Installing Highly Available SAP Systems on Oracle Solaris 11 for Oracle Solaris Cluster 4.x
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1 Introduction to Oracle Solaris Cluster 4.x and HA SAP System

This document describes how to install highly available SAP system on Oracle Solaris 11 with Oracle Solaris Cluster 4.0 or Oracle Solaris Cluster 4.1. The procedure in this article can be used to install highly available SAP application on Oracle Solaris Cluster version 4.0 and version 4.1.

Oracle Solaris Cluster is a high availability cluster hardware and software product for the Oracle Solaris operating system. It is used to improve the availability of hardware and software services and business continuity. Oracle Solaris Cluster operates by having redundant computers known as cluster nodes, the Solaris Cluster framework software, and cluster agents for the applications to provide high availability. Applications are administrated and monitored in resource groups which consists of one or more resources. Resource groups can be configured as fail over or scalable, depending on the application requirement.

Zone clusters on Oracle Solaris Cluster provide administrative isolation with full service protection through fine-grained monitoring of applications, policy-based restart, and fail over within a virtual cluster.

Oracle Solaris Cluster 4.x supports all the SAP products based on SAP NetWeaver 7.0, 7.01, 7.02, 7.03, 7.10, 7.11, 7.20, 7.30, and 7.31 with SAP kernel version updated to at least 720_EXT patch level 300 or 721_EXT patch level 130. Oracle Solaris Cluster 4.1 supports all the SAP products based on SAP NetWeaver 7.4 with at least SAP kernel 740 patch level 36.

Following is a brief description of the types of SAP systems used in this article:

- **ABAP system** – The ABAP system contains the SAP Application Server ABAP. An ABAP system is developed and extended using ABAP. ABAP (Advanced Business Application Programming) is a high level programming language. Highly available SAP ABAP system consists of the following instances:
  - ASCS instance
  - Enqueue replication server instance
  - Database instance
  - Central instance or primary application server instance
  - (Optional) Dialog instance or additional application server instance

- **Java system** – The SAP Java system contains the SAP NetWeaver Application Server Java, it is developed and extended using Oracle’s object-oriented programming language Java. Highly available SAP Java system consists of the following instances:
  - SCS instance
  - Enqueue replication server instance
  - Database instance
  - Central instance or primary application server instance
  - (Optional) Dialog instance or additional application server instance
• **ABAP+Java double stack system** – A double stack system has both NetWeaver Application Server ABAP and NetWeaver Application Server Java in one system. Highly available SAP ABAP+Java system consists of the following instances:
  - ASCS instance
  - SCS instance
  - Database instance
  - Enqueue replication server instances (two instances)
  - Central instance or primary application server instance
  - (Optional) Dialog instance or additional application server instance

The Oracle Solaris Cluster Agent `ORCL.ha-netweaver` is fully qualified by Oracle and also certified by SAP on Oracle Solaris Cluster 4 and Oracle Solaris Cluster 3.3. The agent provides administrative and monitoring functions for SCS, ERS, PAS and AAS instances to ensure that these instances are highly available. The agent is also integrated with `sapstartsrv`.

The procedure in this article uses a two node Oracle Solaris Cluster 4 system that is installed with Oracle Solaris 11 as an example. Two SAP systems, **BMW** and **BNZ**, are to be installed. The SAP system **BMW** is an ABAP system. The SAP system **BNZ** is a Java system. The SAP systems are installed with Oracle Database 11.2.0.3.

## 2 Configuring Zone Clusters in the Oracle Solaris Cluster 4.x

There are two physical cluster nodes `pstar1` and `pstar2` in the cluster `pstar`. For each SAP system, two Oracle Solaris zone clusters, `vzstar1a/vzstar2a` and `vzstar1b/vzstar2b` are created respectively on the Oracle Solaris Cluster.
Illustration 1: Structure of Two HA SAP systems on Two Zone Clusters

Illustration 1 shows the structure of the two HA SAP systems on the two zone clusters of a two-node Oracle Solaris Cluster. The ABAP SAP system BMW is installed in the vzstar1a zone and is able to fail over to the vzstar2a zone. The BMW system consists of the following five SAP instances:

- **ASCS**: ABAP message server and enqueue server which is installed on logical host star-5
- **ERS**: Enqueue replication server which is installed on logical host star-6
- **DB**: Oracle database which is installed on logical host star-8
- **PAS**: Primary application server (former central instance: DVEBMGS) which is installed on logical host star-7
- **AAS**: Additional application server (former dialog instance) which is installed on logical host star-9

Each of the five instances is installed on its own logical host and is able to fail over to the other cluster node. ASCS and ERS instances run on different cluster nodes to provide high availability for the SAP
enqueue lock table. The other instances may run on any cluster node.

The Java SAP system \textbf{BNZ} is installed in the \texttt{vzstar1b} zone and is able to fail over to the \texttt{vzstar2b} zone. The \textbf{BNZ} system consists of the following six SAP instances:

- **SCS**: Java message server and enqueue server which is installed on logical host \texttt{star-11}
- **ERS**: Enqueue replication server which is installed on logical host \texttt{star-12}
- **DB**: Oracle database which is installed on logical host \texttt{star-14}
- **PAS**: Primary application server (former Central Instance: JCxx) which is installed on logical host \texttt{star-13}
- **AAS (2)**: Additional application server (former dialog instance) which is installed on physical hosts

The SCS, ERS, DB and PAS instances are installed on four logical hosts and are able to fail over to the other cluster node separately. SCS and ERS instances run on different cluster nodes to provide high availability for the SAP enqueue lock table. The two AAS instances are installed on physical hosts and are configured as multiple master resource.

Before you begin, ensure that the following requirements are met:

- On Oracle Solaris 11, SAP requires at least Oracle Solaris 11 SRU 1 and Oracle Solaris Cluster 4.0 SRU4.
- You need a two node Oracle Solaris Cluster 4 installed with Oracle Solaris 11. For more information about Oracle Solaris Cluster 4, see \textit{Oracle Solaris Cluster 4 Documentation}.

Perform the following steps to install and configure zone clusters for installing highly available SAP system:

1. Install the ha-cluster packages and configure the cluster nodes.
   a) Set the ha-cluster publisher on all nodes.
   
   

   

   root@pstar1:$ pkg set-publisher -p http://xxxx.us.oracle.com/ha-cluster/support/
   pkg set-publisher:
   Added publisher(s): ha-cluster

   b) Install the ha-cluster packages on all nodes and run scinstall on one node.

   root@pstar1# pkg install ha-cluster-full
   pstar2# pkg install ha-cluster-full
   pstar1# /usr/cluster/bin/scinstall

   c) Edit the nsswitch.conf file on all nodes.

   root@pstar1:$ svccfg -s svc:/system/name-service/switch
   svc:/system/name-service/switch> setprop config/password = astring: "files [NOTFOUND=return] nis [TRYAGAIN=0]"
   svc:/system/name-service/switch> setprop config/group = astring: "files [NOTFOUND=return] nis [TRYAGAIN=0]"
   svc:/system/name-service/switch> setprop config/publickey = astring: "files [NOTFOUND=return] nis [TRYAGAIN=0]"
   svc:/system/name-service/switch> setprop config/project = astring: "files [NOTFOUND=return] nis [TRYAGAIN=0]"
2. Create a 100 GB file system for the SAP ABAP system and another 100 GB file system for the SAP JAVA system using Solaris Volume Manager.

   a) Create `metadb` on both the nodes.

   ```
   root@pstar1:~# metadb -a -f -c 3 c0t5000C5001B07FB3Bd0s3
   root@pstar1:~# metadb
   |
   | flags  first  blk    block  count
   | name   type  start     size
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>u</td>
<td>16</td>
</tr>
</tbody>
</table>
   | /dev/dsk/c0t5000C5001B07FB3Bd0s3
   | a      | u    | 8208          | 8192   |
   | /dev/dsk/c0t5000C5001B07FB3Bd0s3
   | a      | u    | 16400         | 8192   |
   | /dev/dsk/c0t5000C5001B07FB3Bd0s3
   ```

   b) Create the metasets. Run the `metaset` command on one node only.

   ```
   root@pstar1:~# metaset -s sap_abap -a -h pstar1 pstar2
   root@pstar1:~# metaset -s sap_java -a -h pstar1 pstar2
   ```

   c) Add devices to the metasets. Run the `metaset` command on one node only.

   ```
   root@pstar1:~# metaset -s sap_abap -a /dev/did/rdsk/d3 /dev/did/rdsk/d4
   /dev/did/rdsk/d5 /dev/did/rdsk/d6 /dev/did/rdsk/d7 /dev/did/rdsk/d8 /dev/did/rdsk/d9 /dev/did/rdsk/d10
   /dev/did/rdsk/d11 /dev/did/rdsk/d12 /dev/did/rdsk/d13 /dev/did/rdsk/d14 /dev/did/rdsk/d15 /dev/did/rdsk/d16
   /dev/did/rdsk/d17 /dev/did/rdsk/d18 /dev/did/rdsk/d19 /dev/did/rdsk/d20 /dev/did/rdsk/d21 /dev/did/rdsk/d22
   root@pstar1:~# metaset -s sap_java -a /dev/did/rdsk/d23 /dev/did/rdsk/d24 /dev/did/rdsk/d25
   /dev/did/rdsk/d26 /dev/did/rdsk/d27 /dev/did/rdsk/d28 /dev/did/rdsk/d29 /dev/did/rdsk/d30
   /dev/did/rdsk/d31 /dev/did/rdsk/d32
   ```

   d) Configure metadevices using the `metainit` utility. Run the `metainit` utility on one node only.

