance starts successfully.

The SAP instance is now ready for clustering and to control the life time of Enqueue Replication Server using VCS.

# Configuring the Enqueue Replication Server using SAPInst

**To configure the Enqueue Replication Server for SAP NetWeaver using SAPInst**

1 Install Enqueue Replication Server using SAPInst with virtual hostname.

```
# sapinst SAPINST_USE_HOSTNAME=VirtualHostName
```

2 Modify the Enqueue Replication Instance profile

*drive*:\usr\sap*SAPSID*\SYS\profile\SAPSID_InstName_VHostName

3 Add the following lines under the section "standalone enqueue details from (A)SCS instance" in the profile file.

enque/poll_interval = 0

enque/poll_timeout = 120

enque/enrep/inactive_action = sleep

enque/table_size = 4096

4 Delete the following lines from the profile file.

```
Autostart = 1

enque/enrep/hafunc_implementation
```

5 Change the Restart_Program_00 to Start_Program_00 Under "Start enqueue replication server" section.

```
Start_Program_00 = local $(_ER) pf=$(_PFL) NR=$(SCSID)
```

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

## Configuring the Enqueue Replication Server manually

**To manually configure the Enqueue Replication Server for SAP Web Application Server**

1 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
```

Restart the (A)SCS instance to make the change effective.

Let us 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 (that is, the Enqueue Server's lock table) must be protected with an ERS instance as follows:

- ERS SAPSID = PLL
- ERS INSTNO = 11 (a free instance number)
- ERS HOST = sapershost (virtual hostname)

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

Create the directory structure as follows:

*drive*:\usr\sap\PLL\ERS11\exe

*drive*:\usr\sap\PLL\ERS11\log

*drive*:\usr\sap\PLL\ERS11\data

*drive*:\usr\sap\PLL\ERS11\work

3 Copy all the binaries from (A)SCS instance exe directory into the ERS instance exe directory.

**4** Create a new ERS instance profile in *drive*:\usr\sap\PLL\SYS\profile.

```
SAPSYSTEMNAME = PLL
SAPSYSTEM = 11
INSTANCE_NAME = ERS11

DIR_CT_RUN = $(DIR_EXE_ROOT)\$(OS_UNICODE)\NTAMD64
DIR_INSTANCE = <drive>:\usr\sap\$(SAPSYSTEMNAME)\$(INSTANCE_NAME)
DIR_EXECUTABLE = $(DIR_INSTANCE)\exe
DIR_PROFILE = $(DIR_INSTALL)/profile
_PF = $(DIR_PROFILE)\PLL_ERS11_sapershost

SAPGLOBALHOST = sapscshost
SAPLOCALHOST = sapershost

#-----------------------------------------------------------------
# Copy SAP Executables
#-----------------------------------------------------------------
_CPARG0 = list:$(DIR_CT_RUN)/scs.lst
Start_Program_01 = immediate $(DIR_CT_RUN)\sapcpe$(FT_EXE) pf=$(_PF)
$(_CPARG0)
#-----------------------------------------------------------------
# Settings for enqueue monitoring tools (enqt, ensmon)
#-----------------------------------------------------------------
enque/process_location = REMOTESA
rdisp/enqname = $(rdisp/myname)

#-----------------------------------------------------------------
# standalone enqueue details from (A)SCS instance
#-----------------------------------------------------------------
SCSID = 01
SCSHOST = sapscshost
enque/serverinst = $(SCSID)
enque/serverhost = $(SCSHOST)
enque/serverport = 32$(SCSID)

enque/enrep/poll_interval = 0
enque/enrep/poll_timeout = 120
enque/enrep/inactive_action = sleep

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

```
_ER = $(DIR_EXECUTABLE)\enrepserver$(FT_EXE)
Start_Program_02 = local $(_ER) pf=$(_PFL) 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.

5 Use the `sapstartsrv.exe` command to create an SAP Windows Service for the Enqueue Replication Server instance.

6 Start the SAP instance for the Enqueue Replication Server. Ensure that the instance starts successfully.

The SAP instance is now ready for clustering and to control the life time of Enqueue Replication Server using VCS.

# Configuring the Enqueue Replication Server using SAPInst

**To configure the Enqueue Replication Server for SAP NetWeaver using SAPInst**

1 Install Enqueue Replication Server using SAPInst with virtual hostname.

```
# sapinst SAPINST_USE_HOSTNAME=VirtualHostName
```

2 Modify the Enqueue Replication Instance profile

*drive*:\usr\sap*SAPSID*\SYS\profile\SAPSID_InstName_VHostName

3 Add the following lines under the section "standalone enqueue details from (A)SCS instance" in the profile file.

enque/poll_interval = 0

enque/poll_timeout = 120

enque/enrep/inactive_action = sleep

enque/table_size = 4096

4 Delete the following lines from the profile file.

```
Autostart = 1

enque/enrep/hafunc_implementation
```

5 Change the Restart_Program_00 to Start_Program_00 Under "Start enqueue replication server" section.

```
Start_Program_00 = local $(_ER) pf=$(_PFL) NR=$(SCSID)
```

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

# Clustering an SAP instance

This section describes the procedure for clustering an SAP instance.

To cluster an SAP instance, you must first configure the node that hosts the SAP Central Service Instance ([A]SCS) and then configure all other nodes that you want to cluster.

## Configuring the first node in the cluster

Perform the following tasks on the node on which you installed SAP, the first time.

- Set the SAP Service to manual.
- Create the cluster service group for SAP instance.

**To configure the first node in the cluster**

1 Stop the SAP Central Services Instance.

2 Stop the SAP instance Windows service

```
SAPSAPSID_No
```

3 In the instance profile, set the AUTOSTART equal to 0.

4 Configure the SAP*SAPSID_No* service as follows:

- Open services.msc. Click **Start** > **Run** and enter service.msc.
- On the Services panel, right-click the SAP*SAPSID_No* service, and select **Properties**.
- On the General tab, select **Manual** from the Startup type drop-down list.
- Click **OK**.
- Close and exit the Services panel.

## Configuring all other nodes in the cluster

Perform the following tasks on the other remaining cluster nodes:

- Create the required SAP users and groups.

- Set the system and user environment for the SAP system.
- Enter the required port numbers in the Windows services files.
- Install Host Agent using sapinst.exe.
- Create the Windows service for the SAP instance.

**To configure all other nodes in the cluster**

1. Log in as a domain administrator.
2. Create the following local groups.
   - SAP_*SAPSID*_LocalAdmin
   - SAP_SAP_LocalAdmin
   - SAP_LocalAdmin
3. Add the SAP_*SAPSID*_GlobalAdmin domain group to the SAP_*SAPSID*_LocalAdmin and SAP_LocalAdmin group.
4. Add the SAP_SAP_GlobalAdmin domain group to the SAP_SAP_LocalAdmin and SAP_LocalAdmin
5. Add the SAP_*SAPSID*_GlobalAdmin and SAP_SAP_GlobalAdmin domain group to the local Administrators group.

   For details on creating and adding a new local group and users:

   See "Creating and adding local groups and users" on page 66.
6. Click **Start** > **Programs** > **Administrative Tools** > **Local Security Policy** > **Local Policies** > **User Right Assignment**.
7. Add the following privileges for the *sapsid*adm user.
   - Act as a part of the Operating System (SeTcbPrivilege)
   - Replace a process-level token (SeAssignPrimaryTokenPrivilege)
   - Adjust memory quotas for a process (SeIncreaseQuotaPrivilege)
8. Add the following privileges for the SAPService*SAPSID* user.
   - Log on as a Service (SeServiceLogonRight).
   - Adjust memory quotas for a process (SeIncreaseQuotaPrivilege)
   - Access this computer from the network (SeNetworkLogonRight)
   - Deny Log on Locally and Deny Log on through Terminal Services (SeDenyInteractiveLogOnRight)
9. Change the *sapsid*adm user environment as follows:

- At the command prompt enter,
  `runas /profile /user:`*`domain`*`\`*`sapsid`*`adm regedit`
- On the Registry Editor panel, click **HKEY_CURRENT_USER** > **Environment**.
- Modify the user environment based on your Database, SAP Usage Type and SAPSID.

For example, the following table depicts the registry environment with Oracle database (PI1) and Add-In installation with SAPSID PI1.

| Name | Type | Data |
|---|---|---|
| Default | REG_SZ | value not set |
| DBMS_TYPE | REG_SZ | ora |
| dbs_ora_schema | REG_SZ | SAPSR3 |
| dbs_ora_tnsname | REG_SZ | PI1 |
| JAVA_HOME | REG_SZ | C:\j2sdk1.4.2_19-x64 |
| NLS_LANG | REG_SZ | AMERICAN_AMERICA.UTF8 |
| ORACLE_HOME | REG_EXPAND_SZ | E:\oracle\PI1\102 |
| ORACLE_SID | REG_EXPAND_SZ | PI1 |
| PATH | REG_EXPAND_SZ | E:\usr\sap\PI1\SYS\exe\uc\NTAMD64;\ \sappi1scs\sapmnt\PI1\SYS\exe\uc\NTAMD64; E:\oracle\PI1\102\BIN |
| SAPDATA_HOME | REG_EXPAND_SZ | E:\oracle\PI1 |
| SAPEXE | REG_SZ | \\sapi1scs\sapmnt\PI1\SYS\exe\uc\NTAMD64 |
| SAPLOCALHOST | REG_SZ | sappi1aas |
| SAPSYSTEMNAME | REG_SZ | PI1 |
| TEMP | REG_EXPAND_SZ | E:\usr\sap\PI1\tmp |
| TMP | REG_EXPAND_SZ | E:\usr\sap\PI1\tmp |
| TNS_ADMIN | REG_EXPAND_SZ | \\sappi1scs\sapmnt\PI1\SYS\profile\oracle |

**10** From the first node in the cluster, copy the following service entries for the SAP instance, from the services file in the `%windir%\system32\drivers\etc` directory to the corresponding services file on all other nodes in the cluster.