   ```
   root@pstar1:~# metainit -s sap_abap d2 6 1 /dev/did/rdsk/d3s0 1 /dev/did/rdsk/d4s0 1 /dev/did/rdsk/d5s0 1 /dev/did/rdsk/d6s0 1 /dev/did/rdsk/d7s0 1
   /dev/did/rdsk/d8s0
   sap_abap/d2: Concat/Stripe is setup
   root@pstar1:~# metainit -s sap_abap d3 6 1 /dev/did/rdsk/d9s0 1 /dev/did/rdsk/d10s0 1 /dev/did/rdsk/d11s0 1 /dev/did/rdsk/d12s0 1
   root@pstar1:~# metainit -s sap_java d2 6 1 /dev/did/rdsk/d13s0 1 /dev/did/rdsk/d14s0 1 /dev/did/rdsk/d15s0 1 /dev/did/rdsk/d16s0 1
   /dev/did/rdsk/d17s0 1 /dev/did/rdsk/d18s0 1 /dev/did/rdsk/d19s0 1 /dev/did/rdsk/d20s0 1
   /dev/did/rdsk/d21s0 1 /dev/did/rdsk/d22s0
   root@pstar1:~# metainit -s sap_java d3 6 1 /dev/did/rdsk/d23s0 1 /dev/did/rdsk/d24s0 1 /dev/did/rdsk/d25s0 1
   /dev/did/rdsk/d26s0 1 /dev/did/rdsk/d27s0 1 /dev/did/rdsk/d28s0 1 /dev/did/rdsk/d29s0 1 /dev/did/rdsk/d30s0 1
   /dev/did/rdsk/d31s0 /dev/did/rdsk/d32s0
   ```

   e) Mirror the devices.
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```
root@pstar1:~# metainit -s sap_abap d1 -m d2
sap_abap/d1: Mirror is setup
root@pstar1:~# metattach -s sap_abap d1 d3
sap_abap/d1: submirror sap_abap/d3 is attached
root@pstar1:~# metainit -s sap_java d1 -m d2
root@pstar1:~# metattach -s sap_java d1 d3
sap_java/d1: submirror sap_java/d3 is attached
```

f) Type `metastat` to display the metadevice status.

```
root@pstar1:~# metastat -s sap_abap -p
sap_abap/d1 -m /dev/md/sap_abap/rdsk/d1 /dev/md/sap_abap/rdsk/d3 1
sap_abap/d2 6 1 /dev/did/rdsk/d3s0 \ 1 /dev/did/rdsk/d4s0 \ 1 /dev/did/rdsk/d5s0 \ 1 /dev/did/rdsk/d6s0 \ 1 /dev/did/rdsk/d7s0 \ 1 /dev/did/rdsk/d8s0

root@pstar1:~# metastat -s sap_java -p
.sap_java/d1 -m /dev/md/sap_java/rdsk/d1 /dev/md/sap_java/rdsk/d3 1
.sap_java/d2 6 1 /dev/did/rdsk/d17s0 \ 1 /dev/did/rdsk/d18s0 \ 1 /dev/did/rdsk/d19s0 \ 1 /dev/did/rdsk/d20s0 \ 1 /dev/did/rdsk/d21s0 \ 1 /dev/did/rdsk/d22s0

root@pstar1:~# metastat -s sap_abap -p
.sap_abap/d2 6 1 /dev/did/rdsk/d3s0 \ 1 /dev/did/rdsk/d4s0 \ 1 /dev/did/rdsk/d5s0 \ 1 /dev/did/rdsk/d6s0 \ 1 /dev/did/rdsk/d7s0 \ 1 /dev/did/rdsk/d8s0

root@pstar1:~# metastat -s sap_java -p
.sap_java/d2 6 1 /dev/did/rdsk/d17s0 \ 1 /dev/did/rdsk/d18s0 \ 1 /dev/did/rdsk/d19s0 \ 1 /dev/did/rdsk/d20s0 \ 1 /dev/did/rdsk/d21s0 \ 1 /dev/did/rdsk/d22s0
```

```
g) Construct a UFS file system using `newfs` utility. Run the `newfs` utility on one node only.

```
root@pstar1:~# newfs /dev/md/sap_abap/rdsk/d1
newfs: construct a new file system /dev/md/sap_abap/rdsk/d1: (y/n)? y
root@pstar1:~# newfs /dev/md/sap_java/rdsk/d1
newfs: construct a new file system /dev/md/sap_java/rdsk/d1: (y/n)? y
```

h) Add the following entries in the `/etc/vfstab` file in all the global zone nodes.

```
/dev/md/sap_abap/dsk/d1  /dev/md/sap_abap/rdsk/d1  /sap_abap  ufs 2 yes
/dev/md/sap_java/dsk/d1  /dev/md/sap_java/rdsk/d1  /sap_java  ufs 2 yes
```

3. Install and configure zone clusters `zc_sap_abap` and `zc_sap_java`. 

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a) Create a file `zc_sap_abap` with the following contents on one of the global zone nodes.

```plaintext
create
globalsearchpath=/export/zone
set autoboot=true

add node
set physical-host=pstar1
set hostname=vzstar1a
add net
set address=10.134.108.186
end
end

add node
set physical-host=pstar2
set hostname=vzstar2a
add net
set address=10.134.108.192
end
end

add net
set address=star-5
end
add net
set address=star-6
end
add net
set address=star-7
end
add net
set address=star-8
end
add net
set address=star-9
end

commit
exit
```

b) Create a file `zc_sap_java` with the following contents on one of the global zone nodes.

```plaintext
create
globalsearchpath=/export/zone2
set autoboot=true

add node
set physical-host=pstar1
set hostname=vzstar1b
add net
set address=10.134.108.187
end
```
c) Install and configure the zone clusters.

```bash
pstar1# mkdir -p /export/zone
pstar2# mkdir -p /export/zone
pstar1# mkdir -p /export/zone2
pstar2# mkdir -p /export/zone2
pstar1# chmod 700 /export/zone
pstar2# chmod 700 /export/zone
pstar1# chmod 700 /export/zone2
pstar2# chmod 700 /export/zone2
pstar1# clzonecluster configure -f zc_sap_abap zc_sap_abap
pstar1# clzonecluster verify zc_sap_abap
pstar1# clzonecluster install zc_sap_abap
pstar1# clzonecluster boot zc_sap_abap
pstar1# clzonecluster status zc_sap_abap
pstar1# zoneadm list
global
zc_sap_abap
root@pstar1:~# zlogin -C zc_sap_abap
pstar1# clzonecluster configure -f zc_sap_java zc_sap_java
pstar1# clzonecluster verify zc_sap_java
pstar1# clzonecluster install zc_sap_java
pstar1# clzonecluster boot zc_sap_java
pstar1# clzonecluster status zc_sap_java
pstar1# zlogin -C zc_sap_java
```
Note – You might have to configure the host name and NIS information manually.

4. Add the file system to the zone clusters. Perform this step on one node only.

```
root@pstar1:~# clzc configure zc_sap_abap
clzc:zc_sap_abap> add fs
clzc:zc_sap_abap:fs> set dir=/sap_abap
clzc:zc_sap_abap:fs> set special=/sap_abap
clzc:zc_sap_abap:fs> set type=lofs
clzc:zc_sap_abap:fs> end
clzc:zc_sap_abap> verify
clzc:zc_sap_abap> commit
clzc:zc_sap_abap> exit

root@pstar1:~# clzc configure zc_sap_java
clzc:zc_sap_java> add fs
clzc:zc_sap_java:fs> set dir=/sap_java
clzc:zc_sap_java:fs> set special=/sap_java
clzc:zc_sap_java:fs> set type=lofs
clzc:zc_sap_java:fs> end
clzc:zc_sap_java> verify
clzc:zc_sap_java> commit
clzc:zc_sap_java> exit
```

5. Use `hasp` to mount the file systems in the zone clusters.

```
root@vzstar1a:~# clrg create -S hasp4sapabap-rg
root@vzstar1a:~# clrs create -g hasp4sapabap-rg -t SUNW.HAStoragePlus -p FileSystemMountPoints=/sap_abap hasp4sapabap
root@vzstar1a:~# clrg manage hasp4sapabap-rg
root@vzstar1a:~# clrg online hasp4sapabap-rg
root@vzstar1a:~# clrs status

=== Cluster Resources ===

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Node Name</th>
<th>State</th>
<th>Status Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>hasp4sapabap</td>
<td>vzstar1a</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2a</td>
<td>Online</td>
<td>Online</td>
</tr>
</tbody>
</table>

root@vzstar1b:~# clrg create -S hasp4sapjava-rg
root@vzstar1b:~# clrt register SUNW.HAStoragePlus
root@vzstar1b:~# clrs create -g hasp4sapjava-rg -t SUNW.HAStoragePlus -p FileSystemMountPoints=/sap_java hasp4sapjava
root@vzstar1b:~# clrg manage hasp4sapjava-rg
root@vzstar1b:~# clrg online hasp4sapjava-rg
root@vzstar2b:~# clrs status -g hasp4sapjava-rg

=== Cluster Resources ===

<table>
<thead>
<tr>
<th>Resource Name</th>
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<th>State</th>
<th>Status Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>hasp4sapjava</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online</td>
</tr>
</tbody>
</table>
```

6. Add 50 GB of swap space to all the zone cluster nodes, using the secondary local disks.

   a) Add the following entries in the `/etc/vfstab` file in the global zone.
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```
<table>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
<th>Used</th>
<th>Free</th>
<th>Swap</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/dsk/c0t5000C5001B07F877d0s4</td>
<td>-</td>
<td>-</td>
<td>swap</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>/dev/dsk/c0t5000C5001B07F877d0s5</td>
<td>-</td>
<td>-</td>
<td>swap</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>
```

b) Add swap in the global zone.

```
root@pstar2:~# swap -a /dev/dsk/c0t5000C5001B07F877d0s4
root@pstar2:~# swap -a /dev/dsk/c0t5000C5001B07F877d0s5
```

c) Add capped-memory to the zone clusters.

```
root@pstar1:~# clzc configure zc_sap_abap
clzc:zc_sap_abap> add capped-memory
clzc:zc_sap_abap:capped-memory> set swap=50G
clzc:zc_sap_abap:capped-memory> end
clzc:zc_sap_abap> verify
clzc:zc_sap_abap> exit
root@pstar1:~# clzc configure zc_sap_java
clzc:zc_sap_java> add capped-memory
clzc:zc_sap_java:capped-memory> set swap=50G
clzc:zc_sap_java:capped-memory> end
clzc:zc_sap_java> verify
clzc:zc_sap_java> exit
```

7. Install the additional Oracle Solaris 11 packages required for SAP on all the global zones on both the cluster nodes.

```
pkg install solaris-large-server
pkg install solaris-desktop
pkg install system/header
pkg install motif
pkg install unrar
pkg install xclock
pkg install expect
pkg install library/medialib
pkg install pkg:/developer/library/lint
pkg install pkg:/compatibility/ucb
pkg change-facet facet.locale.*=True
pkg install system/input-method/iiim
pkg install pkg:/system/locale/extra
pkg install pkg:/library/motif/libdpstkxm
```

8. Enable the additional Oracle Solaris 11 services required by SAP.

```
svcadm enable svc:/application/graphical-login/gdm:default
svcadm enable svc:/network/login:rlogin
svcadm enable svc:/network/shell:default
```

9. Update the `/etc/system` file with the parameters required for SAP on Oracle Solaris 11. Update the following parameters on all the global zones on both the cluster nodes and reboot the cluster.

```
* SAP Parameter
set max_nprocs=30000 # required for Oracle Database
set pg_contig_disable=1 # not for x86_64, only for SPARC
set rlim_fd_cur=8192 # may also be set as project parameter
# see SAP note 724713
```

10. Enable the root user login through ssh during the installation. Modify the
Installing Highly Available SAP Systems on Oracle Solaris 11 for Oracle Solaris Cluster 4

/etc/ssh/sshd_config file to set PermitRootLogin to yes for ssh. Then, restart ssh service. You can disable root login permissions after SAP is installed.

```
vzstar1a:/ # vi /etc/ssh/sshd_config
vzstar1a:/ # svcadm restart ssh
```

11. (Optional) Since all SAP users are set locally on cluster, the name service client, for example NIS client, can be shut down during SAP installation. Otherwise, the `sapinst` utility could take a long time to go through the user information to check installed SAP systems. To disable the name service client, you must edit the `/etc/nsswitch.conf` file and disable the service with the `svcadm` command. The `/etc/nsswitch.conf` file is overwritten with every reboot. Hence, there is no problem modifying this file temporarily for the SAP installation. You can re-enable the name service client after the SAP installation.

```
vzstar1a:/ # vi /etc/nsswitch.conf
# comment out the old passwd and group entries, add new ones
#passwd: files [NOTFOUND=return] nis [TRYAGAIN=0]
#group: files [NOTFOUND=return] nis [TRYAGAIN=0]
passwd: files
group: files
vzstar1a:/ # svcs -a | grep nis
  online 2:38:23 svc:/network/nis/domain:default
  online 2:38:32 svc:/network/nis/client:default
vzstar1a:/ # svcadm disable svc:/network/nis/client:default
vzstar1a:/ # ypcat passwd
can't communicate with ypbind
vzstar1a:/ #
```

12. Although all the host names are registered in DNS, you may add the physical and logical host names in the `/etc/hosts` file on all the zone cluster nodes.

```
root@vzstar1a:~# more /etc/hosts

#  # Internet host table
#::1 localhost
127.0.0.1 localhost loghost
10.134.108.186 vzstar1a vzstar1a.us.oracle.com # Cluster Node
10.134.108.192 vzstar2a vzstar2a.us.oracle.com
10.134.108.187 vzstar1b vzstar1b.us.oracle.com
10.134.108.193 vzstar2b vzstar2b.us.oracle.com
10.134.108.48 star-1 star-1.us.oracle.com
10.134.108.49 star-2 star-2.us.oracle.com
10.134.108.89 star-5 star-5.us.oracle.com
10.134.108.90 star-6 star-6.us.oracle.com
10.134.108.91 star-7 star-7.us.oracle.com
10.134.108.128 star-8 star-8.us.oracle.com
10.134.108.129 star-9 star-9.us.oracle.com
10.134.108.158 star-10 star-10.us.oracle.com
10.134.108.159 star-11 star-11.us.oracle.com
10.134.108.176 star-12 star-12.us.oracle.com
10.134.108.177 star-13 star-13.us.oracle.com
10.134.108.190 star-14 star-14.us.oracle.com
root@vzstar1a:~#
```
3 Preparation for Installing a Highly Available SAP System on Oracle Solaris Cluster 4.x

1. Even if you have received the DVDs shipped from SAP, check for the latest sap installation packages available at the SAP Service Market Place [http://service.sap.com/swdc](http://service.sap.com/swdc). Download the latest packages to the local folder of the installation host. Do not put these packages on NFS or on the Global File System. For example, for SAP NetWeaver 7.30 on Solaris SPARC and Oracle 11.2.0.3, download the packages given in the following tables.

**Table 1: SAP Packages**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EXE</td>
<td>NW 7.3 ABAP Installation Export 1/2</td>
<td>Info</td>
<td>976563</td>
<td>09.10.2012</td>
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<tr>
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<td>Info</td>
<td>899724</td>
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<td>Info</td>
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<td>09.10.12</td>
</tr>
<tr>
<td>RAR</td>
<td>NW 7.3 Java 3/6</td>
<td>Info</td>
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<td>09.10.12</td>
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<tr>
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<tr>
<td>RAR</td>
<td>NW 7.3 Java 6/6</td>
<td>Info</td>
<td>439165</td>
<td>09.10.12</td>
</tr>
</tbody>
</table>

**Table 2: Oracle Packages**

If you could not find the Oracle database 11.2.0.3 packages in the above place, you may get them from [Software Downloads ➔ SAP Software Download Center ➔ Database and Database Patches ➔ Oracle ➔ Database ➔ Oracle 64-BIT ➔ Oracle 11.2 64-BIT ➔ Installation ➔ Solaris ➔ Oracle Database](http://service.sap.com/swdc).

<table>
<thead>
<tr>
<th>EXE</th>
<th>ORACLE RDBMS 11.2.0.3 SOL. SPARC 64 1 of 6</th>
<th>Info</th>
<th>976563</th>
<th>16.12.2011</th>
</tr>
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<tbody>
<tr>
<td>RAR</td>
<td>ORACLE RDBMS 11.2.0.3 SOL. SPARC 64 2 of 6</td>
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<td>RAR</td>
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<td>16.12.2011</td>
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<tr>
<td>RAR</td>
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<td>Info</td>
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<tr>
<td>RAR</td>
<td>ORACLE RDBMS 11.2.0.3 SOL. SPARC 64 5 of 6</td>
<td>Info</td>
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<td>16.12.2011</td>
</tr>
<tr>
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<td>Info</td>
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<tr>
<td>ZIP</td>
<td>ORACLE Client 11.2.0.3</td>
<td>Info</td>
<td>616997</td>
<td>27.04.2012</td>
</tr>
</tbody>
</table>

**Table 3: SWPM Package**

Download the new `sapinst` tool SWPM available at the SAP Service Market Place from [Software Downloads ➔ SAP Software Download Center ➔ Installations and Upgrades ➔ A-Z Index ➔ N ➔ SAP](http://service.sap.com/swdc).
Installing Highly Available SAP Systems on Oracle Solaris 11 for Oracle Solaris Cluster 4

For SAP product based on NW7.1x, NW 7.3x and NW7.4, choose SWPM*:
**SWPM10SP02_1-20009702.SAR Software Provisioning Manager 1.0 SP 2 for NW higher than 7.0x**

For SAP product based on NW7.0x, choose 70SWPM*:
**70SWPM10SP02_1-20009702.sar Software Provisioning Manager 1.0 SP 02 for NW 7.0x**

*Table 4: SAP Kernel Package for SWPM*

| Software Downloads ➔ SAP Software Download Center ➔ Installations and Upgrades ➔ A-Z Index ➔ N ➔ SAP NETWEAVER ➔ SAP NETWEAVER 7.3 ➔ Kernel for installation/SWPM ➔ SAP KERNEL 7.20_EXT 64-BIT UC ➔ Installation ➔ Solaris |

Choose the following package for Solaris SPARC on Solaris 11:
**51045219_3 720_EXT UC Kernel for SWPM - Solaris on SPARC 64bit**

For more information about SWPM, see the SAP note 1680045: Release Note for Software Provisioning Manager 1.0. The SAP note is available at the SAP Service Marketplace [http://service.sap.com/notes](http://service.sap.com/notes).

2. (Optional) If you are installing an ABAP System and you have not downloaded the latest SWPM package, you can install SAP with the original Installation Master and SAP kernel DVD of the product with workarounds. If you see an error in connecting to the database during the installation, then unpack **DBATOOLS** package listed in Table 6. Unpack the **DBATOOLS** package to the executable folder. After the installation, switch the SAP Kernel to at least 720_EXT patch level 300 or 721_EXT patch level 130.

3. (Optional) If you are installing a Java or ABAP+Java system and you have not downloaded the latest SWPM package then, before the installation, download the SAP kernel with the corresponding IGS, IGS helper, SAPJVM, and the DBATOOLS packages. During the installation, provide the location of the downloaded package when prompted by the **sapinst** utility. After the installation, change the kernel version to at least 720_EXT patch level 300. For releases originally shipped with 720 or 720_EXT kernel, download the latest 720_EXT patch level. For more information see SAP note 1669684 and SAP note 1643799. For example, for installing SAP NetWeaver 7.3, download the packages given in the following table. These package are available at SAP Service Market Place, [http://service.sap.com/swdc](http://service.sap.com/swdc).
Use the original SAPDIAGNOSTICS.SAR during the installation. Otherwise, you might see an issue when unpacking the package.

4. You can extract the downloaded files using `unrar`, `unzip`, and `SAPCAR`. Create new sub folders to place the packages and unpack them from the sub folders.

After you unzip the installation master package, you may find the `SAPCAR` executable in the folder.