```
sapdp<No.>      32<No.>/tcp   # SAP System Dispatcher Port
sapdp<No.>s     47<No.>/tcp   # SAP System Dispatcher Security Port
sapgw<No.>      33<No.>/tcp   # SAP System Gateway Port
sapgw<No.>s     48<No.>/tcp   # SAP System Gateway Security Port
sapms<SAPSID>   36<No.>/tcp   # SAP System Message Port Number
```

where,

The value for <*No.*> is the value of an Instance ID.

**11** Move the Service Group from the first node to the node that you are currently configuring and ensure that the *drive*`:\usr\sap` directory is shared with the names, `sapmnt` and `saploc`.

See "Creating sapmnt and saploc share directories" on page 68.

**12** Install SAP Host Agent with SAPInst. Follow the steps below to install the SAP Host agent.

- In the Master DVD, navigate to the directory containing the sapinst.exe tool.
- Double-click the sapinst.exe file to launch the SAP installation GUI.
- Select **High Availability System** > **Based on [AS ABAP/AS Java/AS ABAP and AS Java]** > **Host Agent** based on the usage type of system you installed.
- Follow the instructions to complete the installation.

**13** Create the SAP*SAPSID_No* service as follows:

- At the command prompt, navigate to the *drive*`:\usr\sap\`*SAPSID*`\`*InstName*`\exe` directory.
- Run the `sapstartsrv.exe` command.
- In the SAP Service Install/Uninstall dialog box, enter the following values:

| | |
|---|---|
| SID | *SAPSID* |
| NR | *InstanceNumber* |

| | |
|---|---|
| Profile | If, SAPLOCALHOST=SAPGLOBALHOST, then enter the value as:<br>`drive:\usr\sap\SAPSID\SYS\profile\SAPSID_InstName_VirtualHostName`<br>If, SAPLOCALHOST is not equal to SAPGLOBALHOST, then enter the value as:<br>`\\SAPGLOBALHOST\sapmnt\SAPSID\SYS\profile\SAPSID_InstName_VirtualHostName` |
| User | *domain*\SAPService*SAPSID* |
| Password | *SAPServiceSAPSID password* |
| Startup type | manual |
| Use Environment of User | *domain**sapsid*adm |

**14** Click **OK**.

**15** Re-register the type library as follows:

- At the command prompt, navigate to the *Drive*:*Path*\SAP\hostctrl\exe directory.
- Run the `sapstartsrv.exe` command.
- In the SAP Service Install/Uninstall dialog box, select **Register COM Typelibrary Only** in the Operation field
- Click **OK**.

**16** Create registry entries for the SAP*SAPSID_No* service.

For example,

| Name | Type | Data |
|---|---|---|
| Default | REG_SZ | value not set |
| EventMessageFile | REG_SZ | \\sappi1scs\sapmnt\PI1\SYS\exe\uc\NTAMD64\sapevents.dll |
| TypesSupported | REG_DWORD | 0x00000007(7) |

**17** If an SAP Microsoft Management Console (MMC) is not configured on the node, register the SAP MMC using the following steps:

- Access the file sapmmcX64u.msi or sapmmcIA64u.msi from Kernel Install DVD depending on the OS architecture.
- Install SAP MMC by executing the msi package.

---

**Note:** Veritas recommends that you cluster the SAP Central Services instances for both ABAP and Java in an Add-In Usage Type in the same service group.

Also, cluster the Enqueue Replication servers for both ABAP and Java in an Add-In Usage Type in a single Service Group.

---

# Creating and adding domain groups and users

If you do not have domain administrator rights, you can perform the SAP instance installation and configuration as a domain user who is a member of the local administrator group.

## User accounts

The SAPInst tool creates the following accounts for the SAP system administrator:

| | |
|---|---|
| *sapsid*adm | This user account is the SAP system administrator account. This account enables interactive administration of the system. |
| SAPService*SID* | This user account is required to start the SAP system. This account has the local user right to log on as a service.<br>This account does not allow interactive logon. You need not set an expiry date for the password. However, you must change the password at the next logon option. |

## Groups

The SAPInst tool creates the following groups during domain installation:

| | |
|---|---|
| SAP_*SAPSID*_GlobalAdmin | This global group is a domain level SAP administration group for organizing SAP system administrators. This global group, groups together the users at the domain level so that they can be placed in appropriate local groups. |
| SAP_*SAPSID*_LocalAdmin | These are local groups created and maintained on an application server. A local group has rights only to the system on which the group is located.<br><br>The system on which the local group is located is part of a particular domain. The local group can contain users and global groups from this domain. |
| SAP_LocalAdmin | Though this group is created on all hosts, creating this group on the transport host is necessary. Members of this group have full control over the transport directory, *drive*:\usr\sap\trans. This directory allows transports to take place between systems.<br><br>The SAP_*SAPSID*_GlobalAdmin groups of all the SAP systems that are part of the transport infrastructure are added to the SAP_LocalAdmin group. Therefore, the *sapsid*adm and SAPService*SAPSID* users of all systems in the transport infrastructure are members of the SAP_LocalAdmin group. These users have the rights necessary to initiate and execute transports. |

## Adding new domain groups and users

This section describes the procedure to add new domain groups and users. You can perform this procedure as a domain administrator only.

**To create the SAP_*SAPSID*_GlobalAdmin Global group**

1. Log in as a domain administrator on to Domain Controller.
2. Click **Start** > **Programs** > **Administrative Tools** > **Active Directory Users and Computers**.

   Alternatively,

   - Click **Start** > **Run**.
   - In the Open field, enter mmc.
   - In the Console window, click **File** > **Add/Remove Snap-in**.
   - In the Add/Remove Snap-in dialog box, click **Add**.

- In the Add Standalone Snap-in dialog box, select **Active Directory Users and Computers**.
- Click **Add**.
- Click **OK**.

3 In the Active Directory Users and Computers dialog box, right-click **Users**, and select **New** > **Group**.

4 In the New Object - Group dialog box, enter the following values:

| | |
|---|---|
| Group Name | SAP_*SAPSID*_GlobalAdmin<br>Specify this value using the exact and correct uppercase and lowercase. |
| Group scope | Global |
| Group type | Security |

5 Click **OK**.

## Creating SAP system users, *sapsid*adm and SAPService*SAPSID*

Follow the steps below to create the SAP system users:

**To create the SAP system users**

1 In the Active Directory Users and Computers dialog box, right-click **Users**, and select **New** > **User**.

2 In the New Object - User dialog box, enter the following values for *sapsid*adm

| | |
|---|---|
| First name | NA |
| Initials | NA |
| Last name | NA |
| Full name | *sapsid*adm |
| User logon name | *sapsid*adm |

3 Click **Next**.

4 Enter the password and confirm the password.

5 Select **Password never expires**.

Ensure that no other option is selected.

6 Click **Next**.

7 Click **Finish**.

## Adding the *sapsid*adm user to the SAP_*SAPSID*_GlobalAdmin Group

**To add the *sapsid*adm user to the SAP_*SAPSID*_GlobalAdmin Group**

1 In the Active Directory Users and Computers dialog box, double-click *sapsid*adm under Users.

2 In the *sapsid*adm Properties dialog box, click **Member** > **Add**.

3 In the Select Groups dialog box, select SAP_*SAPSID*_GlobalAdmin

4 Click **Add**.

---

**Note:** By default, this user is also a member of the Domain Users group.

---

5 Click **OK**.

## To add the SAPService*SAPSID* user to the SAP_*SAPSID*_GlobalAdmin Group

**To add the *SAPSID* service user to the SAP_*SAPSID*_GlobalAdmin Group**

1 In the Active Directory Users and Computers dialog box, double-click SAPService*SAPSID* under Users.

2 In the SAPService*SAPSID* dialog box, click **Member** > **Add**.

3 In the Select Groups dialog box, select SAP_*SAPSID*_GlobalAdmin.

4 Click **Add**.

5 Remove the user from the Domain users group.

- From the Member of list, select SAP_*SAPSID*_GlobalAdmin
- Select Set Primary Group
- Select Domain Users
- Click **Remove** to delete the Domain Users group from the Member of list
- Click **OK**
- Exit the Active Directory Users and Computers dialog box.

# Creating and adding local groups and users

This section describes the procedure to add new local groups and users.

**Note:** This procedure may vary for Windows Server 2008.

**To create a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management dialog box, select **Local Users and Groups**.
3. Right-click **Group**, and select **New Group**.
4. In the New Group dialog box, enter SAP_*SAPSID*_LocalAdmin in the **Group name** field.
5. Click **Add**.
6. In the Select Users, Computers or Groups dialog box, enter *domain*\SAP_*SAPSID*_GlobalAdmin in the Object names field.
7. Click **OK** on the Select Users, Computers, or Groups dialog box.
8. Click **OK** on the New Group dialog box

**To add a domain group to a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management Console, select **Local Users and Groups** >**Groups**.
3. In the right panel, double-click **Administrators**.
4. In the Administrators Properties dialog box, click **Add**.
5. In the Select Users, Computers, or Groups dialog box, enter***domain*\SAP_*SAPSID*_GlobalAdmin** in the Object names field.
6. Click **OK** in the Select Users, Computers, or Groups dialog box.
7. Click **OK** in the Administrators Properties dialog box.

# Creating and adding local groups and users

This section describes the procedure to add new local groups and users.

**To create a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management dialog box, select **Local Users and Groups**.

3 Right-click **Group**, and select **New Group**.

4 In the New Group dialog box, enter SAP_*SAPSID*_LocalAdmin in the **Group name** field.

5 Click **Add**.

6 In the Select Users, Computers or Groups dialog box, enter *domain*\SAP_*SAPSID*_GlobalAdmin in the Object names field.

7 Click **OK** on the Select Users, Computers, or Groups dialog box.

8 Click **OK** on the New Group dialog box

**To add a domain group to a local group**

1 Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.

2 In the Computer Management Console, select **Local Users and Groups** >**Groups**.

3 In the right panel, double-click **Administrators**.

4 In the Administrators Properties dialog box, click **Add**.

5 In the Select Users, Computers, or Groups dialog box, enter***domain*\SAP_*SAPSID*_GlobalAdmin** in the Object names field.

6 Click **OK** in the Select Users, Computers, or Groups dialog box.

7 Click **OK** in the Administrators Properties dialog box.

## Creating sapmnt and saploc share directories

Ensure that the sapmnt and saploc directories are shared, and are accessible by the SAP system Administrator.

**To create the sapmnt and saploc share directories on Windows Server 2008/2012**

1 Right-click the *drive*:\usr\sap directory, and select properties.

2 On the Properties dialog box, click the **Sharing** tab.

3 Click **Advanced Sharing**.

4 Select **Share this folder** option.

5 Enter *sapmnt* in the Share name field.

6 Click **Permissions**.

7 In the Permissions for sapmnt dialog box, ensure that the Administrators and SAP_LocalAdmin user groups have full control for the sapmnt directory.

8 Click **OK** in the Permissions for sapmnt dialog box.

9 In the Properties dialog box, click Advanced Sharing.

10 On the Advanced Sharing dialog box, click **Add**.

11 On the New Share dialog box, enter *saploc* in the Share name field.

12 Click **OK** in the New Share dialog box.

13 Click **Permissions**.

14 In the Permissions for saploc dialog box, ensure that the Administrators and SAP_LocalAdmin user groups have full control for the saploc directory.

15 Click **OK** in the Permissions for saploc dialog box.

16 Click **OK** in the New Share dialog box.

17 Click **OK** in the Advanced Sharing dialog box.

18 Click **Close** in the Properties dialog box.

## Configuring the first node in the cluster

Perform the following tasks on the node on which you installed SAP, the first time.

- Set the SAP Service to manual.
- Create the cluster service group for SAP instance.

**To configure the first node in the cluster**

1 Stop the SAP Central Services Instance.

2 Stop the SAP instance Windows service

`SAP`*`SAPSID_No`*

3 In the instance profile, set the AUTOSTART equal to 0.

4 Configure the SAP*SAPSID_No* service as follows:

- Open services.msc. Click **Start** > **Run** and enter service.msc.
- On the Services panel, right-click the SAP*SAPSID_No* service, and select **Properties**.
- On the General tab, select **Manual** from the Startup type drop-down list.
- Click **OK**.
- Close and exit the Services panel.

## Configuring all other nodes in the cluster

Perform the following tasks on the other remaining cluster nodes:

- Create the required SAP users and groups.
- Set the system and user environment for the SAP system.
- Enter the required port numbers in the Windows services files.
- Install Host Agent using sapinst.exe.
- Create the Windows service for the SAP instance.

**To configure all other nodes in the cluster**

1. Log in as a domain administrator.
2. Create the following local groups.
   - SAP_*SAPSID*_LocalAdmin
   - SAP_SAP_LocalAdmin
   - SAP_LocalAdmin
3. Add the SAP_*SAPSID*_GlobalAdmin domain group to the SAP_*SAPSID*_LocalAdmin and SAP_LocalAdmin group.
4. Add the SAP_SAP_GlobalAdmin domain group to the SAP_SAP_LocalAdmin and SAP_LocalAdmin
5. Add the SAP_*SAPSID*_GlobalAdmin and SAP_SAP_GlobalAdmin domain group to the local Administrators group.

   For details on creating and adding a new local group and users:

   See "Creating and adding local groups and users" on page 66.
6. Click **Start** > **Programs** > **Administrative Tools** > **Local Security Policy** > **Local Policies** > **User Right Assignment**.
7. Add the following privileges for the *sapsid*adm user.
   - Act as a part of the Operating System (SeTcbPrivilege)
   - Replace a process-level token (SeAssignPrimaryTokenPrivilege)
   - Adjust memory quotas for a process (SeIncreaseQuotaPrivilege)
8. Add the following privileges for the SAPService*SAPSID* user.
   - Log on as a Service (SeServiceLogonRight).
   - Adjust memory quotas for a process (SeIncreaseQuotaPrivilege)
   - Access this computer from the network (SeNetworkLogonRight)
   - Deny Log on Locally and Deny Log on through Terminal Services (SeDenyInteractiveLogOnRight)

**9** Change the *sapsid*adm user environment as follows:

- At the command prompt enter,
  `runas /profile /user:`*`domain`*`\`*`sapsid`*`adm regedit`
- On the Registry Editor panel, click **HKEY_CURRENT_USER** > **Environment**.
- Modify the user environment based on your Database, SAP Usage Type and SAPSID.

For example, the following table depicts the registry environment with Oracle database (PI1) and Add-In installation with SAPSID PI1.

| Name | Type | Data |
|---|---|---|
| Default | REG_SZ | value not set |
| DBMS_TYPE | REG_SZ | ora |
| dbs_ora_schema | REG_SZ | SAPSR3 |
| dbs_ora_tnsname | REG_SZ | PI1 |
| JAVA_HOME | REG_SZ | C:\j2sdk1.4.2_19-x64 |
| NLS_LANG | REG_SZ | AMERICAN_AMERICA.UTF8 |
| ORACLE_HOME | REG_EXPAND_SZ | E:\oracle\PI1\102 |
| ORACLE_SID | REG_EXPAND_SZ | PI1 |
| PATH | REG_EXPAND_SZ | E:\usr\sap\PI1\SYS\exe\uc\NTAMD64;\<br>\sappi1scs\sapmnt\PI1\SYS\exe\uc\NTAMD64;<br>E:\oracle\PI1\102\BIN |
| SAPDATA_HOME | REG_EXPAND_SZ | E:\oracle\PI1 |
| SAPEXE | REG_SZ | \\sapi1scs\sapmnt\PI1\SYS\exe\uc\NTAMD64 |
| SAPLOCALHOST | REG_SZ | sappi1aas |
| SAPSYSTEMNAME | REG_SZ | PI1 |
| TEMP | REG_EXPAND_SZ | E:\usr\sap\PI1\tmp |
| TMP | REG_EXPAND_SZ | E:\usr\sap\PI1\tmp |
| TNS_ADMIN | REG_EXPAND_SZ | \\sappi1scs\sapmnt\PI1\SYS\profile\oracle |

**10** From the first node in the cluster, copy the following service entries for the SAP instance, from the services file in the `%windir%\system32\drivers\etc` directory to the corresponding services file on all other nodes in the cluster.