```
root@vzstar1a:/sapinstall/NW730# /usr/bin/unrar x <packagename_part1.exe>
root@vzstar1a:/sapinstall/NW730# unzip <packagename.zip>
root@vzstar1a:/sapinstall/NW730/SWPM# /sapinstall/NW730/IM/SAPCAR -xvf SWPM10SP01_6.SAR
SAPCAR: processing archive SWPM10SP01_6.SAR (version 2.01)
SAPCAR: 1109 file(s) extracted
root@vzstar1a:/sapinstall/NW730/SWPM# ls
BS2008 COMMON NW730 resourcepool.xml
BS2010 LABEL.ASC NW731 resources.dtd
BS2011 messages.dtd product.catalog sapinst
catalog.dtd messages.xml PVIND sapinstgui
```

5. (Optional. If you have not downloaded the latest `SWPM` package or, the `SWPM` does not support the SAP version you want, then you may adjust the installation master DVD.) For Oracle Client 11.2.0.3, download `adaptDVD.zip` from SAP note 1642058. Unzip the file and execute the `adaptDvd.sh` file from the local installation master DVD folder.

```
root@vzstar1a:/sapinstall/NW730# unzip adaptDvd.zip
root@vzstar1a:/sapinstall/NW730# cd 51042312
root@vzstar1a:/sapinstall/NW730/51042312# cp ../adaptDvd.sh .
root@vzstar1a:/sapinstall/NW730/51042312# chmod +x adaptDvd.sh
```
root@vzstar1a:/sapinstall/NW730/51042312# ls -al
 total 318
 drwxr-xr-x 4 root root 20 May 14 03:56 .
 drwxr-xr-x 6 root root 27 May 14 03:55 ..
 -rwxr-xr-x 1 root root 61 Jan 13 13:34 CDLABEL.ASC
 -rwxr-xr-x 1 root root 61 Jan 13 13:41 CDLABEL.EBC
 -rwxr-xr-x 1 root root 37223 Dec 21 16:25 COPY_TM.HTM
 -rwxr-xr-x 1 root root 7153 Dec 21 16:25 COPY_TM.TXT
 drwxr-xr-x 49 root root 50 Jan 4 16:01 DATA_UNITS
 -rwxr-xr-x 1 root root 20 Jan 13 13:34 LABEL.ASC
 -rwxr-xr-x 1 root root 20 Jan 13 13:41 LABEL.EBC
 -rwxr-xr-x 1 root root 12 Aug 8 2011 LABELIDX.ASC
 -rwxr-xr-x 1 root root 53995 Jan 13 13:41 MD5FILE.DAT
 -rwxr-xr-x 1 root root 145511 Jan 13 13:42 MID.XML
 drwxr-xr-x 16 root root 16 Jul 9 2010 MIDBOOT
 -rwxr-xr-x 1 root root 66 Sep 14 2010 PRODLABEL
 -rwxr-xr-x 1 root root 72933 Jan 13 13:42 SHAFILE.DAT
 -rwxr-xr-x 1 root root 5383 Jan 22 2009 STARTUP
 -rwxr-xr-x 1 root root 4219 May 7 2009 STARTUP.BAT
 -rwxr-xr-x 1 root root 68 Jan 13 13:34 VERSION.ASC
 -rwxr-xr-x 1 root root 68 Jan 13 13:41 VERSION.EBC
 -rwxr-xr-x 1 root root 728 May 14 03:56 adaptDvd.sh
 root@vzstar1a:/sapinstall/NW730/51042312# sh adaptDvd.sh.

Note - The period at the end means the current folder.

6. Before installing the Oracle database, create the necessary users, groups and projects for the SAP system. You must be the root user or the executive root user for installing a SAP system. For example, following are the entries present in the /etc/passwd, /etc/group, /etc/project, and /etc/user_attr files for the BMW system. In this procedure, the executive root user emroot is used for the installation. You may also use the root user. For more information, see the SAP note 724713.

root@vzstar1a:/etc# more /etc/group
root::0:
 ... sapinst::100:root,sapadm,bmwadm,orabmw,daadm
 sapsys::101:
 dba::102:bmwadm,oracle
 oper::103:bmwadm,orabmw
 oinstall::104:

root@vzstar1a:/etc# more /etc/passwd
root:x:0:0:Super-User:/root:/usr/bin/bash
 ... emroot:x:0:1:executive root for SAP installation:/bin/tcsh
 bmwadm:x:60004:101:SAP System Administrator:/export/home/bmwadm:/bin/tcsh
 sapadm:x:60005:101:SAP System Administrator:/export/home/sapadm:/bin/tcsh
 orabmw:x:60006:102:SAP Database Administrator:/oracle/BMW:/bin/tcsh
 oracle:x:60007:104:Oracle Installation User:/export/home/oracle:/usr/bin/bash

root@vzstar1a:/etc# more /etc/project
system:0::
user.root:1:::
7. Create the file systems. Check if you are hit by the `cp -p` bug. Type the following command on the Global File System:

```
root@vzstar1a:/sap_abap# touch test
root@vzstar1a:/sap_abap# cp -p test test1 ; echo $?
2
```

If the files are successfully copied but the return code is not 0, then you are hit by the `cp -p` bug of global file system with Oracle Solaris 11. To workaround this, either install Oracle database directly on ASM/RAC or create `/oracle` temporarily on local file system for installation. After installation, you may move the `/oracle` directory to the global file system or migrate to ASM/RAC.

## 4 Installing a Highly Available SAP System on Oracle Solaris Cluster 4.x

Perform the following steps to install highly available NetWeaver 7.3 ABAP system. You can use the same steps to install highly available NetWeaver 7.3 Java system or any other SAP system based on SAP NetWeaver.

1. Log in as the `emroot` super user on the installation node.

2. Check the user limitation settings. Values for the `ulimit` settings are found in the `/etc/project` and the `/etc/user_attr` file. For more information about `ulimit` settings, see SAP note 724713: Parameter settings for Oracle Solaris 10 and above.
Installing Highly Available SAP Systems on Oracle Solaris 11 for Oracle Solaris Cluster 4

3. Create resource groups and logical host resources. Ensure that the logical hosts are running on the installation zone and are not shown in the deprecated state. The logical host star-5 is used for SCS instance. Create the resource group scs-rg in the local zone cluster, which includes the logical host star-5. Create the resource group ers-rg using the logical host star-6. Create the resource group pas-rg using the logical host star-7. Create the resource group oracle-rg using logical host star-8. Create the resource group aas-rg using the logical host star-9.

```
root@vzstar1a:/$ ulimit -a
core file size (blocks, -c) unlimited
data seg size (kbytes, -d) unlimited
file size (blocks, -f) unlimited
open files (-n) 8192
pipe size (512 bytes, -p) 10
stack size (kbytes, -s) 8192
cpu time (seconds, -t) unlimited
max user processes (-u) 29995
virtual memory (kbytes, -v) unlimited
root@vzstar1a:/$

root@vzstar1a:/# clrg list
hasp4sapabap-rg

root@vzstar1a:/# clrg create scs-rg

root@vzstar1a:/# clrslh create -g scs-rg star-5

root@vzstar1a:/# clrg create ers-rg

root@vzstar1a:/# clrg create ers-rg star-6

root@vzstar1a:/# clrg create pas-rg

root@vzstar1a:/# clrg create pas-rg star-7

root@vzstar1a:/# clrg create oracle-rg

root@vzstar1a:/# clrg create oracle-rg star-8

root@vzstar1a:/# clrg create aas-rg

root@vzstar1a:/# clrg create aas-rg star-9

root@vzstar1a:/# clrg online -eM +

root@vzstar1a:/# clrs status

=== Cluster Resources ===

Resource Name Node Name State Status Message
-----------------------------------------------
hasp4sapabap vzstar1a Online Online
vzstar2a Online Online
star-5 vzstar1a Online Online - LogicalHostname online. vzstar2a Offline Offline - LogicalHostname offline.

star-6 vzstar1a Online Online - LogicalHostname online. vzstar2a Offline Offline - LogicalHostname offline.

star-7 vzstar1a Online Online - LogicalHostname online. vzstar2a Offline Offline - LogicalHostname offline.

star-8 vzstar1a Online Online - LogicalHostname online. vzstar2a Offline Offline - LogicalHostname offline.

star-9 vzstar1a Online Online - LogicalHostname online. vzstar2a Offline Offline -
4. Ensure that all the logical hosts are online on the installation node. Check the status of the logical hosts by typing the `ifconfig -a` command. You might see that the logical hosts are shown as online in deprecated state. Take the logical host as not deprecated from the global zone. Make sure the logical hosts are not in deprecated status during the SAP installation using `sapinst` utility. After the installation, this is not required any more.

```bash
root@pstar1:/# ifconfig sc_ipmp0:3 -deprecated up
root@pstar1:/# ifconfig sc_ipmp0:4 -deprecated up
root@pstar1:/# ifconfig sc_ipmp0:5 -deprecated up
root@pstar1:/# ifconfig sc_ipmp0:6 -deprecated up
root@pstar1:/# ifconfig sc_ipmp0:7 -deprecated up
root@vzstar1a:/# ifconfig -a
lo0:1: flags=2001000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4,VIRTUAL> mtu 8232 index 1
zone zc_sap_abap
inet 127.0.0.1 netmask ff000000
sc_ipmp0: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
inet 10.134.108.50 netmask ffffff00 broadcast 10.134.108.255
groupname sc_ipmp0
sc_ipmp0:1: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
zone zc_sap_abap
inet 10.134.108.186 netmask ffffff00 broadcast 10.134.108.255
sc_ipmp0:3: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
zone zc_sap_abap
inet 10.134.108.89 netmask ffffff00 broadcast 10.134.108.255
sc_ipmp0:4: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
zone zc_sap_abap
inet 10.134.108.90 netmask ffffff00 broadcast 10.134.108.255
sc_ipmp0:5: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
zone zc_sap_abap
inet 10.134.108.128 netmask ffffff00 broadcast 10.134.108.255
sc_ipmp0:6: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
zone zc_sap_abap
inet 10.134.108.91 netmask ffffff00 broadcast 10.134.108.255
sc_ipmp0:7: flags=8001000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,IPMP> mtu 1500 index 2
zone zc_sap_abap
inet 10.134.108.129 netmask ffffff00 broadcast 10.134.108.255
clprivnet0: flags=1008843<UP,BROADCAST,RUNNING,MULTICAST,PRIVATE,IPv4> mtu 1500 index 6
inet 172.16.4.1 netmask ffffff00 broadcast 172.16.5.255
clprivnet0:3: flags=1008843<UP,BROADCAST,RUNNING,MULTICAST,PRIVATE,IPv4> mtu 1500 index 6
zone zc_sap_abap
```
5. Ensure that the installation zone is the primary node for storage. If not, switch the device group primary node to the installation zone.