```
sapdp<No.>      32<No.>/tcp   # SAP System Dispatcher Port
sapdp<No.>s     47<No.>/tcp   # SAP System Dispatcher Security Port
sapgw<No.>      33<No.>/tcp   # SAP System Gateway Port
sapgw<No.>s     48<No.>/tcp   # SAP System Gateway Security Port
sapms<SAPSID>   36<No.>/tcp   # SAP System Message Port Number
```

where,

The value for <*No.*> is the value of an Instance ID.

**11** Move the Service Group from the first node to the node that you are currently configuring and ensure that the *drive*`:\usr\sap` directory is shared with the names, `sapmnt` and `saploc`.

See "Creating sapmnt and saploc share directories" on page 68.

**12** Install SAP Host Agent with SAPInst. Follow the steps below to install the SAP Host agent.

- In the Master DVD, navigate to the directory containing the sapinst.exe tool.
- Double-click the sapinst.exe file to launch the SAP installation GUI.
- Select **High Availability System** > **Based on [AS ABAP/AS Java/AS ABAP and AS Java]** > **Host Agent** based on the usage type of system you installed.
- Follow the instructions to complete the installation.

**13** Create the SAP*SAPSID_No* service as follows:

- At the command prompt, navigate to the *drive*`:\usr\sap\`*SAPSID*`\`*InstName*`\exe` directory.
- Run the `sapstartsrv.exe` command.
- In the SAP Service Install/Uninstall dialog box, enter the following values:

| | |
|---|---|
| SID | *SAPSID* |
| NR | *InstanceNumber* |

| | |
|---|---|
| Profile | If, SAPLOCALHOST=SAPGLOBALHOST, then enter the value as:<br>`drive:\usr\sap\SAPSID\SYS\profile\SAPSID_InstName_VirtualHostName`<br>If, SAPLOCALHOST is not equal to SAPGLOBALHOST, then enter the value as:<br>`\\SAPGLOBALHOST\sapmnt\SAPSID\SYS\profile\SAPSID_InstName_VirtualHostName` |
| User | *domain*\SAPService*SAPSID* |
| Password | *SAPServiceSAPSID password* |
| Startup type | manual |
| Use Environment of User | *domain**sapsid*adm |

**14** Click **OK**.

**15** Re-register the type library as follows:

- At the command prompt, navigate to the *Drive*:*Path*\SAP\hostctrl\exe directory.
- Run the `sapstartsrv.exe` command.
- In the SAP Service Install/Uninstall dialog box, select **Register COM Typelibrary Only** in the Operation field
- Click **OK**.

**16** Create registry entries for the SAP*SAPSID_No* service.

For example,

| Name | Type | Data |
|---|---|---|
| Default | REG_SZ | value not set |
| EventMessageFile | REG_SZ | \\sappi1scs\sapmnt\PI1\SYS\exe\uc\NTAMD64\sapevents.dll |
| TypesSupported | REG_DWORD | 0x00000007(7) |

**17** If an SAP Microsoft Management Console (MMC) is not configured on the node, register the SAP MMC using the following steps:

- Access the file sapmmcX64u.msi or sapmmcIA64u.msi from Kernel Install DVD depending on the OS architecture.
- Install SAP MMC by executing the msi package.

---

**Note:** Veritas recommends that you cluster the SAP Central Services instances for both ABAP and Java in an Add-In Usage Type in the same service group.

Also, cluster the Enqueue Replication servers for both ABAP and Java in an Add-In Usage Type in a single Service Group.

---

# Creating and adding domain groups and users

If you do not have domain administrator rights, you can perform the SAP instance installation and configuration as a domain user who is a member of the local administrator group.

## User accounts

The SAPInst tool creates the following accounts for the SAP system administrator:

| | |
|---|---|
| *sapsid*adm | This user account is the SAP system administrator account. This account enables interactive administration of the system. |
| SAPService*SID* | This user account is required to start the SAP system. This account has the local user right to log on as a service.<br>This account does not allow interactive logon. You need not set an expiry date for the password. However, you must change the password at the next logon option. |

## Groups

The SAPInst tool creates the following groups during domain installation:

| | |
|---|---|
| SAP_*SAPSID*_GlobalAdmin | This global group is a domain level SAP administration group for organizing SAP system administrators. This global group, groups together the users at the domain level so that they can be placed in appropriate local groups. |
| SAP_*SAPSID*_LocalAdmin | These are local groups created and maintained on an application server. A local group has rights only to the system on which the group is located.<br><br>The system on which the local group is located is part of a particular domain. The local group can contain users and global groups from this domain. |
| SAP_LocalAdmin | Though this group is created on all hosts, creating this group on the transport host is necessary. Members of this group have full control over the transport directory, *drive*:\usr\sap\trans. This directory allows transports to take place between systems.<br><br>The SAP_*SAPSID*_GlobalAdmin groups of all the SAP systems that are part of the transport infrastructure are added to the SAP_LocalAdmin group. Therefore, the *sapsid*adm and SAPService*SAPSID* users of all systems in the transport infrastructure are members of the SAP_LocalAdmin group. These users have the rights necessary to initiate and execute transports. |

## Adding new domain groups and users

This section describes the procedure to add new domain groups and users. You can perform this procedure as a domain administrator only.

**To create the SAP_*SAPSID*_GlobalAdmin Global group**

1. Log in as a domain administrator on to Domain Controller.
2. Click **Start** > **Programs** > **Administrative Tools** > **Active Directory Users and Computers**.

   Alternatively,

   - Click **Start** > **Run**.
   - In the Open field, enter mmc.
   - In the Console window, click **File** > **Add/Remove Snap-in**.
   - In the Add/Remove Snap-in dialog box, click **Add**.

- In the Add Standalone Snap-in dialog box, select **Active Directory Users and Computers**.
- Click **Add**.
- Click **OK**.

3 In the Active Directory Users and Computers dialog box, right-click **Users**, and select **New** > **Group**.

4 In the New Object - Group dialog box, enter the following values:

| | |
|---|---|
| Group Name | SAP_*SAPSID*_GlobalAdmin<br>Specify this value using the exact and correct uppercase and lowercase. |
| Group scope | Global |
| Group type | Security |

5 Click **OK**.

## Creating SAP system users, *sapsid*adm and SAPService*SAPSID*

Follow the steps below to create the SAP system users:

**To create the SAP system users**

1 In the Active Directory Users and Computers dialog box, right-click **Users**, and select **New** > **User**.

2 In the New Object - User dialog box, enter the following values for *sapsid*adm

| | |
|---|---|
| First name | NA |
| Initials | NA |
| Last name | NA |
| Full name | *sapsid*adm |
| User logon name | *sapsid*adm |

3 Click **Next**.

4 Enter the password and confirm the password.

5 Select **Password never expires**.

Ensure that no other option is selected.

6 Click **Next**.

7 Click **Finish**.

## Adding the *sapsid*adm user to the SAP_*SAPSID*_GlobalAdmin Group

**To add the *sapsid*adm user to the SAP_*SAPSID*_GlobalAdmin Group**

1 In the Active Directory Users and Computers dialog box, double-click *sapsid*adm under Users.

2 In the *sapsid*adm Properties dialog box, click **Member** > **Add**.

3 In the Select Groups dialog box, select SAP_*SAPSID*_GlobalAdmin

4 Click **Add**.

---

**Note:** By default, this user is also a member of the Domain Users group.

---

5 Click **OK**.

## To add the SAPService*SAPSID* user to the SAP_*SAPSID*_GlobalAdmin Group

**To add the *SAPSID* service user to the SAP_*SAPSID*_GlobalAdmin Group**

1 In the Active Directory Users and Computers dialog box, double-click SAPService*SAPSID* under Users.

2 In the SAPService*SAPSID* dialog box, click **Member** > **Add**.

3 In the Select Groups dialog box, select SAP_*SAPSID*_GlobalAdmin.

4 Click **Add**.

5 Remove the user from the Domain users group.

- From the Member of list, select SAP_*SAPSID*_GlobalAdmin
- Select Set Primary Group
- Select Domain Users
- Click **Remove** to delete the Domain Users group from the Member of list
- Click **OK**
- Exit the Active Directory Users and Computers dialog box.

## User accounts

The SAPInst tool creates the following accounts for the SAP system administrator:

| | |
|---|---|
| *sapsid*adm | This user account is the SAP system administrator account. This account enables interactive administration of the system. |
| SAPService*SID* | This user account is required to start the SAP system. This account has the local user right to log on as a service.<br>This account does not allow interactive logon. You need not set an expiry date for the password. However, you must change the password at the next logon option. |

## Groups

The SAPInst tool creates the following groups during domain installation:

| | |
|---|---|
| SAP_*SAPSID*_GlobalAdmin | This global group is a domain level SAP administration group for organizing SAP system administrators. This global group, groups together the users at the domain level so that they can be placed in appropriate local groups. |
| SAP_*SAPSID*_LocalAdmin | These are local groups created and maintained on an application server. A local group has rights only to the system on which the group is located.<br>The system on which the local group is located is part of a particular domain. The local group can contain users and global groups from this domain. |
| SAP_LocalAdmin | Though this group is created on all hosts, creating this group on the transport host is necessary. Members of this group have full control over the transport directory, *drive*:\usr\sap\trans. This directory allows transports to take place between systems.<br>The SAP_*SAPSID*_GlobalAdmin groups of all the SAP systems that are part of the transport infrastructure are added to the SAP_LocalAdmin group. Therefore, the *sapsid*adm and SAPService*SAPSID* users of all systems in the transport infrastructure are members of the SAP_LocalAdmin group. These users have the rights necessary to initiate and execute transports. |

## Adding new domain groups and users

This section describes the procedure to add new domain groups and users. You can perform this procedure as a domain administrator only.

**To create the SAP_*SAPSID*_GlobalAdmin Global group**

1. Log in as a domain administrator on to Domain Controller.
2. Click **Start** > **Programs** > **Administrative Tools** > **Active Directory Users and Computers**.

   Alternatively,

   - Click **Start** > **Run**.
   - In the Open field, enter mmc.
   - In the Console window, click **File** > **Add/Remove Snap-in**.
   - In the Add/Remove Snap-in dialog box, click **Add**.
   - In the Add Standalone Snap-in dialog box, select **Active Directory Users and Computers**.
   - Click **Add**.
   - Click **OK**.
3. In the Active Directory Users and Computers dialog box, right-click **Users**, and select **New** > **Group**.
4. In the New Object - Group dialog box, enter the following values:

| | |
|---|---|
| Group Name | SAP_*SAPSID*_GlobalAdmin<br>Specify this value using the exact and correct uppercase and lowercase. |
| Group scope | Global |
| Group type | Security |

5. Click **OK**.

## Creating SAP system users, *sapsid*adm and SAPService*SAPSID*

Follow the steps below to create the SAP system users:

**To create the SAP system users**

1. In the Active Directory Users and Computers dialog box, right-click **Users**, and select **New** > **User**.
2. In the New Object - User dialog box, enter the following values for *sapsid*adm

| | |
|---|---|
| First name | NA |
| Initials | NA |
| Last name | NA |
| Full name | *sapsid*adm |
| User logon name | *sapsid*adm |

3. Click **Next**.
4. Enter the password and confirm the password.
5. Select **Password never expires**.

   Ensure that no other option is selected.
6. Click **Next**.
7. Click **Finish**.

## Adding the *sapsid*adm user to the SAP_*SAPSID*_GlobalAdmin Group

**To add the *sapsid*adm user to the SAP_*SAPSID*_GlobalAdmin Group**

1. In the Active Directory Users and Computers dialog box, double-click *sapsid*adm under Users.
2. In the *sapsid*adm Properties dialog box, click **Member** > **Add**.
3. In the Select Groups dialog box, select SAP_*SAPSID*_GlobalAdmin
4. Click **Add**.

   **Note:** By default, this user is also a member of the Domain Users group.

5. Click **OK**.

### To add the SAPService*SAPSID* user to the SAP_*SAPSID*_GlobalAdmin Group

**To add the *SAPSID* service user to the SAP_*SAPSID*_GlobalAdmin Group**

1. In the Active Directory Users and Computers dialog box, double-click SAPService*SAPSID* under Users.
2. In the SAPService*SAPSID* dialog box, click **Member** > **Add**.
3. In the Select Groups dialog box, select SAP_*SAPSID*_GlobalAdmin.
4. Click **Add**.
5. Remove the user from the Domain users group.
   - From the Member of list, select SAP_*SAPSID*_GlobalAdmin
   - Select Set Primary Group
   - Select Domain Users
   - Click **Remove** to delete the Domain Users group from the Member of list
   - Click **OK**
   - Exit the Active Directory Users and Computers dialog box.

## Creating and adding local groups and users

This section describes the procedure to add new local groups and users.

---

**Note:** This procedure may vary for Windows Server 2008.

---

**To create a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management dialog box, select **Local Users and Groups**.
3. Right-click **Group**, and select **New Group**.
4. In the New Group dialog box, enter SAP_*SAPSID*_LocalAdmin in the **Group name** field.
5. Click **Add**.
6. In the Select Users, Computers or Groups dialog box, enter *domain*\SAP_*SAPSID*_GlobalAdmin in the Object names field.
7. Click **OK** on the Select Users, Computers, or Groups dialog box.
8. Click **OK** on the New Group dialog box

**To add a domain group to a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management Console, select **Local Users and Groups** >**Groups**.
3. In the right panel, double-click **Administrators**.
4. In the Administrators Properties dialog box, click **Add**.
5. In the Select Users, Computers, or Groups dialog box, enter***domain*\SAP_*SAPSID*_GlobalAdmin** in the Object names field.
6. Click **OK** in the Select Users, Computers, or Groups dialog box.
7. Click **OK** in the Administrators Properties dialog box.

## Creating and adding local groups and users

This section describes the procedure to add new local groups and users.

**To create a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management dialog box, select **Local Users and Groups**.
3. Right-click **Group**, and select **New Group**.
4. In the New Group dialog box, enter SAP_*SAPSID*_LocalAdmin in the **Group name** field.
5. Click **Add**.
6. In the Select Users, Computers or Groups dialog box, enter *domain*\SAP_*SAPSID*_GlobalAdmin in the Object names field.
7. Click **OK** on the Select Users, Computers, or Groups dialog box.
8. Click **OK** on the New Group dialog box

**To add a domain group to a local group**

1. Click **Start** > **ControlPanel** > **Administrative tools** > **Computer Management**.
2. In the Computer Management Console, select **Local Users and Groups** >**Groups**.
3. In the right panel, double-click **Administrators**.
4. In the Administrators Properties dialog box, click **Add**.
5. In the Select Users, Computers, or Groups dialog box, enter***domain*\SAP_*SAPSID*_GlobalAdmin** in the Object names field.

6 Click **OK** in the Select Users, Computers, or Groups dialog box.

7 Click **OK** in the Administrators Properties dialog box.

## Creating sapmnt and saploc share directories

Ensure that the sapmnt and saploc directories are shared, and are accessible by the SAP system Administrator.

**To create the sapmnt and saploc share directories on Windows Server 2008/2012**

1 Right-click the *drive*:\usr\sap directory, and select properties.

2 On the Properties dialog box, click the **Sharing** tab.

3 Click **Advanced Sharing**.

4 Select **Share this folder** option.

5 Enter *sapmnt* in the Share name field.

6 Click **Permissions**.

7 In the Permissions for sapmnt dialog box, ensure that the Administrators and SAP_LocalAdmin user groups have full control for the sapmnt directory.

8 Click **OK** in the Permissions for sapmnt dialog box.

9 In the Properties dialog box, click Advanced Sharing.

10 On the Advanced Sharing dialog box, click **Add**.

11 On the New Share dialog box, enter *saploc* in the Share name field.

12 Click **OK** in the New Share dialog box.

13 Click **Permissions**.

14 In the Permissions for saploc dialog box, ensure that the Administrators and SAP_LocalAdmin user groups have full control for the saploc directory.

15 Click **OK** in the Permissions for saploc dialog box.

16 Click **OK** in the New Share dialog box.

17 Click **OK** in the Advanced Sharing dialog box.

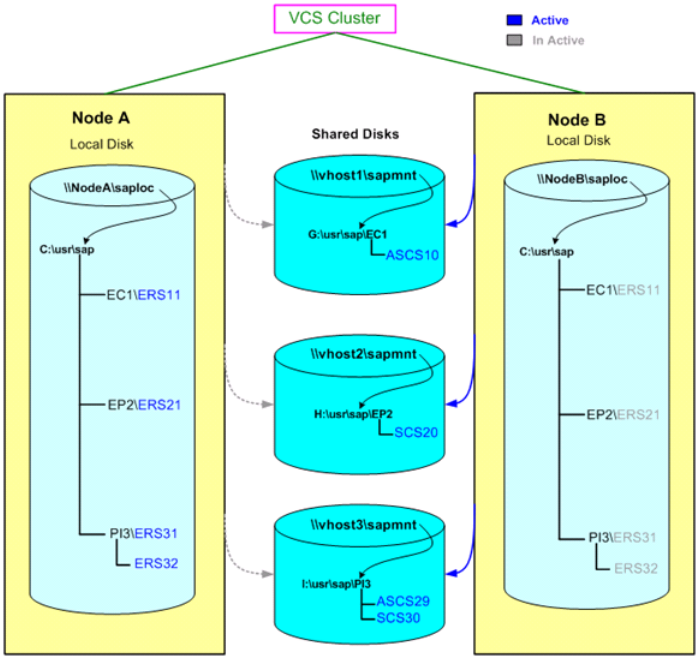
18 Click **Close** in the Properties dialog box.

# Configuring the SAP systems on Windows Server 2008/2012

On Windows Server 2008/2012, you can only access file shares pointing to local disks with the physical computer name. To be able to define file shares pointing to shared disks, a “client access point” (one IP address associated with one network name cluster resource) must already exist in the failover cluster service group to which the shared disk belongs. Since you can only access file shares pointing to shared disks with the network name that belongs to the same failover cluster service group, you can create multiple file shares with the same file share name (for example, sapmnt) in a failover cluster environment, assuming the file shares belong to different cluster service groups.

Figure 2-1 shows a typical SAP system installation on a Windows Server 2008/2012 system under VCS environment.

**Figure 2-1** Typical SAP system installation (using multiple sapmnt file shares) on a Windows Server 2008/2012 system under VCS environment




For sample service group configurations on Windows Server 2008/2012,

See “Sample service group configurations for SAP systems on Windows Server 2008/2012” on page 112.

Section 2

# Configuring the application for high availability


- Chapter 3. Configuring the application in a physical environment
- Chapter 4. Configuring the application in a VMware environment
- Chapter 5. Optional configuration tasks for the SAP Web Application Server agent

Chapter 3

# Configuring the application in a physical environment

This chapter includes the following topics:


- Overview
- Before configuring the service groups for SAP Web Application Server
- Configuring service groups with the SAP Web Application Server agent
- Configuring the SAPWebAS preonline script


## Overview

To provide high availability for SAP NetWeaver 7.1, 7.3 and 7.4 components in a physical environment, you must perform the following tasks:

1. Review and configure the attributes of the agent for SAP Web Application Server. See "Agent attributes for SAP Web Application Server" on page 22.
2. Create and configure service groups.

   You must have administrator privileges to create and configure a service group. You can configure the service groups using one of the following:

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

   See "Configuring service groups with the SAP Web Application Server agent" on page 72.

# Before configuring the service groups for SAP Web Application Server

Before you configure the SAP Web Application Server service group, you must perform the following:

- Verify that VCS is installed and configured on all nodes in the cluster where you will configure the service group.
  Refer to the product installation guide for more information on installing and configuring VCS.
- See "About installing SAP Web Application Server for high availability" on page 31.
  See "About configuring SAP Web Application Server for high availability" on page 31.
- Verify that the Cluster Server agent for SAP Web Application Server is installed on all nodes in the cluster.

# Configuring service groups with the SAP Web Application Server agent

While setting up a cluster, you must always ensure that the cluster has some spare capacity to handle the SAP NetWeaver failover scenarios. For example, in case of a back-end database failure, the cluster must be able to run another database instance in conjunction with other running applications. Review the information about data protection.

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

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

**To configure the service groups**

1. Change the cluster configuration to read/write mode.

   ```
   C:\> haconf -makerw
   ```

2. Create a service group for SAP NetWeaver

   ```
   C:\> hagrp -add SAP710-PI1SCS
   ```

3. Modify the SystemList attribute for the group, to add systems.

   ```
   C:\> hagrp -modify SAP710-PI1SCS SystemList vcswin74 0 vcswin75
   1
   ```

4. Create resources for NIC, IP, Lanman,VMDg, and MountV in the service group.

   ```
   C:\> hares -add SAP710-PI1SCS_nic NIC SAP710-PI1SCS

   C:\> hares -add SAP710-PI1SCS_ip IP SAP710-PI1SCS

   C:\> hares -add SAP710-PI1SCS_lanman Lanman SAP710-PI1SCS

   C:\> hares -add SAP710-PI1SCS_mnt MountV SAP710-PI1SCS

   C:\> hares -add SAP710-PI1SCS_vmdg VMDg SAP710-PI1SCS
   ```

   For more details on creating and modifying resource attributes for NIC, IP, Lanman, VMDg and MountV refer to *Cluster Server Bundled Agents Reference Guide*.

5. Create links between the resources.

   ```
   C:\> hares -link SAP710-PI1SCS_ip SAP710-PI1SCS_nic

   C:\> hares -link SAP710-PI1SCS_lanman SAP710-PI1SCS_ip

   C:\> hares -link SAP710-PI1SCS_mnt SAP710-PI1SCS_vmdg
   ```

6. Create SAPWebAS resource for applications based on SAP NetWeaver

   ```
   C:\> hares -add SAP710-PI1SCS_scs SAPWebAS SAP710-PI1SCS
   ```

   Based on the SAP instance you are clustering, modify the resource attributes.

   See "Agent attributes for SAP Web Application Server" on page 22.

7. Create resource dependencies for SAPWebAS resource.

   The SAPWebAS resource depends on the Lanman and MountV resources.

   ```
   C:\> hares -link SAP710-PI1SCS_scs SAP710-PI1SCS_lanman

   C:\> hares -link SAP710-PI1SCS_scs SAP710-PI1SCS_mnt
   ```

**8** Verify the final resource dependencies for SAP server group.

```
   Group              Parent                 Child
SAP710-PI1SCS    SAP710-PI1SCS_scs      SAP710-PI1SCS_lanman
SAP710-PI1SCS    SAP710-PI1SCS_scs      SAP710-PI1SCS_mnt
SAP710-PI1SCS    SAP710-PI1SCS_ip       SAP710-PI1SCS_nic
SAP710-PI1SCS    SAP710-PI1SCS_lanman   SAP710-PI1SCS_ip
SAP710-PI1SCS    SAP710-PI1SCS_mnt      SAP710-PI1SCS_vmdg
```

**9** Save the cluster configuration.

```
C:\> haconf -dump -makero
```

# Configuring the SAPWebAS preonline script

In a clustered environment, the SAP administrator installs and configures SAP Enqueue and SAP Enqueue Replication Server. SAP Enqueue and Enqueue Replication Server have the following requisites:

- If an Enqueue server instance fails, the server must fail over to the node on which the Enqueue Replication Server instance is running.
- If the Enqueue Replication Server instance fails, the instance must fail over to a node on which Enqueue Server is NOT running.

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

The SAPWebAS 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 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.

The VCS preonline trigger calls an external preonline trigger utility—sapwebaspreonline.exe. The initiated preonline trigger performs the steps necessary for correct failover behavior of the Enqueue servers. The sapwebaspreonline.exe utility is located in the `%VCS_HOME%\bin\SAPWebAS` directory.

**To configure SAPWebAS preonline script**

1. Go to the `%VCS_HOME%\bin\Trigger` directory.
2. Skip this step if the preonline file exists in this directory.

   If the preonline file does not exist, copy the sample preonline trigger file from the `%VCS_HOME%\bin\Sample_Triggers directory` to the `%VCS_HOME%\bin\Triggers` directory, rename the file to preonline, and then use this file.

**3** Add the following lines to the preonline file:

```
#---------------------------------------------------------------
# Start sapwebas preonline trigger.
#---------------------------------------------------------------
# Perl preonline.pl <system> <group> <whyonlining>
<systemwheregroupfaulted>
my $system = $ARGV[0];
my $group = $ARGV[1];
my $whyonlining = $ARGV[2];
my $systemwheregroupfaulted = undef;
my $sArgs = join(' ', @ARGV);
VCSAG_LOG_MSG("I", "Arguments [$sArgs]", 15041);
if(defined $ARGV[3]) {
 $systemwheregroupfaulted = $ARGV[3];
}
my $SAPWebASPreOnlineTrigger = sprintf("%s\\bin\\SAPWebAS\\
sapwebaspreonline.exe", $vcs_home);
VCSAG_LOG_MSG("I",
"The trigger command is [$SAPPreOnlineTrigger]", 15041);
if(defined $systemwheregroupfaulted)
{
 VCSAG_LOG_MSG("I", "The group is faulted on syetem =
[$systemwheregroupfaulted]", 15042);
 $CMD = sprintf("\"%s\" %s %s %s %s", $SAPWebASPreOnlineTrigger,
 $system, $group, $whyonlining, $systemwheregroupfaulted);
}
else {
 $CMD = sprintf("\"%s\" %s %s %s", $SAPWebASPreOnlineTrigger,
 $system, $group, $whyonlining);
}
system($CMD);
my $exit_value = $? >> 8;
VCSAG_LOG_MSG("I", "The exit code from the trigger: [$exit_value].",
 15046, $exit_value);
if($exit_value == 0) {
 VCSAG_LOG_MSG("I", "The PreOnline Trigger for SAP executed
successfully.", 15046);
 exit;
}
elsif($exit_value == 1) {
 VCSAG_LOG_MSG("I", "The PreOnline Trigger for SAP FAILED.", 15047);
 exit;
```

```
}
else {
 VCSAG_LOG_MSG("I", "Unknown PreOnline trigger.", 15048);
}
#-------------------------------------------------------------
# End sapwebas preonline trigger.
#-------------------------------------------------------------
.
.
# give control back to HAD.
if (defined $ARGV[3]) {
 `\"$vcs_home\\bin\\hagrp\" -online -nopre $ARGV[1] -sys $ARGV[0]
-checkpartial $ARGV[3]`;
 exit;
}

`\"$vcs_home\\bin\\hagrp\" -online -nopre $ARGV[1] -sys $ARGV[0]`;
exit;
```

**4** Use the following command to set the preonline trigger attribute to true for the Service Groups to which the Enqueue and Enqueue Replication server instances belongs:

```
C:\> hagrp -modify service_group PreOnline 1 -sys system
```

The preonline script is now configured to facilitate Enqueue and Enqueue Replication server behavior. You can view the logs in the VCS engine log, engine_A.log.

---

**Note:** Once the preonline trigger is configured, you may see unexpected behavior while manually switching or performing online operations on the Enqueue Replication service group. This behavior is a result of the control logic within the preonline trigger that protects the Enqueue lock table. For system maintenance, if you prefer to perform manual operations on the service groups, you can do so by disabling the preonline trigger.

To disable the preonline trigger, use the following command:

C:\> hagrp -modify service_group PreOnline 0 -sys system

---

Chapter 4

# Configuring the application in a VMware environment

This chapter includes the following topics:


- About configuring application monitoring with Veritas High Availability solution for VMware
- Configuring application monitoring for SAP Web Application Server


## About configuring application monitoring with Veritas High Availability solution for VMware

Consider the following before you proceed:

- You can configure application monitoring on a virtual machine using the Veritas High Availability Configuration Wizard for VMware. The wizard is launched when you click **Configure application for high availability** on the Veritas High Availability tab in VMware vSphere Client.
  Apart from the Veritas High Availability Configuration Wizard, you can also configure application monitoring using the Cluster Server (VCS) commands. For more information, refer to the *Cluster Server Administrator's Guide*.
- Veritas recommends that you first configure application monitoring using the wizard before using VCS commands to add additional components or modify the existing configuration.
  Apart from the application monitoring configuration, the wizard also sets up the other components required for successful application monitoring.
- In case the VMwareDisks agent resource is configured manually, care should be taken not to add the operating system disk in the configuration. The

VMwareDisks agent does not block this operation. This might lead to a system crash during failover.

- If VMware vMotion is triggered at the same time as an application fails over, the VMwareDisks resource may either fail to go offline or may report an unknown status. The resource will eventually failover and report online after the vMotion is successful and the application is online on the target system.
- VMware snapshot operations may fail if VMwareDisks agent is configured for a physical RDM type of disk. Currently only virtual RDM disks are supported.
- Non-shared disks partitioned using GUID Partition Table (GPT) are not supported. Currently only Master Boot Record (MBR) partition is supported.
- VMwareDisks agent does not support disks attached to the virtual machine using IDE controllers. The agent resource reports an unknown if IDE type of disks are configured.
- In case VMware HA is disabled and the ESX itself faults, VCS moves the application to the target failover system on another ESX host. VMwareDisks agent registers the faulted system on the new ESX host. When you try to power on the faulted system, you may see the following message in the vSphere Client:

  ```
  This virtual machine might have been moved or copied.
  In order to configure certain management and networking features,
  VMware ESX needs to know if this virtual machine was moved or copied.
  If you don't know, answer "I copied it".
  ```

  You must select “I moved it” (instead of the default “I copied it”) on this message prompt.
- You must not restore a snapshot on a virtual machine where an application is currently online, if the snapshot was taken when the application was offline on that virtual machine. Doing this may cause an unwanted fail over.
  This also applies in the reverse scenario; you should not restore a snapshot where the application was online on a virtual machine, where the application is currently offline. This may lead to a misconfiguration where the application is online on multiple systems simultaneously.
- If you want to suspend a system on which an application is currently online, then you must first switch the application to a failover target system.
  If you suspend the system without switching the application, then VCS moves the disks along with the application to another system.
  Later, when you try to restore the suspended system, VMware does not allow the operation because the disks that were attached before the system was suspended are no longer with the system.

- While creating a VCS cluster in a virtual environment, you must configure one of the cluster communication link over a public adapter in addition to the link configured over a private adapter. To have less VCS cluster communication over the link using the public adapter, you may assign it low priority. This keeps the VCS cluster communication intact even if the private network adapters fail. If the cluster communication is configured over the private adapters only, the cluster systems may fail to communicate with each other in case of network failure. In this scenario, each system considers that the other system has faulted, and then try to gain access to the disks, thereby leading to an application fault.
- VMware Fault Tolerance does not support adding or removing of non-shared disks between virtual machines. During a failover, disks that contain application data cannot be moved to alternate failover systems. Applications that are being monitored thus cannot be brought online on the failover systems.
- For cluster communication, you must not select the teamed network adapter or the independently listed adapters that are a part of the teamed NIC.
  A teamed network adapter is a logical NIC, formed by grouping several physical NICs together. All NICs in a team have an identical MAC address, due to which you may experience the following issues:
  - SSO configuration failure
  - The application monitoring configuration wizard may fail to discover the specified network adapters
  - The application monitoring configuration wizard may fail to discover/validate the specified system name

# Configuring application monitoring for SAP Web Application Server

Configuring an application for high availability involves the following tasks:

1. Configuring the VCS cluster

   This task involves selecting the virtual machines on which you want to configure monitoring and setting up the network communication links between the selected virtual machines.

   See “Configuring the VCS cluster” on page 81.

2. Configuring the application

   This task involves configuring the application in one of the following modes:

   - Start/stop mode on a single system: In the event of a failure, the application is restarted on a virtual machine for a configured number of times.

- Failover mode on multiple systems: In the event of a failure, the application is first restarted on a virtual machine for a configured number of times. If the application does not restart, the virtual machine fails over to another ESX host.

  When configuring an application in the failover mode, you need to select the ESX hosts where the virtual machines can fail over.

See "Configuring the application" on page 84.

# Configuring the VCS cluster

VCS cluster configuration involves selecting the virtual machines on which you want to configure high availability and setting up the network communication links between the selected virtual machines.

**To configure the VCS cluster**

1. Launch the vSphere Client and connect to the vCenter Server that manages the virtual machine. On the Inventory view of the vCenter Server, in the left pane, select the virtual machine where you want to configure application monitoring. Then, in the right pane, select the Veritas High Availability tab.
2. Skip this step if you have already configured the single sign-on during the guest installation.

   On the Veritas High Availability view, specify the credentials of a user account that has administrative privileges on the system and then click **Configure**.

   The single sign-on configuration enables the Veritas High Availability Console to set up a permanent authentication for the user account. After the authentication is successful, the Veritas High Availability view refreshes and displays the link to configure the VCS cluster.
3. On the Veritas High Availability view, click **Configure a VCS Cluster**. This launches the VCS cluster configuration wizard. Unless you configure a cluster, you cannot configure an application for monitoring.
4. On the Welcome panel, review the pre-requisites and then click **Next**.

**5** On the Configuration Inputs panel, specify the systems for the VCS cluster operations and the user account details for each system.

---

**Note:** The specified user account must have administrative privileges on the system.

---

The **Cluster systems** lists the systems that are included in the cluster configuration. The local system is selected by default.

To add more systems, click **Add System** and then on the Add System dialog box, specify the following details of the system that you want to add to the VCS cluster.

| | |
|---|---|
| System Name or IP address | Specify the name or IP address of the system that you want to add to the VCS cluster. |
| User name | Specify the user account for the system. The user name must be in the domain.com\username.<br>**Note:** The specified user must be a domain user having administrative privileges on all the selected system. |
| Password | Specify the password for the user account mentioned. |
| Use the specified user account on all systems | Uses the specified user account on all the cluster systems. This option is selected by default. |

The wizard validates the system details and then adds the system to VCS cluster system list.

**6** Skip this step if you do not want to modify the default security settings for your cluster.

To modify the security settings for the cluster, on the Configuration Inputs panel, click **Advanced Settings** . In the Advanced settings dialog box, specify the following details and then click **OK**.

| | |
|---|---|
| Use Single Sign-on | Select to configure single sign-on using VCS Authentication Service for cluster communication.<br>This option is enabled by default. |
| Use VCS user privileges | Select to configure a user with administrative privileges to the cluster.<br>Specify the user name and password and click **OK**. |

**7** On the Network Details panel, select the type of communication for the VCS cluster and then select the adapters to configure the communication links.

Depending on the network over which you want to configure the links, select:

- **Use MAC address for cluster communication (LLT over Ethernet)** : The LLT over Ethernet communication configures the links over the non-routed network. Choose this mode only if the failover target systems reside in the same subnet.
- **Use IP address for cluster communication (LLT over UDP)**: The LLT over UDP communication configures the links over the routed network. You can choose this mode regardless of whether the failover target systems reside in the same subnet or in different subnets. You can select only those adapters that have an IP address.

You must select a minimum of two adapters per system.

Veritas recommends the following:

- IP addresses that are assigned to the selected adapters should be in different subnets.
- One of the network adapters must be a public adapter. You may assign low priority to the VCS cluster communication link that uses the public adapter.

| | |
|---|---|
| Network Adapter | Select a network adapter for the communication links.<br>You must select a different network adapter for each communication link.<br>To configure links over UDP, select the IP version and then specify the required details for each communication link.<br>**Note:** Do not select the teamed network adapters and the independently listed adapters that are a part of the teamed NIC. |
| IP Address | Specify the IP address for cluster communication over the specified UDP port. |
| Port | Specify a unique port number for each link. You can use ports in the range 49152 to 65535.<br>A specified port for a link is used for all the cluster systems on that link. |
| Subnet mask | Displays the subnet masks to which the specified IP belongs. |

By default, the VCS cluster communication link that uses the public adapter is configured as low-priority link. To change the priority, click **Modify**. In the Modify low-priority link dialog box, select the link and click **OK**.

For information about adding or changing the selected network links after the configuration workflow is complete, see the *Cluster Server Administrator's Guide*.

**8** On the Configuration Summary panel, specify a cluster name and a cluster ID of your choice.

Review the VCS cluster configuration details and then click **Next** to initiate the configuration.

If the network contains multiple clusters, the wizard verifies the cluster ID with the IDs assigned to all the accessible clusters in the network. The wizard does not validate the assigned ID with the clusters that are not accessible during the validation. Veritas recommends you to validate the uniqueness of the assigned ID in the existing network.

**9** On the Implementation panel, the wizard displays the VCS cluster configuration tasks and the status of each task. After all the tasks are complete, click **Next**.

If the configuration tasks fail, click **Diagnostic information** to check the details of the failure.

Rectify the cause of the failure and run the wizard again to configure the VCS cluster.

**10** On the Finish panel, click **Finish** to complete the wizard workflow. This step completes the VCS cluster configuration.

The Veritas High Availability view now displays the link to configure an application for high availability.

## Configuring the application

Perform the following steps to configure the SAP Web Application Server for high availability on a virtual machine.

**To configure the application**

1. Launch the vSphere Client and connect to the vCenter Server that manages the virtual machine. On the Inventory view of the vCenter Server, in the left pane, select the virtual machine where you want to configure application monitoring. Then, in the right pane, select the Veritas High Availability tab.

   **Note:** Ensure that the disk residing on the shared datastore is attached and the volumes are mounted on the selected virtual machine.

2. On the Veritas High Availability tab, click **Configure Application for High Availability**. This option is available only after a cluster has been configured. Unless you configure a cluster, you cannot configure an application for monitoring.
3. On the Welcome panel of the Veritas High Availability Configuration wizard, review the pre-requisites and then click **Next**.
4. On the Application Selection panel, select **SAP** from the Supported Applications list and then click **Next**.

   Alternatively, you can use the **Search** box to find the application and then click **Next**.

   If you want to download any of the Veritas High Availability agents, click the **Download Application Agents (SORT)** link to download the agents from the Veritas Services and Operations Readiness Tools (SORT) site.

   https://sort.veritas.com/agents
5. On the SAP Instance Selection panel, select the instance that you want to configure, enter the SAP administrator's password, and click **Next**.

   **Note:** The wizard does not display those SAP instances that are already configured for monitoring.

6 On the Configuration Inputs panel, select the VCS cluster systems on which you want to configure the application for high availability and move them to the **Application failover targets** list. The local system is selected by default.

Using the up-down arrow keys, you can define the priority order for the failover systems.

For each system that you assign as a failover target, you must specify the domain user account details in the appropriate fields on the Edit System dialog box. The VCS agents use these details to perform domain operations such as Active Directory updates.

7 On the Virtual Network Details panel, specify the virtual IP and the network details for the application to be configured and then click **Next**.

To specify the virtual IP and network details, select the IP version and then specify the following details for each failover system:

---

**Note:** You must select the same IP version as that selected during the VCS cluster configuration.

---

| | |
|---|---|
| Virtual IP address | Specify a unique virtual IP address. |
| Subnet mask | Specify the subnet mask to which the IP address belongs. |
| Virtual name | Specify a virtual name. |
| Network Adapter column | Select the network adapter that will host the virtual IP. |

If you want to add another virtual IP address, click **Add virtual IP address**. A virtual IP input panel appears, in which you can enter the details as described earlier in this step.

---

**Note:** You can only provide either a set of IPv4 addresses or a set of IPv6 addresses, not both.

---

**8** On the Target ESX/ESXi Host Details panel, specify the hosts and the administrative user account details for each host, and then click **Next**.

---

**Note:** This panel appears only if you have selected multiple application failover targets on the Configuration Inputs panel.

---

To specify the hosts, click **Add ESX/ESXi Host**, and on the Add ESX/ESXi Host dialogue box, specify the following details:

| | |
|---|---|
| ESX/ESXi hostname or IP address | Specify the target ESX hostname or IP address.<br>The virtual machines will fail over on this ESX host during vMotion.<br>The mount points configured on the ESX host where the application is currently running must be available on the target ESX host. |
| User name | Specify a user account for the ESX host.<br>The user account must have administrator privileges on the specified ESX host. |
| Password | Specify the password for the user account provided in the User name text box. |

The wizard validates the user account and the storage details on the specified hosts.

**9** On the Configuration Summary panel, review the application configuration details.

The wizard assigns a unique name to the application service group. Click **Rename** to rename the service group.

Click **Next** to initiate the application monitoring configuration.

**10** On the Implementation panel, the wizard performs the application configuration tasks.

The wizard displays the status of each task. After all the tasks are complete, click **Next**.

If the configuration tasks fail, click **Diagnostic information** to check the details of the failure. Rectify the cause of the failure, and run the wizard again to configure application monitoring.

**11** On the Finish panel, click **Finish** to complete the wizard workflow. This configures the application for high availability on the selected VCS cluster systems.

The Veritas High Availability view now displays the application status and its component dependency.

If the application status shows as not running, click **Start** to start the configured components on the system.

Chapter 5

# Optional configuration tasks for the SAP Web Application Server agent

This chapter includes the following topics:


- Setting the SAPMonHome attribute
- Configuring the execution period for agent functions
- Executing a custom monitor program
- Preventing early faulting of Java and Add-In instances


## 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 SAP usage types and SAP instances are as follows:

- For ABAP application Server: sapcontrol.exe
- For Add-In (ABAP + Java) application server: sapcontrol.exe
- For Enqueue and Enqueue Replication Server: ensmon.exe

---

**Note:** For Java application server and java component of Add-In application server the agent uses the sapcontrol.exe utility present in SAPHome.

---

# Configuring the execution period for agent functions

An agent function is allocated an execution period using the respective time-out attributes: OnlineTimeout, OfflineTimeout, MonitorTimeout, and CleanTimeout. By default these values are set to 300, 300, 60 and 60 respectively.

If an agent function executes a program, for example sapcontrol.exe, the program must execute within the allocated execution period. If the program is unable to execute within the allocated period, the agent function cancels and terminates the execution of the program. You must set these timeout attributes to appropriate values depending on the time required for SAP applications. You can modify these values with the following command.

```
hatype -modify TypeName attribute_name attribute_value
```

Example: C:\> hatype -modify SAPWebAS OnlineTimeout 600

# Executing a custom monitor program

The monitor function executes a custom monitor program to perform a user-defined SAP WebAS state check.

The monitor function executes the MonitorProgram if the following conditions are true:

- The specified utility is a valid executable file.
- The first level process check indicates that the SAP Web AS instance is online.
- The SecondLevelMonitor attribute is either set to 0 or 1, and the second level check indicates that the SAP Web AS 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 operation interprets the program 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 custom monitor program is always available to the agent application, Veritas recommends storing the file in a shared directory that is available on an online node.

# Preventing early faulting of Java and Add-In instances

When you start a SAP Java or a SAP Add-In Application Server Instance, SAP automatically starts processes such as jstart.exe. Depending upon the available resources, starting these processes takes some finite time.

The agent for SAP WebAS 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.

Veritas 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 jstart process, you must set the value of the MonitorTimeout attribute to at least 90 seconds.

Section 3

# Troubleshooting the Agent


- Chapter 6. Troubleshooting the agent for SAP Web Application Server

Chapter 6

# Troubleshooting the agent for SAP Web Application Server

This chapter includes the following topics:


- Starting the SAP Web Application Server outside a cluster
- Troubleshooting common problems
- Reviewing SAP Web Application Server agent log files
- Reviewing error log files
- Checks for an SAP Add-In Usage Types


## Starting the SAP Web Application Server 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 Web Application Server independent of the cluster framework. Refer to the cluster documentation for information about disabling a resource. You can then restart the SAP Web Application Server outside the cluster framework.

---

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

---

A sample procedure to start a SAP Web Application Server outside the cluster framework, is illustrated as follows:

**To start a SAP instance outside the cluster framework, using SAP MMC**

1. Log in to the system as a *sapsid*adm user.
2. Use the SAP Microsoft Management Console (MMC) to start the SAP instance.

   Ensure that the SAP instance starts successfully. If the instance starts successfully outside the cluster, you can attempt to start it inside the cluster framework.

**To start a SAP instance outside the cluster framework, using the command prompt**

1. Log in to the system as a *sapsid*adm user.
2. Start the SAP Windows service SAP*SAPSID_xx* for SAP instance, using the following command:.

   ```
   drive\> net start SAPSAPSID_xx
   ```

3. Use the startsap.exe utility to start the SAP instance. Enter,

   ```
   drive\>usr\sap\SAPSID\InstName\exe\startsap.exe name=SAPSID
   nr=InstID sapdiahost=virtual_hostname
   ```

   Ensure that the SAP instance starts successfully. If the instance starts successfully outside the cluster, you can attempt to start it inside the cluster framework.

# Troubleshooting common problems

This section describes some problems that you may face while working with the Veritas High Availability agent for SAP Web Application Server in a VCS environment.

## Unable to install the Veritas High Availability agent for SAP Web Application Server

If you are not able to install the Veritas High Availability agent for SAP Web Application Server, check to see if previous versions of the agent are present in the system. If present, remove the older agents and attempt to install the agent again.

Also, ensure that you go through the prerequisites before installing SAP NetWeaver.

## Unable to see an entry in the SAP MMC for an SAP instance

If you cannot see any entry for an SAP instance in the SAP MMC, you must re-register the SAP services as COM Typelibrary Only.

**To re-register the SAP services**

1. At the command prompt, navigate to *drive*\Program Files\SAP\hostcntl\exe directory.
2. Run the sapstartsrv.exe command.
3. In the SAP Service Install/Uninstall dialog box, select **Register COM Typelibrary Only** in the Operation field.

   You must re-register the SAP services as described here whenever a change in the SAP service registration occurs.

## The agent for SAP Web Application Server fails to bring online an SAP instance resource through VCS

Attempt to start the SAP resource outside the VCS environment to ensure that the resource is working properly.

See "Starting the SAP Web Application Server outside a cluster" on page 93.

You can also view the log files to further diagnose the problem.

See "Reviewing SAP Web Application Server agent log files" on page 99.

## SAP instance does not come online, and the startsap.exe command exits with exit code -1

Check the SAP MMC to ensure that the entry for this SAP instance is present. If the entry is not present, add the SAP instance in the SAP MMC.

See "Unable to see an entry in the SAP MMC for an SAP instance" on page 96.

Then attempt to bring the SAP instance online.

## In case of an Enqueue server failure, the Enqueue server instance fails to take over the lock table from the Enqueue Replication server instance

If the Enqueue Replication server instance does not recognize the correct Enqueue server instance, this problem may occur. Ensure that the value of InstID passed to the Enqueue Replication server process, enrepserver.exe in the start profile, belongs to the correct Enqueue server instance.

## The ensmon.exe command returns exit code 4 for a Enqueue server instance

If the Enqueue Replication server is not configured or is not online, this problem occurs. Ensure that if the Enqueue Replication server is configured, the instance is online.

If the Enqueue Replication server instance is not configured, disable the replication parameter in the Instance profile of the Enqueue server instance:

```
enque/server/replication = false
```

## The return code of the ensmon.exe command is 8 for an Enqueue Replication server instance

The return code indicates that the Enqueue server instance is down. When the Enqueue server instance fails, the ensmon.exe command returns this code when the instance is switching over to the Enqueue Replication server instance to take over the instate lock table.

Check the state of the Enqueue server instance.

## The Enqueue server instance does not fail over to the correct Enqueue Replication server instance

This problem occurs if the preonline script is not configured properly. To configure the preonline script:

See “Configuring the SAPWebAS preonline script” on page 74.

This problem also occurs if the InstType attribute is not set properly. Also make sure that you configured EnqSrvResName attribute for Enqueue Replication Server (ERS) Instance resource.

## In case of a resource fault, the Service Group does not fail over

If the resource is not set to critical, the Service Group may not fail over. To resolve the issue, set the resource to critical.

## Unable to see an entry in the SAP MMC for an SAP instance

If you cannot see any entry for an SAP instance in the SAP MMC, you must re-register the SAP services as COM Typelibrary Only.

**To re-register the SAP services**

1. At the command prompt, navigate to *drive*\Program Files\SAP\hostcntl\exe directory.
2. Run the sapstartsrv.exe command.
3. In the SAP Service Install/Uninstall dialog box, select **Register COM Typelibrary Only** in the Operation field.

   You must re-register the SAP services as described here whenever a change in the SAP service registration occurs.

## The agent for SAP Web Application Server fails to bring online an SAP instance resource through VCS

Attempt to start the SAP resource outside the VCS environment to ensure that the resource is working properly.

See "Starting the SAP Web Application Server outside a cluster" on page 93.

You can also view the log files to further diagnose the problem.

See "Reviewing SAP Web Application Server agent log files" on page 99.

## SAP instance does not come online, and the startsap.exe command exits with exit code -1

Check the SAP MMC to ensure that the entry for this SAP instance is present. If the entry is not present, add the SAP instance in the SAP MMC.

See "Unable to see an entry in the SAP MMC for an SAP instance" on page 96.

Then attempt to bring the SAP instance online.

## In case of an Enqueue server failure, the Enqueue server instance fails to take over the lock table from the Enqueue Replication server instance

If the Enqueue Replication server instance does not recognize the correct Enqueue server instance, this problem may occur. Ensure that the value of InstID passed to the Enqueue Replication server process, enrepserver.exe in the start profile, belongs to the correct Enqueue server instance.

## The ensmon.exe command returns exit code 4 for a Enqueue server instance

If the Enqueue Replication server is not configured or is not online, this problem occurs. Ensure that if the Enqueue Replication server is configured, the instance is online.

If the Enqueue Replication server instance is not configured, disable the replication parameter in the Instance profile of the Enqueue server instance:

```
enque/server/replication = false
```

## The return code of the ensmon.exe command is 8 for an Enqueue Replication server instance

The return code indicates that the Enqueue server instance is down. When the Enqueue server instance fails, the ensmon.exe command returns this code when the instance is switching over to the Enqueue Replication server instance to take over the instate lock table.

Check the state of the Enqueue server instance.

## The Enqueue server instance does not fail over to the correct Enqueue Replication server instance

This problem occurs if the preonline script is not configured properly. To configure the preonline script:

See “Configuring the SAPWebAS preonline script” on page 74.

This problem also occurs if the InstType attribute is not set properly. Also make sure that you configured EnqSrvResName attribute for Enqueue Replication Server (ERS) Instance resource.

## In case of a resource fault, the Service Group does not fail over

If the resource is not set to critical, the Service Group may not fail over. To resolve the issue, set the resource to critical.

# Reviewing SAP Web Application Server agent log files

If you are facing problems while using the VCS agent for SAP Web Application Server or an SAP server instance, refer to the following sections to access the relevant files for information about the issue.

## Using SAP instance log files

In case of problems while using the VCS agent for SAP Web Application Server, you can access the SAP instance log files for more information. These log files are located in the *drive*:\usr\sap*SAPSID**InstName*\work directory.

## Using SAP log files

If an SAP server is facing problems, you can access the agent log files to further diagnose the problem. The log file is *drive*:\Program Files\Veritas\Cluster Server\log\SAPWebAS_A.txt.

## Using SAP instance log files

In case of problems while using the VCS agent for SAP Web Application Server, you can access the SAP instance log files for more information. These log files are located in the *drive*:\usr\sap*SAPSID**InstName*\work directory.

## Using SAP log files

If an SAP server is facing problems, you can access the agent log files to further diagnose the problem. The log file is *drive*:\Program Files\Veritas\Cluster Server\log\SAPWebAS_A.txt.

# Reviewing error log files

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

## Using SAP NetWeaver instance 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 *drive*\usr\sap\SAPSID\InstName\work directory.

# Reviewing cluster log files

In case of problems while using the agent for SAP Web Application Server, you can access the engine log file for more information about a particular resource. The engine log file is located at *drive*:\Program Files\Veritas\Cluster Server\log\engine_A.txt.

Additionally, you can also refer to the latest SAP Web Application Server agent log files located at *drive*:\Program Files\Veritas\Cluster Server\log\SAPWebAS_A.txt.

---

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

---

# Using trace level logging

The ResLogLevel attribute controls the level of logging that is written in a cluster log file for each SAP Web AS 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. Veritas recommends that you localize the ResLogLevel attribute for a particular resource.

---

**Warning:** You may consider to temporarily increase the timeout values for SAPWebAS 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 Veritas support for more help.

## Using SAP NetWeaver instance 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 *drive*\usr\sap\SAPSID\InstName\work directory.

## Reviewing cluster log files

In case of problems while using the agent for SAP Web Application Server, you can access the engine log file for more information about a particular resource. The engine log file is located at *drive*:\Program Files\Veritas\Cluster Server\log\engine_A.txt.

Additionally, you can also refer to the latest SAP Web Application Server agent log files located at *drive*:\Program Files\Veritas\Cluster Server\log\SAPWebAS_A.txt.

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

## Using trace level logging

The ResLogLevel attribute controls the level of logging that is written in a cluster log file for each SAP Web AS 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. Veritas recommends that you localize the ResLogLevel attribute for a particular resource.

**Warning:** You may consider to temporarily increase the timeout values for SAPWebAS 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 Veritas support for more help.

# Checks for an SAP Add-In Usage Types

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

- The SAP resources running the ABAP and Java Central Services instances are in the same Service Group.
- The SAP resources running the ABAP and Java Enqueue Replication server instances, are in the same Service Group.

  **Note:** Veritas recommends to configure the Central Services and Enqueue Replication server instances for an Add-In usage type in different service groups to minimize the SPOFs in a service group.

- 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 Central Services instance (SCS).

- The EnqSrvResName attribute of the ABAP Enqueue Replication server instance is set to the VCS resource that is running the corresponding ABAP Central Services instance (ASCS).

Appendix A

# Sample Configurations

This appendix includes the following topics:


- About the sample configuration for the agent for SAP Web Application Server
- Sample agent type definition for SAP WebAS
- Sample SAP resource configuration in a physical environment
- Sample service group configurations in a physical environment
- Sample configuration in a virtual environment


## About the sample configuration for the agent for SAP Web Application Server

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

## Sample agent type definition for SAP WebAS

This section provides the sample agent type definition for SAP WebAS.

```
type SAPWebAS (
   static i18nstr ArgList[] = { ResLogLevel, SAPAdmin,
     SAPAdminDomain, SAPAdminPassword, SAPHome, SAPHost,
     SAPMonHome, SAPServiceUser, SAPSID, InstName,
     InstProfile, InstType, ProcMon, EnqSrvResName,
     MonitorProgram, SecondLevelMonitor}
   str ResLogLevel = INFO
```

```
 str SAPAdmin
 str SAPAdminDomain
 str SAPAdminPassword
 str SAPHome
 str SAPHost
 str SAPMonHome
 str SAPServiceUser
 str SAPSID
 str InstName
 str InstProfile
 str InstType = APPSERV
 str ProcMon[]
 str EnqSrvResName
 str MonitorProgram
 int SecondLevelMonitor = 0
)
```

# Sample SAP resource configuration in a physical environment

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

## Sample SAP primary application server instance

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

```
SAPWebAS SAP710-PI1PAS_sap (
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\DVEBMGS22\\exe"
  SAPHost = sappi1pas
  SAPMonHome = "E:\\usr\\sap\\rfcsdk\\bin"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = DVEBMGS22
  InstType = APPSERV
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\SYS\\profile\\
  PI1_DVEBMGS22_sappi1pas"
```

```
  ProcMon = { "disp+work.exe", "jstart.exe" }
  )
```

## Sample SAP additional application server instance

An excerpt of the main.cf file for a SAP additional application server instance is as follows:

```
SAPWebAS SAP710-PI1PAS_sap (
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\D23\\exe"
  SAPHost = sappi1aas
  SAPMonHome = "E:\\usr\\sap\\rfcsdk\\bin"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = D23
  InstType = APPSERV
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\
  SYS\\profile\\PI1_D23_sappi1aas"
  ProcMon = { "disp+work.exe", "jstart.exe" }
  )
```

## Sample SAP Central Services instance

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

```
SAPWebAS SAP710-PI1SCS_scs (
  Critical = 0
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\ASCS20\\exe"
  SAPHost = sappi1scs
  SAPMonHome = "E:\\usr\\sap\\PI1\\ASCS20\\exe"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = ASCS20
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\SYS\\profile\\
  PI1_ASCS20_sappi1scs"
  InstType = ENQUEUE
  ProcMon = { "msg_server.exe", "enserver.exe" }
```

```
  SecondLevelMonitor = 1
  )
```

## Sample SAP Enqueue Replication server instance

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

```
SAPWebAS SAP710-PI1ERS_ers (
  Critical = 0
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\ERS24\\exe"
  SAPHost = sappi1ers
  SAPMonHome = "E:\\usr\\sap\\PI1\\ERS24\\exe"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = ERS24
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\SYS\\profile\\
  PI1_ERS24_sappi1ers"
  InstType = ENQREP
  ProcMon = { "enrepserver.exe" }
  EnqSrvResName = SAP710-PI1SCS_scs
  SecondLevelMonitor = 1
  )
```

## Sample SAP primary application server instance

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

```
SAPWebAS SAP710-PI1PAS_sap (
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\DVEBMGS22\\exe"
  SAPHost = sappi1pas
  SAPMonHome = "E:\\usr\\sap\\rfcsdk\\bin"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = DVEBMGS22
  InstType = APPSERV
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\SYS\\profile\\
```

```
  PI1_DVEBMGS22_sappi1pas"
  ProcMon = { "disp+work.exe", "jstart.exe" }
  )
```

## Sample SAP additional application server instance

An excerpt of the main.cf file for a SAP additional application server instance is as follows:

```
SAPWebAS SAP710-PI1PAS_sap (
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\D23\\exe"
  SAPHost = sappi1aas
  SAPMonHome = "E:\\usr\\sap\\rfcsdk\\bin"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = D23
  InstType = APPSERV
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\
  SYS\\profile\\PI1_D23_sappi1aas"
  ProcMon = { "disp+work.exe", "jstart.exe" }
  )
```

## Sample SAP Central Services instance

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

```
SAPWebAS SAP710-PI1SCS_scs (
  Critical = 0
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\ASCS20\\exe"
  SAPHost = sappi1scs
  SAPMonHome = "E:\\usr\\sap\\PI1\\ASCS20\\exe"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = ASCS20
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\SYS\\profile\\
  PI1_ASCS20_sappi1scs"
  InstType = ENQUEUE
  ProcMon = { "msg_server.exe", "enserver.exe" }
```

```
  SecondLevelMonitor = 1
  )
```

## Sample SAP Enqueue Replication server instance

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