6. To install the ASCS instance, in the installation zone create a temporary installation folder on local file system. Set the environment variable for DISPLAY. Change to the temporary installation folder and start sapinst utility with SAPINST_USE_HOSTNAME. The log files will be kept both in the installation folder and in the /tmp directory. You may delete the log files after the SAP installation.

7. In the sapinst GUI, choose the option SAP NetWeaver 7.3 → Oracle → SAP Systems → Application Server ABAP → High-Availability System → ASCS Instance as shown in the illustration 2. Click Next and follow the information in the sapinst GUI.
8. (Optional. Required only if you have not downloaded the kernel DVD for SWPM.) When the SAP System Archives dialog box appears, type the location of the downloaded SAP kernel archives:

- SAPEXE.SAR
- SAPEXEDB.SAR
- IGSEXE.SAR
- IGSHELPER.SAR
- SAPJVM.SAR
- DBATL.SAR.

Do not use downloaded SAPDIAGNOSTICS.SAR package. For an ABAP system, you may skip this step and update to kernel 720_EXT after the installation.

9. After the installation is completed, close the sapinst GUI.

10. Repeat steps 6 through 9 to install the enqueue replication server instance on logical host star-6.

```
root@vzstar1a:/# mkdir -p /sapinstall/log/ERS
root@vzstar1a:/# cd /sapinstall/log/ERS
root@vzstar1a:/sapinstall/log/ERS# /sapinstall/NW730/SWPM/sapinst SAPINST_USE_HOSTNAME=star-6
```

11. Repeat steps 6 through 9 to install the database instance on logical host star-8.

```
root@vzstar1a:/# mkdir -p /sapinstall/log/Oracle
root@vzstar1a:/# cd /sapinstall/log/Oracle
root@vzstar1a:/sapinstall/log/Oracle# /sapinstall/NW730/SWPM/sapinst SAPINST_USE_HOSTNAME=star-8
```

During the installation, a pop up window will appear prompting you to install the Oracle Database software. Follow the instructions described in the pop up window to install the Oracle database software.
bash-3.00$ ssh -X oraqo1@vzstar1a
Password:
Oracle Corporation SunOS 5.11 11.1 December 2012
vzstar1a:oraqo1 1% cd /oracle/stage/112_64/database/SAP/
vzstar1a:oraqo1 2% ./RUNINSTALLER

When the pop up window prompts to execute two scripts, log in as super user root or emroot. Execute the following commands and continue the database instance installation.

root@vzstar1a:/$ orainventory/orainstRoot.sh
root@vzstar1a:/$ BMW/112_64/root.sh

12. Repeat steps 6 through 9 to install the primary application server instance on the star-7 logical host.

root@vzstar1a:/# mkdir -p /sapinstall/log/PAS
root@vzstar1a:/# cd /sapinstall/log/PAS
root@vzstar1a:/sapinstall/log/PAS#
/sapinstall/NW730/SWPM/sapinst SAPINST_USE_HOSTNAME=star-7

13. (Optional) Repeat steps 6 through 9 to install the additional application server on the star-9 logical host.

root@vzstar1a:/# mkdir -p /sapinstall/log/AAS
root@vzstar1a:/# cd /sapinstall/log/AAS
root@vzstar1a:/sapinstall/log/AAS#
/sapinstall/NW730/SWPM/sapinst SAPINST_USE_HOSTNAME=star-9

5 Troubleshooting for SAP Installation

1. **Problem**: You need Oracle Database 11.2.0.3 to install SAP on Oracle Solaris 11. If you have not downloaded the latest SWPM package, the sapinst utility accepts only the Oracle Client version 10.

   **Workaround**: Stop the sapinst utility and download the adaptDVD.zip file from the SAP note 1642058. Unzip the file in the installation master DVD folder and execute the following command.

   sh adaptDVD.sh.
   or
   sh adaptDVD.sh <InstallationMaster_Folder>

   Delete all the old files in the temporary installation directory or create a new temporary installation folder. Restart installation of the database instance. For more information, see the SAP note 1642058. The new SWPM package accepts Oracle Database 11.2.0.3 for installing SAP on Oracle Solaris 11.

2. **Problem**: You might see a pop up error window in Install Instance Basics of ASCS with the error message, “could not stop the instance in … minutes”.

   **Workaround**: Check the sapinst.log log file in the installation folder. If you find the warning: installsapinit.sh exit with status 1, type the following commands:

   chown 0:sapsys /etc/init.d/sapinit
   chown 750 /etc/init.d/sapinit
   ln -s /etc/init.d/sapinit /etc/rc3.d/S90sapinit

3. **Problem**: If you are using the old sapinst utility, after repeated starts of the utility on SPARC, you might see the following error messages:
An unexpected error has been detected by SAP Java Virtual Machine: Internal Error (interpreter.cpp:358), pid=6569, tid=2
Error: guarantee(codelet_size > 0 && (size_t)codelet_size > *K,"not enough space for interpreter generation")

Workaround: You can choose from one on the following solutions to fix the error:

- Download the latest SWPM package and use the sapinst utility.
- Remove the temporary folders or files in /tmp/sapinst_exe.*. Do not remove the /tmp/sapinst_instdir directory.
- Reboot the server. After the reboot, switch the logical hosts to the installation server and make sure they are not in the deprecated state during the SAP installation. The /etc/nsswitch.conf file is overwritten with every reboot. If you modified it before, you may modify it again for the SAP installation.

4. Problem: If you are not using the latest Kernel DVDs for SWPM, during the installation of diagnostic instance, you might see the following error messages:

Execution of the command "/usr/sap/DAA/SYS/exe/uc/sun_64/sapcontrol
-prot NI_HTTP -nr 97 -function GetProcessList" finished with return code 255. Output:
Could not open the ICU common library.
The following files must be in the path described by the environment variable "LD_LIBRARY_PATH":
libicuuc.so.40, libicudata.so.40, libicui18n.so.40 [nlsui0_mt.c 1544]
pid = 23296
LD_LIBRARY_PATH is currently set to /usr/sap/DAA/SYS/exe/uc/sun_64 [nlsui0_mt.c 1547] pid = 23296
ERROR 2011-11-23 17:09:14.967
CJS-30087 Instance DAA/SMDA97 [PARTIAL] did not stop after 2:10 minutes. Giving up.

Workaround: Log in as the daadm user on the installation node. You can perform one of the following steps to fix the error messages:

- Copy the files: libicuuc.so.40, libicudata.so.40, and libicui18n.so.40 from the /sapmnt/<SID>/exe/uc/sun_64 folder to /usr/sap/DAA/SYS/exe/uc/sun_64 folder.
- Extract the library files from the downloaded SAPEXE.SAR to /usr/sap/DAA/SYS/exe/uc/sun_64.

5. Problem: The sapinst utility may be busy reading and writing the information required for installation. Use the following workaround to to check if the sapinst utility is busy reading and writing.

Workaround: Check the device group. Issue the iostat command from the host which holds the primary device group.

```
root@vzstar1a:/sap_abap# cldg status
root@vzstar1a:/sap_abap# iostat -xncz 3 3333
```

6. Problem: You might see the following error message displayed:
ERROR 2012-05-15 08:12:13.554
FSL-02007 Unable to set access rights of /sap_abap/usr/sap/DAA/SYS/exe/uc/sun_64/icmbnd.

**Workaround**: Switch the primary node for storage to the installation node. Click “try again”. This error occurs because SUID bit can only be set for a file on the global file systems from the primary node.

```bash
root@pstar1:~# cldg status
=== Cluster Device Groups ===
--- Device Group Status ---
Device Group Name Primary Secondary Status
----------------- -------- --------
sap_abap pstar2 pstar1 Online
sap_java pstar2 pstar1 Online

root@pstar1:~# cldg switch -n pstar1 sap_abap

root@pstar1:~# cldg status
=== Cluster Device Groups ===
--- Device Group Status ---
Device Group Name Primary Secondary Status
----------------- -------- --------
sap_abap pstar1 pstar2 Online
sap_java pstar2 pstar1 Online

root@pstar1:~#
```

6 Configuring Identical Oracle Solaris Cluster Nodes for SAP

1. Log in to a SAP system. For an ABAP system, log in using the SAP GUI. For a Java system, log in using the web browser. Verify that the SAP system is running on the installation node.