```
SAPWebAS SAP710-PI1ERS_ers (
  Critical = 0
  SAPAdmin = pi1adm
  SAPAdminDomain = SAP-DOMAIN
  SAPAdminPassword = HVNtKVkRWnINjNKnL
  SAPHome = "E:\\usr\\sap\\PI1\\ERS24\\exe"
  SAPHost = sappi1ers
  SAPMonHome = "E:\\usr\\sap\\PI1\\ERS24\\exe"
  SAPServiceUser = SAPServicePI1
  SAPSID = PI1
  InstName = ERS24
  InstProfile = "\\\\sappi1scs\\sapmnt\\PI1\\SYS\\profile\\
  PI1_ERS24_sappi1ers"
  InstType = ENQREP
  ProcMon = { "enrepserver.exe" }
  EnqSrvResName = SAP710-PI1SCS_scs
  SecondLevelMonitor = 1
  )
```

# Sample service group configurations in a physical environment

This section provides sample service group configurations and dependencies in a physical environment.

## Sample service group configuration for ABAP and Java Usage types

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 application server must be dependent on the database server

- Each SAP instance (Application Server, Enqueue, and Enqueue Replication) should have a separate virtual IP address assigned to facilitate network transparency.
- Each SAP instance (Application Server, 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 UNC path with SAPGLOBALHOST.

Figure A-1 shows the service group configuration for Application Server

**Figure A-1** Service group configuration for Application Server

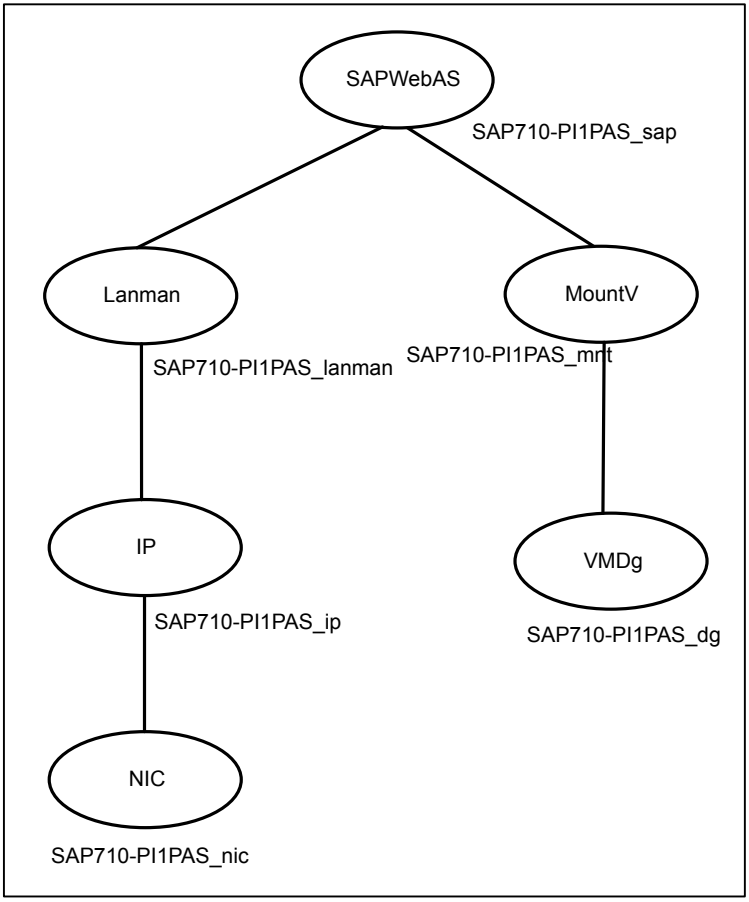



Figure A-2 shows the service group configuration for SAP Central services instance

**Figure A-2** Service group configuration for SAP Central services instance

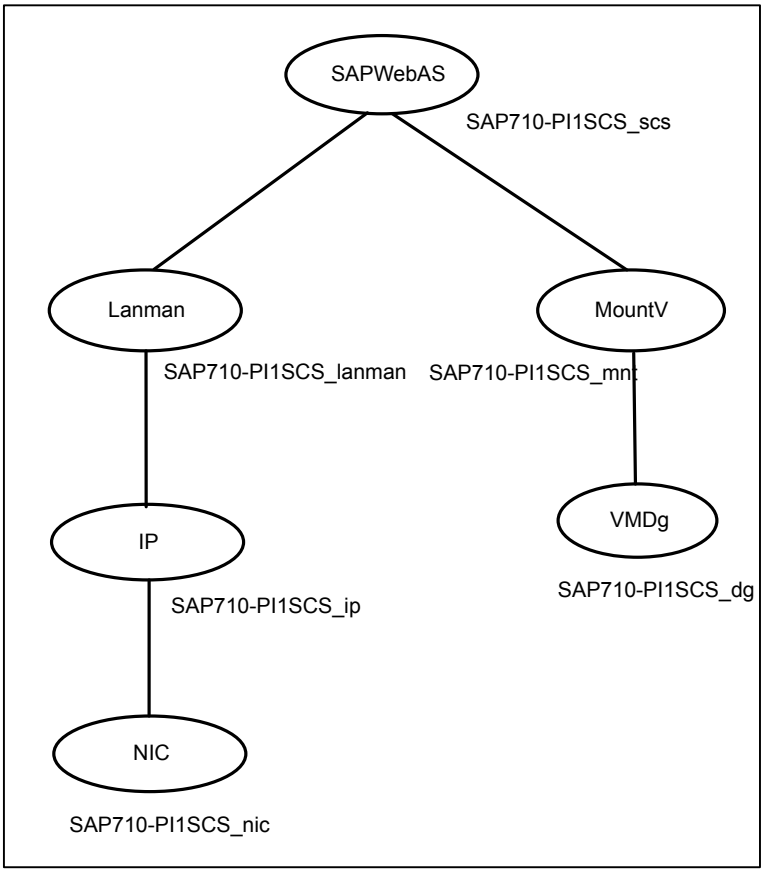
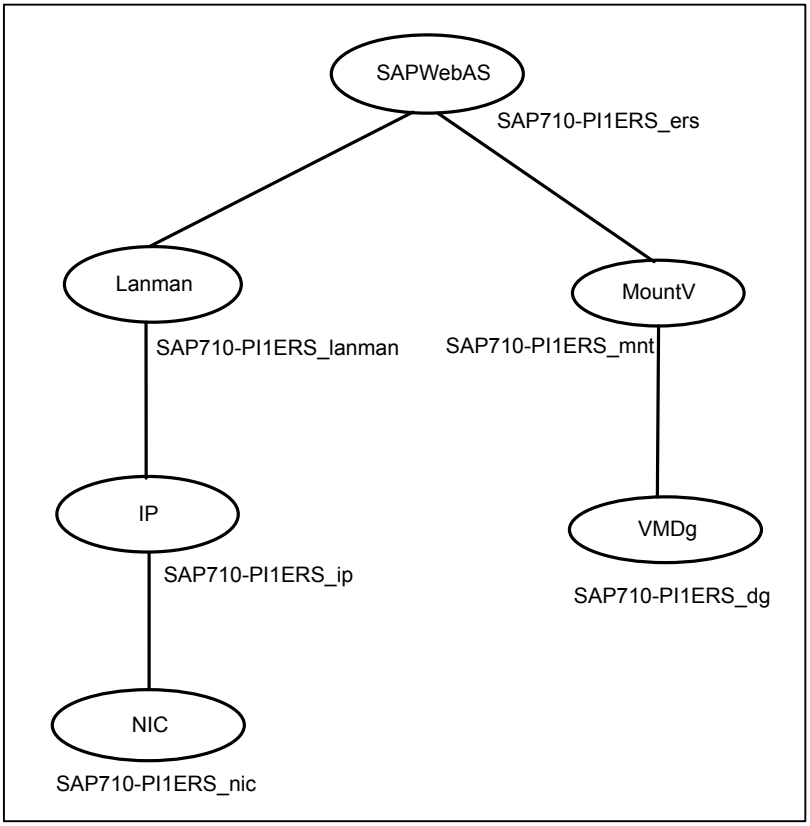



Figure A-3 shows the service group configuration for Enqueue Replication Server instance

**Figure A-3** Service group configuration for Enqueue Replication Server instance




# Sample service group configurations for SAP systems on Windows Server 2008/2012

This section provides the sample service group configurations and resource dependency diagrams for SAP systems on Windows Server 2008/2012.

## Sample configuration for SAP Central Services Instances service group for Add-In installation Usage Type

This section provides the VCS main.cf for SAP Central Services Instances service group for Add-In installation Usage Type.

```
group SAP-PI3SCS (
 SystemList = { SysA = 0, SysB = 1 }
```

```
 )
 FileShare SAP-PI3SCS_sapmnt_FS (
  PathName = "\\usr\\sap"
  ShareName = sapmnt
  LanmanResName = SAP-PI3SCS_Lanman
  MountResName = SAP-PI3SCS_H_MountV
  UserPermissions = { "'SAP_LocalAdmin'" = FULL_CONTROL,
    "'Administrators'" = FULL_CONTROL,
    "'SYMCORP\\SAP_PI3_GlobalAdmin'" = FULL_CONTROL,
    "'SAP_PI3_LocalAdmin'" = FULL_CONTROL }
  )
 IP SAP-PI3SCS_IP (
  Address = "10.xxx.xx.30"
SubNetMask = "255.255.252.0"
  MACAddress = "00-15-17-63-45-92"
  )
 Lanman SAP-PI3SCS_Lanman (
  VirtualName = sappi3scs
  IPResName = SAP-PI3SCS_IP
  )
 MountV SAP-PI3ASCS_MountV (
  MountPath = "I:\\usr\\sap\\PI3\\ASCS29"
  VolumeName = PI3ASCS_vol
  VMDGResName = SAP-PI3ASCS_VMDg
  )
 MountV SAP-PI3SCS_MountV (
  MountPath = "I:\\usr\\sap\\PI3\\SCS30"
  VolumeName = PI3SCS_vol
  VMDGResName = SAP-PI3SCS_VMDg
  )
 MountV SAP-PI3SCS_I_MountV (
  MountPath = "I:"
  VolumeName = PI3SCS_I_vol
  VMDGResName = SAP-PI3SCS_I_VMDg
  )
 MountV SAP-PI3SYS_MountV (
  MountPath = "I:\\usr\\sap\\PI3\\SYS"
  VolumeName = PI3SYS_vol
  VMDGResName = SAP-PI3SYS_VMDg
  )
 NIC SAP-PI3SCS_NIC (
  MACAddress = "00-15-17-63-45-92"
  )
```

```
 SAPWebAS SAP-PI3ASCS_SAPWebAS (
  SAPSID = PI3
  SAPHome = "I:\\usr\\sap\\PI3\\ASCS29\\exe"
  SAPMonHome = "I:\\usr\\sap\\PI3\\ASCS29\\exe"
  SAPHost = sappi3scs
  ProcMon = { "msg_server.exe", "enserver.exe" }
  SAPServiceUser = SAPServicePI3
  SAPAdminDomain = SYMCORP
  SAPAdmin = pi3adm
  SAPAdminPassword = AFkl41nmqdaou
  InstType = ENQUEUE
  InstName = ASCS29
  InstProfile = "I:\\usr\\sap\\PI3\\SYS\\profile\\PI3_ASCS29_sappi3scs"
  )
 SAPWebAS SAP-PI3SCS_SAPWebAS (
  SAPSID = PI3
  SAPHome = "I:\\usr\\sap\\PI3\\SCS30\\exe"
  SAPMonHome = "I:\\usr\\sap\\PI3\\SCS30\\exe"
SAPHost = sappi3scs
  ProcMon = { "msg_server.exe", "enserver.exe" }
  SAPServiceUser = SAPServicePI3
  SAPAdminDomain = SYMCORP
  SAPAdmin = pi3adm
  SAPAdminPassword = AFkl41nmqdaou
  InstType = ENQUEUE
  InstName = SCS30
  InstProfile = "I:\\usr\\sap\\PI3\\SYS\\profile\\PI3_SCS30_sappi3scs"
  )
 VMDg SAP-PI3SCS_I_VMDg (
  DiskGroupName = PI3SCS_I_dg
  )
 VMDg SAP-PI3ASCS_VMDg (
  DiskGroupName = PI3ASCS_dg
  )
 VMDg SAP-PI3SCS_VMDg (
  DiskGroupName = PI3SCS_dg
  )
 VMDg SAP-PI3SYS_VMDg (
  DiskGroupName = PI3SYS_dg
  )
 SAP-PI3SCS_sapmnt_FS requires SAP-PI3SCS_Lanman
 SAP-PI3SCS_sapmnt_FS requires SAP-PI3SCS_I_MountV
 SAP-PI3SCS_IP requires SAP-PI3SCS_NIC
```

```
SAP-PI3SCS_Lanman requires SAP-PI3SCS_IP
SAP-PI3ASCS_MountV requires SAP-PI3SCS_I_MountV
SAP-PI3ASCS_MountV requires SAP-PI3ASCS_VMDg
SAP-PI3SCS_MountV requires SAP-PI3SCS_I_MountV
SAP-PI3SCS_MountV requires SAP-PI3SCS_VMDg
SAP-PI3SCS_I_MountV requires SAP-PI3SCS_I_VMDg
SAP-PI3SYS_MountV requires SAP-PI3SCS_I_MountV
SAP-PI3SYS_MountV requires SAP-PI3SYS_VMDg
SAP-PI3ASCS_SAPWebAS requires SAP-PI3SCS_sapmnt_FS
SAP-PI3ASCS_SAPWebAS requires SAP-PI3ASCS_MountV
SAP-PI3ASCS_SAPWebAS requires SAP-PI3SYS_MountV
SAP-PI3SCS_SAPWebAS requires SAP-PI3SCS_sapmnt_FS
SAP-PI3SCS_SAPWebAS requires SAP-PI3SCS_MountV
SAP-PI3SCS_SAPWebAS requires SAP-PI3SYS_MountV

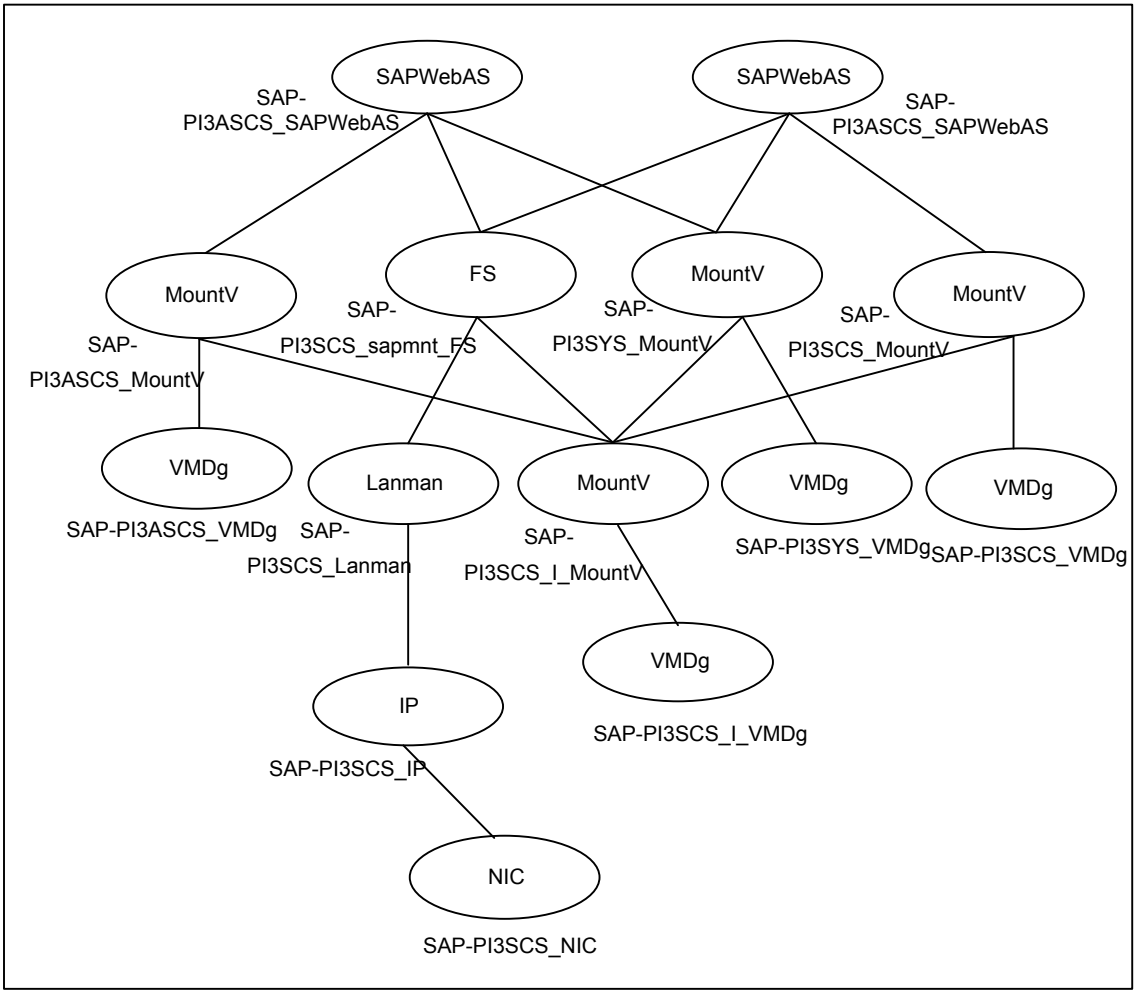
// resource dependency tree
//
// group SAP-PI3SCS
// {
// SAPWebAS SAP-PI3ASCS_SAPWebAS
//     {
//     FileShare SAP-PI3SCS_sapmnt_FS
//         {
//         Lanman SAP-PI3SCS_Lanman
//             {
//             IP SAP-PI3SCS_IP
//                 {
//                 NIC SAP-PI3SCS_NIC
//                 }
//             }
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         }
//     MountV SAP-PI3ASCS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         VMDg SAP-PI3ASCS_VMDg
//         }
```

```
//     MountV SAP-PI3SYS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         VMDg SAP-PI3SYS_VMDg
//         }
//     }
// SAPWebAS SAP-PI3SCS_SAPWebAS
//     {
//     FileShare SAP-PI3SCS_sapmnt_FS
//         {
//         Lanman SAP-PI3SCS_Lanman
//             {
//             IP SAP-PI3SCS_IP
//                 {
//                 NIC SAP-PI3SCS_NIC
//                 }
//             }
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         }
//     MountV SAP-PI3SCS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         VMDg SAP-PI3SCS_VMDg
//         }
//     MountV SAP-PI3SYS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//        VMDg SAP-PI3SYS_VMDg
//         }
//     }
// }
```

## Sample resource dependency for SAP Central Services Instances service group for Add-In installation usage type

Figure A-4 shows the sample resource dependency diagram for SAP Central Services Instances service group for Add-In installation Usage Type on a Windows 2008/2012 Server.

**Figure A-4** Sample resource dependency diagram for SAP Central Services Instances service group for Add-In installation Usage Type on a Windows 2008/2012 Server



## Sample configuration for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type

```
group SAP-PI3ERS (
 SystemList = { SysA = 0, SysB = 1 }
 )
 IP SAP-PI3ERS_IP (
  Address = "10.xxx.xx.30"
  SubNetMask = "255.255.252.0"
  MACAddress = "00-15-17-63-45-92"
  )
 Lanman SAP-PI3ERS_Lanman (
  VirtualName = sappi3ers
IPResName = SAP-PI3ERS_IP
  )
 MountV SAP-PI3AERS_MountV (
  MountPath = "C:\\usr\\sap\\PI3\\ERS31"
  VolumeName = PI3AERS_vol
  VMDGResName = SAP-PI3AERS_VMDg
  )
 MountV SAP-PI3ERS_MountV (
  MountPath = "C:\\usr\\sap\\PI3\\ERS32"
  VolumeName = PI3ERS_vol
  VMDGResName = SAP-PI3ERS_VMDg
  )
 NIC SAP-PI3ERS_NIC (
  MACAddress = "00-15-17-63-45-92"
  )
 SAPWebAS SAP-PI3AERS_SAPWebAS (
  SAPSID = PI3
  SAPHome = "C:\\usr\\sap\\PI3\\ERS31\\exe"
  SAPMonHome = "C:\\usr\\sap\\PI3\\ERS31\\exe"
  SAPHost = sappi3ers
  ProcMon = { "enrepserver.exe" }
  SAPServiceUser = SAPServicePI3
  SAPAdminDomain = SYMCORP
  SAPAdmin = pi3adm
  SAPAdminPassword = AFkl41nmqdaou
  InstType = ENQREP
  InstName = ERS31
  InstProfile = "\\\\sappi3scs\\sapmnt\\
  PI3\\SYS\\profile\\PI3_ERS31_sappi3ers"
  EnqSrvResName = SAP-PI3ASCS_SAPWebAS
```

```
 )
 SAPWebAS SAP-PI3ERS_SAPWebAS (
  SAPSID = PI3
  SAPHome = "C:\\usr\\sap\\PI3\\ERS32\\exe"
  SAPMonHome = "C:\\usr\\sap\\PI3\\ERS32\\exe"
  SAPHost = sappi3ers
  ProcMon = { "enrepserver.exe" }
  SAPServiceUser = SAPServicePI3
  SAPAdminDomain = SYMCORP
  SAPAdmin = pi3adm
  SAPAdminPassword = AFkl41nmqdaou
  InstType = ENQREP
  InstName = ERS32
  InstProfile = "\\\\sappi3scs\\sapmnt\\
  PI3\\SYS\\profile\\PI3_ERS32_sappi3ers"
  EnqSrvResName = SAP-PI3SCS_SAPWebAS
  )
 VMDg SAP-PI3AERS_VMDg (
  DiskGroupName = PI3AERS_dg
  )
VMDg SAP-PI3ERS_VMDg (
  DiskGroupName = PI3ERS_dg
  )
 SAP-PI3ERS_IP requires SAP-PI3ERS_NIC
 SAP-PI3ERS_Lanman requires SAP-PI3ERS_IP
 SAP-PI3AERS_MountV requires SAP-PI3AERS_VMDg
 SAP-PI3ERS_MountV requires SAP-PI3ERS_VMDg
 SAP-PI3AERS_SAPWebAS requires SAP-PI3AERS_MountV
 SAP-PI3AERS_SAPWebAS requires SAP-PI3ERS_Lanman
 SAP-PI3ERS_SAPWebAS requires SAP-PI3ERS_MountV
 SAP-PI3ERS_SAPWebAS requires SAP-PI3ERS_Lanman

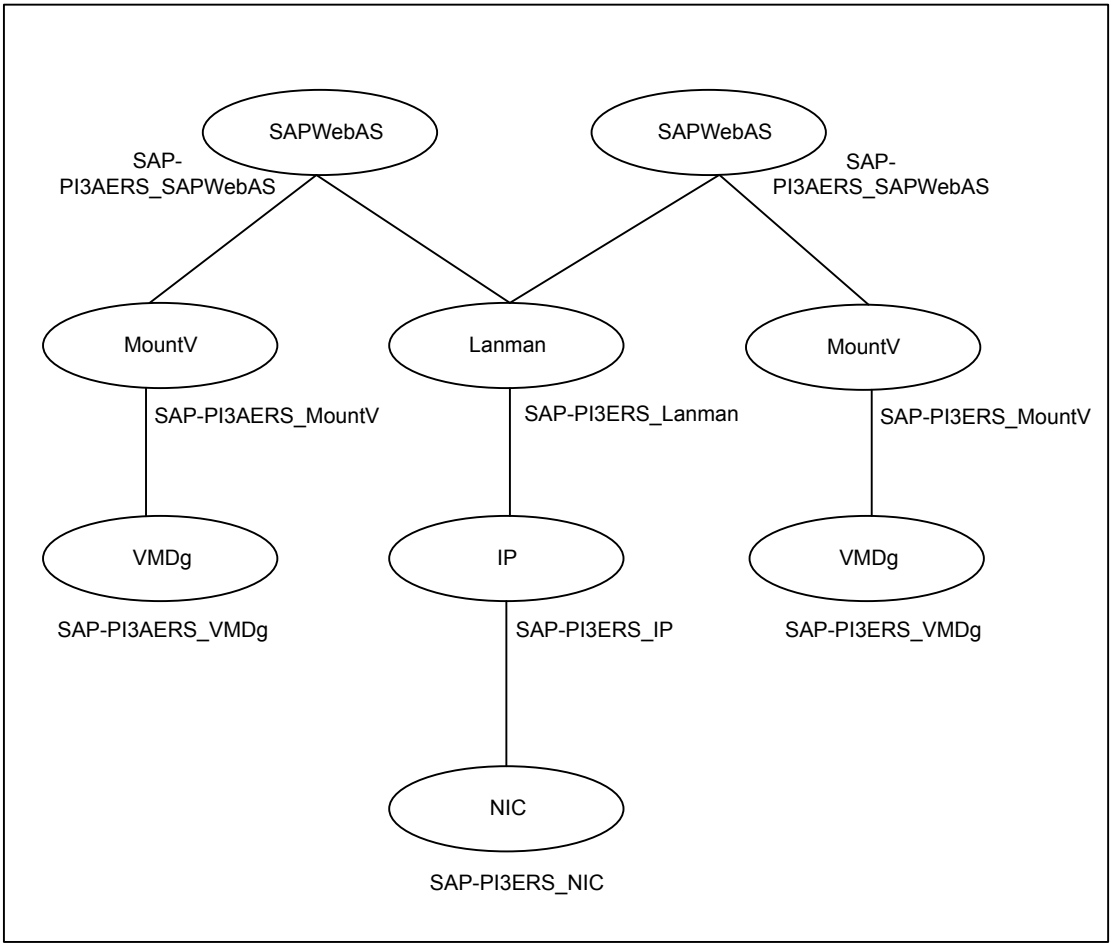
 // resource dependency tree
 //
 // group SAP-PI3ERS
 // {
 // SAPWebAS SAP-PI3AERS_SAPWebAS
 //     {
 //     MountV SAP-PI3AERS_MountV
 //         {
 //         VMDg SAP-PI3AERS_VMDg
 //         }
 //     Lanman SAP-PI3ERS_Lanman
```

```
//          {
//          IP SAP-PI3ERS_IP
//              {
//              NIC SAP-PI3ERS_NIC
//              }
//          }
//      }
// SAPWebAS SAP-PI3ERS_SAPWebAS
//      {
//      MountV SAP-PI3ERS_MountV
//          {
//          VMDg SAP-PI3ERS_VMDg
//          }
//      Lanman SAP-PI3ERS_Lanman
//          {
//          IP SAP-PI3ERS_IP
//              {
//              NIC SAP-PI3ERS_NIC
//              }
//          }
//      }
// }
```

## Sample resource dependency for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type

Figure A-5 shows the sample resource group dependency for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type

**Figure A-5** Sample resource group dependency for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type




## Sample configuration for SAP Central Services Instances service group for Add-In installation Usage Type

This section provides the VCS main.cf for SAP Central Services Instances service group for Add-In installation Usage Type.

```
group SAP-PI3SCS (
 SystemList = { SysA = 0, SysB = 1 }
 )
 FileShare SAP-PI3SCS_sapmnt_FS (
```

```
  PathName = "\\usr\\sap"
  ShareName = sapmnt
  LanmanResName = SAP-PI3SCS_Lanman
  MountResName = SAP-PI3SCS_H_MountV
  UserPermissions = { "'SAP_LocalAdmin'" = FULL_CONTROL,
    "'Administrators'" = FULL_CONTROL,
    "'SYMCORP\\SAP_PI3_GlobalAdmin'" = FULL_CONTROL,
    "'SAP_PI3_LocalAdmin'" = FULL_CONTROL }
  )
 IP SAP-PI3SCS_IP (
  Address = "10.xxx.xx.30"
SubNetMask = "255.255.252.0"
  MACAddress = "00-15-17-63-45-92"
  )
 Lanman SAP-PI3SCS_Lanman (
  VirtualName = sappi3scs
  IPResName = SAP-PI3SCS_IP
  )
 MountV SAP-PI3ASCS_MountV (
  MountPath = "I:\\usr\\sap\\PI3\\ASCS29"
  VolumeName = PI3ASCS_vol
  VMDGResName = SAP-PI3ASCS_VMDg
  )
 MountV SAP-PI3SCS_MountV (
  MountPath = "I:\\usr\\sap\\PI3\\SCS30"
  VolumeName = PI3SCS_vol
  VMDGResName = SAP-PI3SCS_VMDg
  )
 MountV SAP-PI3SCS_I_MountV (
  MountPath = "I:"
  VolumeName = PI3SCS_I_vol
  VMDGResName = SAP-PI3SCS_I_VMDg
  )
 MountV SAP-PI3SYS_MountV (
  MountPath = "I:\\usr\\sap\\PI3\\SYS"
  VolumeName = PI3SYS_vol
  VMDGResName = SAP-PI3SYS_VMDg
  )
 NIC SAP-PI3SCS_NIC (
  MACAddress = "00-15-17-63-45-92"
  )
 SAPWebAS SAP-PI3ASCS_SAPWebAS (
  SAPSID = PI3
```

```
    SAPHome = "I:\\usr\\sap\\PI3\\ASCS29\\exe"
    SAPMonHome = "I:\\usr\\sap\\PI3\\ASCS29\\exe"
    SAPHost = sappi3scs
    ProcMon = { "msg_server.exe", "enserver.exe" }
    SAPServiceUser = SAPServicePI3
    SAPAdminDomain = SYMCORP
    SAPAdmin = pi3adm
    SAPAdminPassword = AFkl41nmqdaou
    InstType = ENQUEUE
    InstName = ASCS29
    InstProfile = "I:\\usr\\sap\\PI3\\SYS\\profile\\PI3_ASCS29_sappi3scs"
    )
  SAPWebAS SAP-PI3SCS_SAPWebAS (
    SAPSID = PI3
    SAPHome = "I:\\usr\\sap\\PI3\\SCS30\\exe"
    SAPMonHome = "I:\\usr\\sap\\PI3\\SCS30\\exe"
SAPHost = sappi3scs
    ProcMon = { "msg_server.exe", "enserver.exe" }
    SAPServiceUser = SAPServicePI3
    SAPAdminDomain = SYMCORP
    SAPAdmin = pi3adm
    SAPAdminPassword = AFkl41nmqdaou
    InstType = ENQUEUE
    InstName = SCS30
    InstProfile = "I:\\usr\\sap\\PI3\\SYS\\profile\\PI3_SCS30_sappi3scs"
    )
  VMDg SAP-PI3SCS_I_VMDg (
    DiskGroupName = PI3SCS_I_dg
    )
  VMDg SAP-PI3ASCS_VMDg (
    DiskGroupName = PI3ASCS_dg
    )
  VMDg SAP-PI3SCS_VMDg (
    DiskGroupName = PI3SCS_dg
    )
  VMDg SAP-PI3SYS_VMDg (
    DiskGroupName = PI3SYS_dg
    )
  SAP-PI3SCS_sapmnt_FS requires SAP-PI3SCS_Lanman
  SAP-PI3SCS_sapmnt_FS requires SAP-PI3SCS_I_MountV
  SAP-PI3SCS_IP requires SAP-PI3SCS_NIC
  SAP-PI3SCS_Lanman requires SAP-PI3SCS_IP
  SAP-PI3ASCS_MountV requires SAP-PI3SCS_I_MountV
```

```
SAP-PI3ASCS_MountV requires SAP-PI3ASCS_VMDg
SAP-PI3SCS_MountV requires SAP-PI3SCS_I_MountV
SAP-PI3SCS_MountV requires SAP-PI3SCS_VMDg
SAP-PI3SCS_I_MountV requires SAP-PI3SCS_I_VMDg
SAP-PI3SYS_MountV requires SAP-PI3SCS_I_MountV
SAP-PI3SYS_MountV requires SAP-PI3SYS_VMDg
SAP-PI3ASCS_SAPWebAS requires SAP-PI3SCS_sapmnt_FS
SAP-PI3ASCS_SAPWebAS requires SAP-PI3ASCS_MountV
SAP-PI3ASCS_SAPWebAS requires SAP-PI3SYS_MountV
SAP-PI3SCS_SAPWebAS requires SAP-PI3SCS_sapmnt_FS
SAP-PI3SCS_SAPWebAS requires SAP-PI3SCS_MountV
SAP-PI3SCS_SAPWebAS requires SAP-PI3SYS_MountV

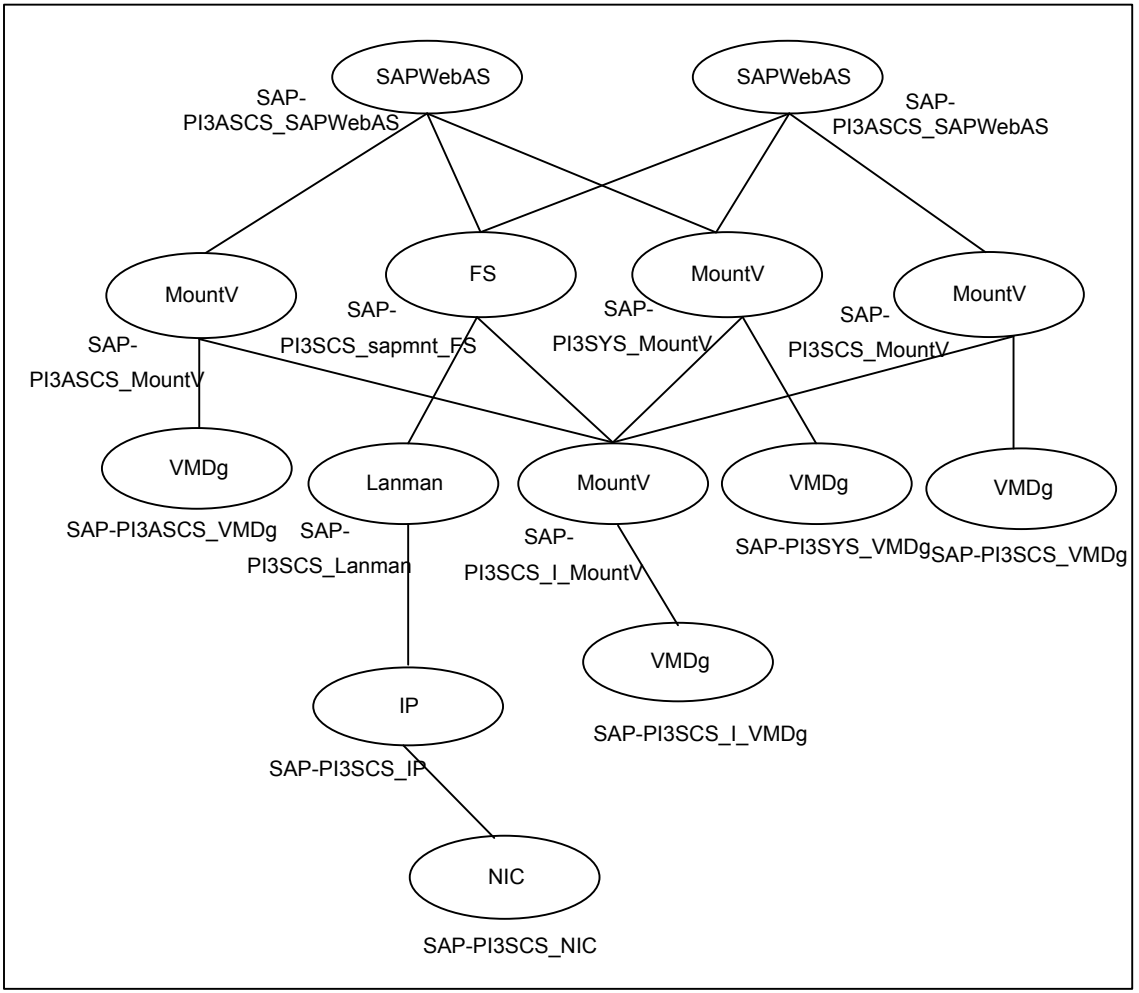
// resource dependency tree
//
// group SAP-PI3SCS
// {
// SAPWebAS SAP-PI3ASCS_SAPWebAS
//     {
//     FileShare SAP-PI3SCS_sapmnt_FS
//         {
//         Lanman SAP-PI3SCS_Lanman
//             {
//            IP SAP-PI3SCS_IP
//                 {
//                 NIC SAP-PI3SCS_NIC
//                 }
//             }
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         }
//     MountV SAP-PI3ASCS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         VMDg SAP-PI3ASCS_VMDg
//         }
//     MountV SAP-PI3SYS_MountV
//         {
```

```
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         VMDg SAP-PI3SYS_VMDg
//         }
//     }
// SAPWebAS SAP-PI3SCS_SAPWebAS
//     {
//     FileShare SAP-PI3SCS_sapmnt_FS
//         {
//         Lanman SAP-PI3SCS_Lanman
//             {
//             IP SAP-PI3SCS_IP
//                 {
//                 NIC SAP-PI3SCS_NIC
//                 }
//             }
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         }
//     MountV SAP-PI3SCS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//         VMDg SAP-PI3SCS_VMDg
//         }
//     MountV SAP-PI3SYS_MountV
//         {
//         MountV SAP-PI3SCS_I_MountV
//             {
//             VMDg SAP-PI3SCS_I_VMDg
//             }
//        VMDg SAP-PI3SYS_VMDg
//         }
//     }
// }
```

## Sample resource dependency for SAP Central Services Instances service group for Add-In installation usage type

Figure A-4 shows the sample resource dependency diagram for SAP Central Services Instances service group for Add-In installation Usage Type on a Windows 2008/2012 Server.

**Figure A-6** Sample resource dependency diagram for SAP Central Services Instances service group for Add-In installation Usage Type on a Windows 2008/2012 Server



## Sample configuration for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type

```
group SAP-PI3ERS (
 SystemList = { SysA = 0, SysB = 1 }
 )
 IP SAP-PI3ERS_IP (
  Address = "10.xxx.xx.30"
  SubNetMask = "255.255.252.0"
  MACAddress = "00-15-17-63-45-92"
  )
 Lanman SAP-PI3ERS_Lanman (
  VirtualName = sappi3ers
IPResName = SAP-PI3ERS_IP
  )
 MountV SAP-PI3AERS_MountV (
  MountPath = "C:\\usr\\sap\\PI3\\ERS31"
  VolumeName = PI3AERS_vol
  VMDGResName = SAP-PI3AERS_VMDg
  )
 MountV SAP-PI3ERS_MountV (
  MountPath = "C:\\usr\\sap\\PI3\\ERS32"
  VolumeName = PI3ERS_vol
  VMDGResName = SAP-PI3ERS_VMDg
  )
 NIC SAP-PI3ERS_NIC (
  MACAddress = "00-15-17-63-45-92"
  )
 SAPWebAS SAP-PI3AERS_SAPWebAS (
  SAPSID = PI3
  SAPHome = "C:\\usr\\sap\\PI3\\ERS31\\exe"
  SAPMonHome = "C:\\usr\\sap\\PI3\\ERS31\\exe"
  SAPHost = sappi3ers
  ProcMon = { "enrepserver.exe" }
  SAPServiceUser = SAPServicePI3
  SAPAdminDomain = SYMCORP
  SAPAdmin = pi3adm
  SAPAdminPassword = AFkl41nmqdaou
  InstType = ENQREP
  InstName = ERS31
  InstProfile = "\\\\sappi3scs\\sapmnt\\
  PI3\\SYS\\profile\\PI3_ERS31_sappi3ers"
  EnqSrvResName = SAP-PI3ASCS_SAPWebAS
```