2. Log in as the **sidadm** user in the installation node. Stop the SAP system and the Oracle Database processes. Stop all the **sapstarsrv** services.

```bash
vzstar1a:bmwadm 3% stopsap
vzstar1a:bmwadm 4% sapcontrol -nr 00 -function StopServices
vzstar1a:bmwadm 5% sapcontrol -nr 01 -function StopServices
vzstar1a:bmwadm 6% sapcontrol -nr 10 -function StopServices
...
```

3. Log in as the **orasid** user in the installation node and stop the Oracle listener.

```bash
vzstar1a:orabmw 1% lsnrctl stop
```

4. Log in as the **root** user in the installation node and stop the SAP host agent.

```bash
root@vzstar1a:/# /usr/sap/hostctrl/exe/saphostexec -stop
```

5. Ensure that all the SAP system and Oracle database processes have been stopped.

```bash
root@vzstar1a:/# ps -ef | grep -i sap
root 29536 8587 0 01:26:47 pts/10 0:00 grep -i sap
root@vzstar1a:/# ps -ef | grep -i ora
root 29538 8587 0 01:26:52 pts/10 0:00 grep -i ora
root@vzstar1a:/#
```

6. If you have installed the Oracle database in the **/oracle** local file system, you may either migrate it to RAC/ASM or move it from the local file system to the global file system. To move the oracle

```bash
```
database to global file system, type the following command:

```
root@vzstar1a:/# cd /
root@vzstar1a:/# tar cfv oracle.tar Oracle
root@vzstar1a:/# cd /sap_abap
root@vzstar1a:/sap_abap# tar xfv /oracle.tar
root@vzstar1a:/sap_abap# cd /
root@vzstar1a:/# mv oracle oracle_local
root@vzstar1a:/# ln -s /sap_abap/oracle oracle
```

7. Copy the following files and folders from the installation node to the other nodes. Assign the same ownership and permissions to the files and folders, as in the installation node. You can create the tar files in the installation node as the `root` user and extract the tar files on the other nodes.

```
/* The following files should be made identical as on the installation node */
/etc/group
/etc/passwd
/etc/project
/etc/user_attr
/etc/shadow
/etc/services
/export/home
/var/opt/oracle (for Oracle Database)
/var/opt/oracle (for Oracle Database)
```

```
$ ssh -X -I root vzstar2a
Password:
Last login: Tue May 22 01:06:49 2012 from n1c65
Oracle Corporation SunOS 5.11 11.0 November 2011
You have new mail.
root@vzstar2a:~# cd /etc
root@vzstar2a:/etc# cp group group.old
root@vzstar2a:/etc# cp passwd passwd.old
root@vzstar2a:/etc# cp shadow shadow.old
root@vzstar2a:/etc# cp project project.old
root@vzstar2a:/etc# cp user_attr user_attr.old
root@vzstar2a:/etc# cp services services.old

root@vzstar2a:/etc# scp root@vzstar1a:/etc/group .
Password:
group 100% |***********************************| 503 00:00

root@vzstar2a:/etc# scp root@vzstar1a:/etc/passwd .
Password:
passwd 100% |***********************************| 1444 00:00

root@vzstar2a:/etc# scp root@vzstar1a:/etc/project .
Password:
project 100% |***********************************| 602 00:00

root@vzstar2a:/etc# scp root@vzstar1a:/etc/user_attr .
Password:
user_attr 100% |***********************************| 514 00:00
```
8. On the installation server vzstar1a, create a tar file that includes all the user home directories. Copy the tar file to the node vzstar2a.

```
root@vzstar1a:~/etc# scp root@vzstar1a:/etc/shadow .
Password: ...
```

```
root@vzstar2a:/etc# scp root@vzstar1a:/etc/services .
Password: ...
```

9. Create the /usr/local/bin and the /var/opt/oracle folders on the node vzstar2a. Copy the oracle files from the installation node to the node vzstar2a.

```
root@vzstar1a:~# cd /export
root@vzstar1a:/export# tar cfv home.tar home
root@vzstar2a:/etc# scp root@vzstar1a:/export/home.tar /export
Password: ...
```

```
root@vzstar2a:/etc# cd /export
root@vzstar2a:/export# ls
home home.tar
```

```
root@vzstar2a:/export# tar -xfv home.tar
```

10. Check all the folders and files to ensure that the files, folders, ownership, and permissions are identical to those on the installation node.

11. Set the symbolic link on the node vzstar2a as on the installation node.

```
root@vzstar2a:~# cd /
root@vzstar2a:/# ln -s /sap_abap/oracle oracle
root@vzstar2a:/# ln -s /sap_abap/sapmnt sapmnt
root@vzstar2a:/# ln -s /sap_abap/usrsap /usr/sap
```

12. Move the SAP host agent /usr/sap/hostctrl to the local file system on all the zone cluster nodes.

```
root@vzstar1a:~# mkdir /usr/sap_local
root@vzstar1a:/# cp -rp /usr/sap/hostctrl /usr/sap_local/
root@vzstar2a:/# mkdir /usr/sap_local
root@vzstar2a:/# cp -rp /usr/sap/hostctrl /usr/sap_local/
root@vzstar1a:/# mv /usr/sap/hostctrl /usr/sap/hostctrl.orig
root@vzstar2a:/# ln -s /usr/sap_local/hostctrl /usr/sap/hostctrl
```

13. Ensure that all the SAP system and Oracle database processes have been stopped on the installation node.

```
root@vzstar1a:~# ps -ef | grep -i sap
root@vzstar1a:~# ps -ef | grep -i ora
```
14. Identify the resource groups which have the logical host’s resources. Switch the resource groups to the node `vzstar2a` to start the SAP system.

```
root@vzstar1a:/usr/local/bin# clrg switch -n vzstar2a scs-rg
root@vzstar1a:/usr/local/bin# clrg switch -n vzstar2a ers-rg
root@vzstar1a:/usr/local/bin# clrg switch -n vzstar2a pas-rg
root@vzstar1a:/usr/local/bin# clrg switch -n vzstar2a oracle-rg
root@vzstar1a:/usr/local/bin# clrg switch -n vzstar2a aas-rg
```

15. Log in as the `orasid` user on the node `vzstar2a` and start the Oracle listener.

```
vzstar2a:orabmw 1% lsnrctl start
```

16. Log in as the `sidadm` user on the node `vzstar2a` and start the SAP system together with Oracle database.

```
vzstar2a:bmwadm 2% startsap
```

17. Log in to the SAP system using the SAP GUI or using the internet explorer. Verify that the SAP system is running.

18. Log in as the `sidadm` user on the node `vzstar2a`. Stop the SAP system, Oracle Database, and `sapstarsrv` processes.

```
vzstar2a:bmwadm 3% stopsap
vzstar2a:bmwadm 4% sapcontrol –nr <nr> -function StopServices
```

19. Log in as the `orasid` user on the node `vzstar2a` and stop the Oracle listener.

```
vzstar2a:orabmw 1% lsnrctl stop
```

## 7 Installing Local Additional Application Servers on the Physical Host

You can repeat steps 1 through 12 of the section, Installing a High Availability SAP System on Oracle Solaris Cluster 4, to install the SCS, ERS, DB, and PAS instances of the Java system `BNZ` on logical hosts. Then, configure the node `vzstar2b` identical to the installation zone `vzstar1b`. You can install the additional application server instances on both the nodes. The following example installs the instance `J03` of SAP system `BNZ` on the physical zone host `vzstar2b`.

1. Create a folder for the local instance.

```
root@vzstar2b:/usr# mkdir -p /usr/sap_local/BNZ/J03
root@vzstar2b:/usr# cd /usr/sap_local/BNZ
root@vzstar2b:/usr/sap_local/BNZ# chown bnzadm:sapsys J03
root@vzstar2b:/usr/sap_local/BNZ# ls -al
```

```
total 11
  drwxr-xr-x 3 root root 3 May 21 08:02 .
  drwxr-xr-x 3 root root 3 May 21 08:02 ..
  drwxr-xr-x 2 bnzadm sapsys 2 May 21 08:02 J03
```

```
root@vzstar2b:/usr/sap_local# cd /usr/sap/BNZ/
root@vzstar2b:/usr/sap/BNZ# ln -s /usr/sap_local/BNZ/J03 J03
root@vzstar2b:/usr/sap/BNZ#
```

2. Copy the required SAP Software DVDs and kernel patches to the local folder in the local node. Do
not put them on NFS file system. Do not put them on global file system.

```
root@vzstar2b:/sapinstall# scp -rp root@vzstar1b:/sapinstall/NW730 .
root@vzstar2b:/sapinstall# scp -rp root@vzstar1b:/sapinstall/kernelpatches .
```

3. (Optional) Disable name service client, for example NIS, to avoid long-time `ypcat` by `sapinst` utility.

```
root@vzstar2b:/# svcs -a | grep nis
online May_10 svc:/network/nis/domain:default
online May_10 svc:/network/nis/client:default

root@vzstar2b:/# svcadm disable svc:/network/nis/client:default

root@vzstar2b:/# vi /etc/nsswitch.conf
# comment out the old passwd and group entries, add new ones
#passwd: files [NOTFOUND=return] nis [TRYAGAIN=0]
#group: files [NOTFOUND=return] nis [TRYAGAIN=0]
passwd: files
group: files

root@vzstar2b:/# ypcat passwd
can't communicate with ypbind

root@vzstar2b:/#
```

4. Start the SAP system with Oracle database.

5. Create a new temporary installation folder to install an additional application server on the physical host. Run `sapinst` utility without the `SAPINST_USE_HOSTNAME` parameter from the installation folder. Choose the Additional Application Server Instance as shown in illustration 2.

```
Illustration 3: Screen shot of the Options Displayed by sapinst Utility
```

8 Configure Oracle Database under Oracle Solaris Cluster Control

Before you begin, ensure that Oracle database server and listener are running.
1. Modify the `local_listener` parameter to use the correct listener name.

```sql
orabnz@vzstar1b:~$ sqlplus "/ as sysdba"
SQL*Plus: Release 11.2.0.3.0 Production on Thu May 31 11:22:25 2012
Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
SQL> show parameter listener
NAME                      TYPE     VALUE
----------------------------------- ------------------------------
listener_networks         string   
local_listener            string   LISTENER_BNZ
remote_listener           string   
SQL> alter system set local_listener='LISTENER_BNZ' scope=both;
System altered.
SQL> alter system register;
System altered.
SQL> exit
```