```
 )
 SAPWebAS SAP-PI3ERS_SAPWebAS (
  SAPSID = PI3
  SAPHome = "C:\\usr\\sap\\PI3\\ERS32\\exe"
  SAPMonHome = "C:\\usr\\sap\\PI3\\ERS32\\exe"
  SAPHost = sappi3ers
  ProcMon = { "enrepserver.exe" }
  SAPServiceUser = SAPServicePI3
  SAPAdminDomain = SYMCORP
  SAPAdmin = pi3adm
  SAPAdminPassword = AFkl41nmqdaou
  InstType = ENQREP
  InstName = ERS32
  InstProfile = "\\\\sappi3scs\\sapmnt\\
  PI3\\SYS\\profile\\PI3_ERS32_sappi3ers"
  EnqSrvResName = SAP-PI3SCS_SAPWebAS
  )
 VMDg SAP-PI3AERS_VMDg (
  DiskGroupName = PI3AERS_dg
  )
VMDg SAP-PI3ERS_VMDg (
  DiskGroupName = PI3ERS_dg
  )
 SAP-PI3ERS_IP requires SAP-PI3ERS_NIC
 SAP-PI3ERS_Lanman requires SAP-PI3ERS_IP
 SAP-PI3AERS_MountV requires SAP-PI3AERS_VMDg
 SAP-PI3ERS_MountV requires SAP-PI3ERS_VMDg
 SAP-PI3AERS_SAPWebAS requires SAP-PI3AERS_MountV
 SAP-PI3AERS_SAPWebAS requires SAP-PI3ERS_Lanman
 SAP-PI3ERS_SAPWebAS requires SAP-PI3ERS_MountV
 SAP-PI3ERS_SAPWebAS requires SAP-PI3ERS_Lanman

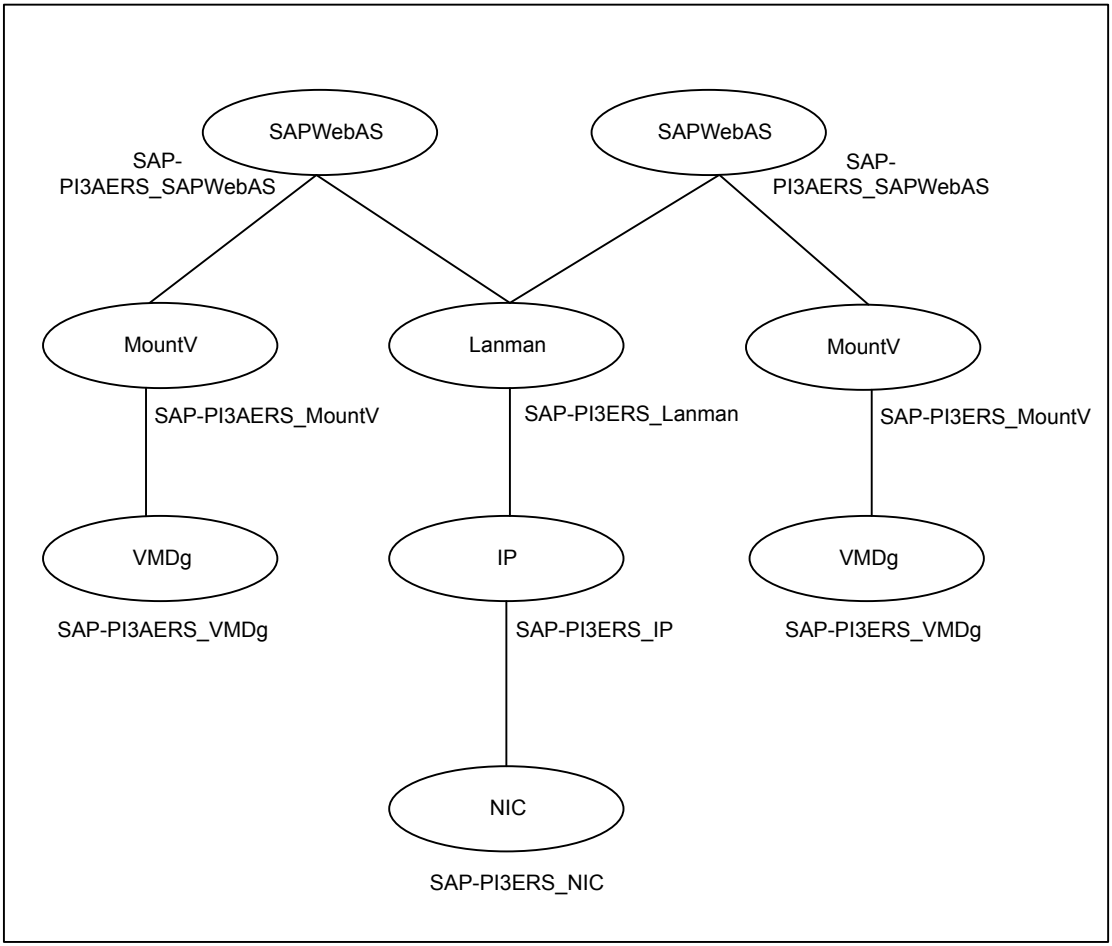
 // resource dependency tree
 //
 // group SAP-PI3ERS
 // {
 // SAPWebAS SAP-PI3AERS_SAPWebAS
 //     {
 //     MountV SAP-PI3AERS_MountV
 //         {
 //         VMDg SAP-PI3AERS_VMDg
 //         }
 //     Lanman SAP-PI3ERS_Lanman
```

```
//          {
//          IP SAP-PI3ERS_IP
//              {
//              NIC SAP-PI3ERS_NIC
//              }
//          }
//      }
// SAPWebAS SAP-PI3ERS_SAPWebAS
//      {
//      MountV SAP-PI3ERS_MountV
//          {
//          VMDg SAP-PI3ERS_VMDg
//          }
//      Lanman SAP-PI3ERS_Lanman
//          {
//          IP SAP-PI3ERS_IP
//              {
//              NIC SAP-PI3ERS_NIC
//              }
//          }
//      }
// }
```

## Sample resource dependency for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type

Figure A-5 shows the sample resource group dependency for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type

**Figure A-7** Sample resource group dependency for SAP Enqueue Replication Server Instances service group for Add-In installation Usage Type




## Sample service group dependency for SAP Web Application Server

This section includes service groups that show the group dependency for SAP Web Application Server.

Figure A-8 shows the sample service group dependency.

**Figure A-8** Sample service group dependency




# Sample configuration in a virtual environment

A sample main.cf configuration in a virtual environment that contains the Enqueue instance, Enqueue Replication instance, Application Server instance, and SMDA instance is as follows:

```
include "types.cf"
```

```
cluster Cluster_59087 (
 SecureClus = 1
 )

system SAPVM21 (
 )

system SAPVM22 (
 )

group SAP_ASCS00 (
 SystemList = { SAPVM21 = 0, SAPVM22 = 1 }
 UserAssoc = { Type = SAPWin, Name = SAP_ASCS00 }
 )

 IP SAP_ASCS00-IP (
  Address = "10.xxx.xx.189"
  SubNetMask = "255.255.252.0"
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  MACAddress @SAPVM22 = "00:50:56:B7:21:C3"
  )

 Lanman SAP_ASCS00-Lanman-sapenq (
  VirtualName = sapenq
  IPResName = SAP_ASCS00-IP
  )

 MountV SAP_ASCS00-Mount (
  MountPath = "e:\\usr\\sap\\pi7\\ascs00"
  VolumeName = SCSVOL
  VMDGResName = SAP_ASCS00_SCSDG_VMNSDg
  )

 MountV SAP_ASCS00-Mount-1 (
  MountPath = "e:\\usr\\sap\\pi7\\sys"
  VolumeName = SYSVOL
  VMDGResName = SAP_ASCS00_SCSDG_VMNSDg
  )

 NIC SAP_ASCS00-NIC (
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  MACAddress @SAPVM22 = "00:50:56:B7:21:C3"
  )
```

```
SAPWebAS SAP_PI7_ASCS00_res (
 Critical = 0
 SAPAdmin = pi7adm
 SAPAdminDomain = sap-domain
 SAPAdminPassword = GUMsJUjOGmHMiMJmKMl
 SAPHome = "E:\\usr\\sap\\PI7\\ASCS00\\exe"
 SAPHost = sapenq
 SAPServiceUser = SAPServicePI7
 SAPSID = PI7
 InstName = ASCS00
 InstProfile = "\\\\sapenq\\sapmnt\\PI7\\SYS\\profile\\
 PI7_ASCS00_sapenq"
 InstType = ENQUEUE
 ProcMon = { "enserver.exe" }
 )

VMNSDg SAP_ASCS00_SCSDG_VMNSDg (
 DiskGroupName = SCSDG
 DGGuid = b26580c2-e773-4ca8-9e62-e03e235013c0
 SkipStorageValidation = 1
 )

VMwareDisks SAP_ASCS00-VMwareDisks (
 ESXDetails = {
   "vcslx658.vxindia.veritas.com" = "root=GUMsJUjOGmHMiMJ" }
 DiskPaths = {
   "6000C296-5313-69b0-63f9-f15efcf60d66:[NIMBSHARE] SAP_Win2k8_Vm1
 /SAP_Win2k8_Vm1.vmdk" = "1:8" }
 IsVMHAEnabled = 0
 )

SAP_PI7_ASCS00_res requires SAP_ASCS00-Lanman-sapenq
SAP_PI7_ASCS00_res requires SAP_ASCS00-Mount
SAP_PI7_ASCS00_res requires SAP_ASCS00-Mount-1
SAP_ASCS00-IP requires SAP_ASCS00-NIC
SAP_ASCS00-Lanman-sapenq requires SAP_ASCS00-IP
SAP_ASCS00-Mount requires SAP_ASCS00_SCSDG_VMNSDg
SAP_ASCS00-Mount-1 requires SAP_ASCS00_SCSDG_VMNSDg
SAP_ASCS00_SCSDG_VMNSDg requires SAP_ASCS00-VMwareDisks


// resource dependency tree
```

```
//
// group SAP_ASCS00
// {
// SAPWebAS SAP_PI7_ASCS00_res
//     {
//     Lanman SAP_ASCS00-Lanman-sapenq
//         {
//         IP SAP_ASCS00-IP
//             {
//             NIC SAP_ASCS00-NIC
//             }
//         }
//     MountV SAP_ASCS00-Mount
//         {
//         VMNSDg SAP_ASCS00_SCSDG_VMNSDg
//             {
//             VMwareDisks SAP_ASCS00-VMwareDisks
//             }
//         }
//     MountV SAP_ASCS00-Mount-1
//         {
//         VMNSDg SAP_ASCS00_SCSDG_VMNSDg
//             {
//             VMwareDisks SAP_ASCS00-VMwareDisks
//             }
//         }
//     }
// }


group SAP_ERS10 (
 SystemList = { SAPVM21 = 0, SAPVM22 = 1 }
 UserAssoc = { Type = SAPWin, Name = SAP_ERS10 }
 PreOnline = 1
 )

 IP SAP_ERS10-IP (
  Address = "10.209.69.193"
  SubNetMask = "255.255.252.0"
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  MACAddress @SAPVM22 = "00:50:56:B7:21:C3"
  )
```

```
Lanman SAP_ERS10-Lanman-sapers (
 VirtualName = sapers
 IPResName = SAP_ERS10-IP
 )

NIC SAP_ERS10-NIC (
 MACAddress @SAPVM21 = "00:50:56:B7:18:36"
 MACAddress @SAPVM22 = "00:50:56:B7:21:C3"
 )

SAPWebAS SAP_PI7_ERS10_res (
 SAPAdmin = pi7adm
 SAPAdminDomain = sap-domain
 SAPAdminPassword = GUMsJUjOGmHMiMJmKMl
 SAPHome = "E:\\usr\\sap\\PI7\\ERS10\\exe"
 SAPHost = sapers
 SAPServiceUser = SAPServicePI7
 SAPSID = PI7
 InstName = ERS10
 InstProfile = "E:\\usr\\sap\\PI7\\SYS\\profile\\PI7_ERS10_sapers"
 InstType = ENQREP
 ProcMon = { "enrepserver.exe" }
 EnqSrvResName = SAP_PI7_ASCS00_res
 )

SAP_PI7_ERS10_res requires SAP_ERS10-Lanman-sapers
SAP_ERS10-IP requires SAP_ERS10-NIC
SAP_ERS10-Lanman-sapers requires SAP_ERS10-IP


// resource dependency tree
//
// group SAP_ERS10
// {
// SAPWebAS SAP_PI7_ERS10_res
//     {
//     Lanman SAP_ERS10-Lanman-sapers
//         {
//         IP SAP_ERS10-IP
//             {
//             NIC SAP_ERS10-NIC
//             }
//         }
```

```
//      }
// }


group SAP_SMDA97 (
 SystemList = { SAPVM21 = 0, SAPVM22 = 1 }
 UserAssoc = { Type = SAPWin, Name = SAP_SMDA97 }
 )

 IP SAP_SMDA97-IP (
  Address = "10.209.69.192"
  SubNetMask = "255.255.252.0"
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  MACAddress @SAPVM22 = "00:50:56:B7:21:C3"
  )

 Lanman SAP_SMDA97-Lanman-sapdi (
  VirtualName = sapdi
  IPResName = SAP_SMDA97-IP
  )

 NIC SAP_SMDA97-NIC (
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  MACAddress @SAPVM22 = "00:50:56:B7:21:C3"
  )

 SAPWebAS SAP_DAA_SMDA97_res (
  SAPAdmin = daaadm
  SAPAdminDomain = sapvm22
  SAPAdminPassword = GUMsJUjOGmHMiMJmKMl
  SAPHome = "E:\\usr\\sap\\DAA\\SMDA97\\exe"
  SAPHost = sapdi
  SAPServiceUser = SAPServiceDAA
  SAPSID = DAA
  InstName = SMDA97
  InstProfile = "E:\\usr\\sap\\DAA\\SYS\\profile\\DAA_SMDA97_sapdi"
  InstType = SMDA
  ProcMon = { "jstart.exe" }
  )

 SAP_DAA_SMDA97_res requires SAP_SMDA97-Lanman-sapdi
 SAP_SMDA97-IP requires SAP_SMDA97-NIC
 SAP_SMDA97-Lanman-sapdi requires SAP_SMDA97-IP
```

```
// resource dependency tree
//
// group SAP_SMDA97
// {
// SAPWebAS SAP_DAA_SMDA97_res
//     {
//     Lanman SAP_SMDA97-Lanman-sapdi
//         {
//         IP SAP_SMDA97-IP
//             {
//             NIC SAP_SMDA97-NIC
//             }
//         }
//     }
// }
// }

group SAP_DVEBMGS01 (
 SystemList = { SAPVM21 = 0 }
 UserAssoc = { Type = SAPWin, Name = SAP_DVEBMGS01, UITimeout = 300 }
 )

 IP SAP_DVEBMGS01-IP (
  Address = "10.209.69.191"
  SubNetMask = "255.255.252.0"
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  )

 Lanman SAP_DVEBMGS01-Lanman-sapapp (
  VirtualName = sapapp
  IPResName = SAP_DVEBMGS01-IP
  )

 NIC SAP_DVEBMGS01-NIC (
  MACAddress @SAPVM21 = "00:50:56:B7:18:36"
  )

 SAPWebAS SAP_PI7_DVEBMGS01_res (
  SAPAdmin = pi7adm
  SAPAdminDomain = sap-domain
  SAPAdminPassword = gumSjuJogMhmImjMkmL
  SAPHome = "E:\\usr\\sap\\PI7\\DVEBMGS01\\exe"
```

```
 SAPHost = sapapp
 SAPServiceUser = SAPServicePI7
 SAPSID = PI7
 InstName = DVEBMGS01
 InstProfile = "\\\\sapenq\\sapmnt\\PI7\\SYS\\profile\\
 PI7_DVEBMGS01_sapapp"
 ProcMon = { "disp+work.exe" }
 )

requires group SAP_ASCS00 online global soft
SAP_PI7_DVEBMGS01_res requires SAP_DVEBMGS01-Lanman-sapapp
SAP_DVEBMGS01-IP requires SAP_DVEBMGS01-NIC
SAP_DVEBMGS01-Lanman-sapapp requires SAP_DVEBMGS01-IP


// resource dependency tree
//
// group SAP_DVEBMGS01
// {
// SAPWebAS SAP_PI7_DVEBMGS01_res
//     {
//     Lanman SAP_DVEBMGS01-Lanman-sapapp
//         {
//         IP SAP_DVEBMGS01-IP
//             {
//             NIC SAP_DVEBMGS01-NIC
//             }
//         }
//     }
// }


group VCSInfraSG (
 SystemList = { SAPVM21 = 0, SAPVM22 = 1 }
 UserAssoc = { Type = "vcs internal",
   Name = "VCS Infrastructure service group" }
 Parallel = 1
 AutoStartList = { SAPVM21, SAPVM22 }
 OnlineRetryLimit = 5
 )

 Process VCSNotifySinkRes (
  StartProgram = "C:\\Program Files\\Veritas\\Cluster Server\\bin
```

```
 \\notify_sink.exe"
 StartupDirectory = "C:\\Program Files\\Veritas\\Cluster Server\\bin"
 )



// resource dependency tree
//
// group VCSInfraSG
// {
// Process VCSNotifySinkRes
// }
```