2. Create the user/password to access the oracle database. You may use your own user/password.

```sql
root@vzstar1b:~# su - orabnz
Oracle Corporation SunOS 5.11 11.0 November 2011
vzstar1b:orabnz % sqlplus "/ as sysdba"

SQL*Plus: Release 11.2.0.3.0 Production on Wed May 23 10:06:55 2012
Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
SQL> grant connect, resource to mary identified by mary;
Grant succeeded.
SQL> alter user mary default tablespace system quota 1m on system;
User altered.
SQL> grant select on v_$sysstat to mary;
Grant succeeded.
SQL> grant create table to mary;
Grant succeeded.
SQL> grant create session to mary;
Grant succeeded.
```
3. Shut down the Oracle server and listener.
4. Register the Oracle server resource type.
   ```bash
   root@vzstar1b:~# clrt register SUNW.oracle_server
   ```
5. Register the Oracle listener resource type.
   ```bash
   root@vzstar1b:~# clrt register SUNW.oracle_listener
   ```
6. Create the Oracle server resource.
   ```bash
   root@vzstar1b:~# clrs create -g oracle-rg -t SUNW.oracle_server \
   > -p oracle_home=/oracle/BNZ/112_64 \
   > -p oracle_sid=BNZ \
   > -p alert_log_file=/sap_java/oracle/BNZ/saptrace/diag/rdbms/BNZ/trace/alert_BNZ.log \
   > -p connect_string=mary/mary \
   > -p Resource_dependencies_offline_restart=hasp4sapjava \
   > -d oracle-rs
   ```
7. Create the Oracle listener resource.
   ```bash
   root@vzstar1b:~# clrs create -g oracle-rg -t SUNW.oracle_listener \
   > -p oracle_home=/oracle/BNZ/112_64 \
   > -p listener_name=LISTENER \
   > -p Resource_dependencies_offline_restart=hasp4sapjava \
   > -d listener-rs
   ```
8. Set the Resource_project_name parameter for the oracle-rs and the listener-rs resource.
   ```bash
   root@vzstar1b:~# clrs set -p Resource_project_name=BNZ oracle-rs
   root@vzstar1b:~# clrs set -p Resource_project_name=BNZ listener-rs
   ```
9. Enable the oracle-rs resource.
   ```bash
   root@vzstar1b:~# clrs enable oracle-rs
   ```
10. Enable the listener-rs resource.
    ```bash
    root@vzstar1b:~# clrs enable listener-rs
    ```
11. (Optional) Repeat steps 1-10 if you want to configure another Oracle server and listener.

9 Configure SAP Instances under Oracle Solaris Cluster Control

The following is the example steps for the Java system. For more information about the Oracle Solaris Cluster, see [Oracle Solaris Cluster 4 Documentation](http://docs.oracle.com/cd/E19699-01/822-8301/i100656/index.html).

1. Log in as the `sidadm` user on the nodes on which the SAP instance is running. Stop the SAP instances on all the nodes.
   ```bash
   stopsap j2ee J02 vzstar1b
   stopsap j2ee J03 vzstar2b
   ```
2. Stop all the sapstarsrv processes.

```
stopsap j2ee J01 star-13
stopsap j2ee ERS10 star-12
stopsap j2ee SCS00 star-11
```

```
sapcontrol -nr 02 -function StopService
sapcontrol -nr 03 -function StopService
sapcontrol -nr 01 -function StopService
sapcontrol -nr 10 -function StopService
sapcontrol -nr 00 -function StopService
```

3. Log in as the root user and stop the SAP host agent processes.

```
root@vzstar1b:~# /usr/sap/hostctrl/exe/saphostexec -stop
root@vzstar2b:~# /usr/sap/hostctrl/exe/saphostexec -stop
```

4. Rename S90sapinit to s90sapinit, to avoid the starting of sapstartsrv during server reboot.

```
root@vzstar1b:~# cd to /etc/rc3.d
root@vzstar1b:~# mv S90sapinit s90sapinit
```

5. Modify the start profile or instance profiles, to ensure that the message server is restarted by sapstartsrv, and the enqueue server is not restarted by sapstartsrv.

```
# Start SAP message server
_MS = ms.sap$(SAPSYSTEMNAME)_$(INSTANCE_NAME)
Execute_01 = local rm -f $(_MS)
Execute_02 = local ln -s -f $(DIR_EXECUTABLE)/msg_server$(FT_EXE) $(_MS)
Restart_Program_00 = local $(_MS) pf=$(_PF)

# Start SAP enqueue server
_EN = en.sap$(SAPSYSTEMNAME)_$(INSTANCE_NAME)
Execute_03 = local rm -f $(_EN)
Execute_04 = local ln -s -f $(DIR_EXECUTABLE)/enserver$(FT_EXE) $(_EN)
# modified for enqueue server failover from Restart_Program
# to Start_Program for Solaris Cluster:
# Restart_Program_01 = local $(_EN) pf=$(_PF)
Start_Program_01 = local $(_EN) pf=$(_PF)
```
6. If the public network fails for more than 30 minutes, the enqueue replication server might get disconnected from the enqueue server. Enable the SAP keep-alive mechanism in the replication server to allow automatic reconnection. To enable the SAP keep-alive mechanism, set the `enque/enrep/keepalive_count` to 1 on enqueue server and enqueue replication server instance profile.

```plaintext
enque/enrep/keepalive_count = 1
```

7. Type `ps -ef | grep -i sap` command on all the nodes to ensure that the SAP process is not running.

8. Set `rg_affinities` property for the `scs-rg` resource group. Type the following commands to declare weak positive affinity for the `ers-rg` resource group.

```plaintext
root@vzstar1b:~# clrg set -p rg_affinities=+ers-rg scs-rg
root@vzstar1b:~# clrg show -p RG_affinities scs-rg
```

9. Register the `sapstartsrv` resource type.

```plaintext
# clrt register ORCL.sapstartsrv
```

10. Register the `sapcentr` resource type.

```plaintext
# clrt register ORCL.sapcentr
```

11. Register the `saprepenq` resource type.

```plaintext
# clrt register ORCL.saprepenq
```

12. Register the `sapdia` resource type.

```plaintext
# clrt register ORCL.sapdia
```

13. Register the Replication enqueue server `preempter` resource type.

```plaintext
# clrt register ORCL.saprepenq_preempt
```

14. Create the `sapstartsrv` resource for central services.

```plaintext
root@vzstar1b:~# clrs create -d -g scs-rg -t ORCL.sapstartsrv \ 
  > -p sid=BNZ \ 
  > -p sap_user=bnzadm \ 
  > -p instance_number=00 \ 
  > -p instance_name=SCS00 \ 
  > -p host=star-11 \ 
  > -p timeout_return=20 \ 
  > -p debug_level=0 \ 
  > -p Child_mon_level=5 \ 
  > -p resource_dependencies_offline_restart=hasp4sapjava \ 
```
15. Create the central services resource. If you are using scalable storage resources, you can set the `resource_dependencies_offline_restart` property on storage resources. If you are using the failover global file system, set the `resource_dependencies` property instead of the `resource_dependencies_offline_restart` property.

```
root@vzstar1b:~# clrs create -d -g scs-rg -t sapcentr \\
> -p sid=BNZ \\
> -p sap_user=bnzadm \\
> -p instance_number=00 \\
> -p instance_name=SCS00 \\
> -p host=star-11 \\
> -p yellow=20 \\
> -p debug_level=0 \\
> -p Retry_count=0 \\
> -p resource_dependencies=hasp4sapjava,scs-java-startsrv-rs \\
> scs-java-rs
```

16. Create the `sapstartsrv` resource for replicated enqueue server.

```
root@vzstar1b:~# clrs create -d -g ers-rg -t sapstartsrv \\
> -p sid=BNZ \\
> -p sap_user=bnzadm \\
> -p instance_number=10 \\
> -p instance_name=ERS10 \\
> -p host=star-12 \\
> -p timeout_return=20 \\
> -p debug_level=0 \\
> -p Child_mon_level=5 \\
> -p resource_dependencies_offline_restart =hasp4sapjava \\
> ers-java-startsrv-rs
```

17. Create the replicated enqueue server resource.

```
root@vzstar1b:~# clrs create -d -g ers-rg -t saprepenq \\
> -p sid=BNZ \\
> -p sap_user=bnzadm \\
> -p instance_number=10 \\
> -p instance_name=ERS10 \\
> -p host=star-12 \\
```
18. Create the replication enqueue server `preempter` resource.

```bash
root@vzstar1b:~# clrs create -d -g scs-rg -t saprepenq_preempt \
> -p sid=BNZ \
> -p sap_user=bnzadm \
> -p repenqres=ers-java-rs \
> -p enq_instnr=00 \
> -p debug_level=0 \
> -p resource_dependencies_offline_restart=hasp4sapjava,scs-java-rs \
> preempter-rs
```

19. Create the `sapstartsrv` resource for the primary application instance.

```bash
root@vzstar1b:~# clrs create -d -g pas-rg -t sapstartsrv \
> -p sid=BNZ \
> -p sap_user=bnzadm \
> -p instance_number=01 \
> -p instance_name=J01 \
> -p host=star-13 \
> -p timeout_return=20 \
> -p debug_level=0 \
> -p resource_dependencies_offline_restart=hasp4sapjava \
> pas-java-startsrv-rs
```

20. Create the primary application instance resource.

```bash
root@vzstar1b:~# clrs create -d -g pas-rg -t sapdia \
> -p sid=BNZ \
> -p sap_user=bnzadm \
> -p instance_number=01 \
> -p instance_name=J01 \
> -p host=star-13 \
> -p debug_level=0 \
> -p resource_dependencies_offline_restart=hasp4sapjava \
> -p resource_dependencies=oracle-rs,listener-rs,scs-java-rs,pas-java-startsrv-rs \
> pas-rs
```
21. (Optional) The additional dialog instances J02 and J03 can be configured in multi-master configuration. Create the multi-master resource group and put it in the managed and online state.

```
root@vzstar1b:~# clrg create -p maximum_primaries=2 -p desired_primaries=2 aas-multi-r
root@vzstar1b:~# clrg managed aas-multi-rg
root@vzstar1b:~# clrg online aas-multi-rg
```

Create the sapstartsrv resource for the additional dialog instance running in multi-master configuration.

```
root@vzstar1b:~# clrs create -d -g aas-multi-rg -t sapstartsrv \
> -p sid=BNZ \n> -p sap_user=bnzadm \n> -p instance_number{vzstar1b}=02 \n> -p instance_number{vzstar2b}=03 \n> -p instance_name{vzstar1b}=J02 \n> -p instance_name{vzstar2b}=J03 \n> -p timeout_return=20 \n> -p debug_level=0 \n> -p resource_dependencies_offline_restart=hasp4sapjava \n> aas-multi-startsrv-rs
```

Create the additional dialog instance resource running in multi-master configuration.

```
root@vzstar1b:~# clrs create -d -g aas-multi-rg -t sapdia \
> -p sid=BNZ \n> -p sap_user=bnzadm \n> -p instance_number{vzstar1b}=02 \n> -p instance_number{vzstar2b}=03 \n> -p instance_name{vzstar1b}=J02 \n> -p instance_name{vzstar2b}=J03 \n> -p host{vzstar1b}=vzstar1b \n> -p host{vzstar2b}=vzstar2b \n> -p debug_level=0 \n> -p resource_dependencies_offline_restart=hasp4sapjava \n> -p resource_dependencies=oracle-rs,listener-rs,scs-java-rs,aas-multi-startsrv-rs \n> aas-multi-rs
```

22. Depending on the storage topology, add the required affinities and dependencies to the resource groups, to ensure that the resource group always has access to the necessary file system.
In the following example, resource groups declares strong positive affinity for the hasp resource group.

```
root@vzstar1b:~# clrg set -p RG_affinities=++hasp4sapjava-rg ers-rg
root@vzstar1b:~# clrg set -p RG_affinities=++hasp4sapjava-rg scs-rg
root@vzstar1b:~# clrg set -p RG_affinities=++hasp4sapjava-rg pas-rg
```

23. Set the Resource_project_name parameter for the resources.

```
root@vzstar1b:~# clrs set -p Resource_project_name=BNZ db-rs
root@vzstar1b:~# clrs set -p Resource_project_name=BNZ scs-rs
root@vzstar1b:~# clrs set -p Resource_project_name=BNZ ers-rs
root@vzstar1b:~# clrs set -p Resource_project_name=BNZ pas-rs
root@vzstar1b:~# clrs set -p Resource_project_name=BNZ aas-multi-rs
```

24. Enable the resources.

```
root@vzstar1b:~# clrs enable scs-java-startsrv-rs
root@vzstar1b:~# clrs enable scs-java-rs
root@vzstar1b:~# clrs enable preempter-rs
root@vzstar1b:~# clrs enable ers-java-startsrv-rs
root@vzstar1b:~# clrs enable ers-java-rs
root@vzstar1b:~# clrs enable pas-java-startsrv-rs
root@vzstar1b:~# clrs enable pas-rs
root@vzstar1b:~# clrs enable aas-multi-startsrv-rs
root@vzstar1b:~# clrs enable aas-multi-rs
```

25. Check the status of the resource groups and resources.

```
root@vzstar1b:~# clrg status

=== Cluster Resource Groups ===

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Node Name</th>
<th>Suspended</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>hasp4sapjava-rg</td>
<td>vzstar1b</td>
<td>No</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>No</td>
<td>Online</td>
</tr>
<tr>
<td>scs-rs</td>
<td>vzstar1b</td>
<td>No</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>No</td>
<td>Offline</td>
</tr>
<tr>
<td>ers-rs</td>
<td>vzstar1b</td>
<td>No</td>
<td>Offline</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>No</td>
<td>Online</td>
</tr>
<tr>
<td>pas-rs</td>
<td>vzstar1b</td>
<td>No</td>
<td>Offline</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>No</td>
<td>Online</td>
</tr>
<tr>
<td>oracle-rg</td>
<td>vzstar1b</td>
<td>No</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>No</td>
<td>Offline</td>
</tr>
</tbody>
</table>
```
### Installing Highly Available SAP Systems on Oracle Solaris 11 for Oracle Solaris Cluster 4

```bash
root@vzstar1b:~# clrs status

== Cluster Resources ==

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Node Name</th>
<th>State</th>
<th>Status Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>hasp4sapjava</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td>preempter-rs</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online - Service is online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>scs-java-rs</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>scs-java-startsrv-rs</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>star-11</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online - LogicalHostname online.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>ers-java-rs</td>
<td>vzstar1b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td>ers-java-startsrv-rs</td>
<td>vzstar1b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td>star-12</td>
<td>vzstar1b</td>
<td>Offline</td>
<td>Offline - LogicalHostname offline.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - LogicalHostname online.</td>
</tr>
<tr>
<td>pas-rs</td>
<td>vzstar1b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td>pas-java-startsrv-rs</td>
<td>vzstar1b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td>star-13</td>
<td>vzstar1b</td>
<td>Offline</td>
<td>Offline - LogicalHostname offline.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - LogicalHostname online.</td>
</tr>
<tr>
<td>listener-rs</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>oracle-rs</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>star-14</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online - LogicalHostname online.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Offline</td>
<td>Offline</td>
</tr>
<tr>
<td>aas-multi-rs</td>
<td>vzstar1b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
<tr>
<td></td>
<td>vzstar2b</td>
<td>Online</td>
<td>Online - Service is online.</td>
</tr>
</tbody>
</table>
```
26. Repeat steps 1-20 for the SAP ABAP system to configure resources for ASCS, DB, and PAS. Repeat steps 19 and 20 for the AAS instance D02 which is running on a logical host. Repeat steps 22-25 for the ABAP system to take the resources online.

10 Enable Oracle Solaris Cluster HA Connector for sapstartsrv

Oracle Solaris Cluster 4 agent for SAP ORCL.ha-netweaver provides the option to enable Oracle Solaris Cluster HA Connector for sapstartsrv.

If you do not enable Oracle Solaris Cluster HA Connector with sapstartsrv, the Oracle Solaris Cluster will restart the resources or instances automatically when the SAP administrator stops the SAP instances with stopsap, sapcontrol or SAP MMC. The administrator must use Oracle Solaris Cluster commands to stop the SAP instances.

If you enable the Oracle Solaris Cluster HA Connector with sapstartsrv, the administrator can stop the instances using either the Oracle Solaris Cluster 4 commands or the SAP commands which include stopsap/startsap script, SAP MMC, and sapcontrol command.

Follow the below steps to enable the Oracle Solaris Cluster HA Connector for sapstartsrv:

1. If you have not installed the latest SAP host agent on the cluster, download the latest SAPHOSTAGENT.SAR package for the SAP software version and platform. Download the following packages available at the SAP Service Marketplace http://service.sap.com/swdc.

   Table 5: SAPHOSTAGETN.SAR

<table>
<thead>
<tr>
<th>Software Downloads</th>
<th>SAP Software Download Center</th>
<th>Support Packages and Patches – A-Z Index – N</th>
<th>SAP NetWeaver</th>
<th>SAP NetWeaver 7.3</th>
<th>Entry by Component</th>
<th>Application Server ABAP</th>
<th>SAP Host Agent 7.20</th>
<th>Solaris on SPARC 64 bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAR SAPHOSTAGENT143_143-20005737.SAR</td>
<td>SAP HOST AGENT 7.20 SP143</td>
<td>143</td>
<td>Info</td>
<td>33931</td>
<td>10.04.2013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Oracle Solaris on x86_64 and version 720, use the following :</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAP HOST AGENT 7.20</td>
<td>Solaris on x86_64 64bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAR SAPHOSTAGENT143_143-20005736.SAR</td>
<td>SAP HOST AGENT 7.20 SP143</td>
<td>143</td>
<td>Info</td>
<td>28318</td>
<td>10.04.2013</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Follow the instructions in the PDF document attached to the SAP note 1031096 available at the SAP Service Marketplace http://service.sap.com/notes. Following are the instructions to upgrade the SAP host agent:

   - Extract the SAPHOSTAGENT.SAR archive into a temporary directory.
   - Switch to the root user. Change to the temporary directory where the extracted package is stored. Perform the upgrade by typing the command saphostexec -upgrade in the temporary directory.
   - Upgrade the SAP host agent on all the nodes locally.
3. Check if the `saphascriptco.so` file exists in the `/usr/sap/<SID>/SYS/exe/run` folder. If not, update the SAP kernel to the latest patchlevel.

4. Copy the following three parameters into the default profile `/sapmnt/<SID>/profile/DEFAULT.PFL` of the SAP system or to the instance profile files of each instance.

Note - The second parameter and its value should be entered in one line.

```
# SAP HA Script Connector
# service/halib = /usr/sap/<SID>/SYS/exe/run/saphascriptco.so
service/halib_cluster_connector = /opt/ORCLscsapnetw/saphacmd/bin/sap_orcl_cluster_connector
service/halib_debug_level = 1
```

5. (Optional) If the SAP kernel 720_EXT is not at least at patch level 300 or `SAPHOSTAGENT` is not at least at patch level 116, create the following symbolic links under the `/usr/local/bin` directory on every node.

Note: For SAP kernel 720_EXT with at least patch level 300 and `SAPHOSTAGENT` package with at least patch level 116, you need not perform this step.

```
# cd /usr/local/bin
# ln -s /opt/ORCLscsapnetw/saphacmd/bin/functions_sap_ha function_sap_ha
# ln -s /opt/ORCLscsapnetw/saphacmd/bin/sap_orcl_cluster_connector sap_cluster_connector
```

6. Ensure that the `sidadm` user has the cluster administration privilege on all the nodes. If not, grant the cluster administration privilege to the `sidadm` user.

```
# usermod -A solaris.cluster.admin <sid>adm
/* Or add an entry in /etc/usr_attr on all nodes. For example: */
bmwadm::::type=normal;auths=solaris.cluster.admin;project=BMW
```

7. Restart the cluster resource groups for SAP instances to activate the changes. You will see `SAP_HA_OK` in the `/usr/sap/<SID>/<Instance>/work/sapstartsrv.log` log file.

```
# clrg restart ers-rg
# clrg restart scs-rg
# clrg restart pas-rg
# clrg restart aas-rg
```

Note: The resource group `scs-rg` should fail over to the node where `ers-rg` is running.

8. You might use the `startsap` or `stopsap` scripts, or the `sapcontrol` commands to start or stop the
SAP instances. Alternatively, you can go to http://<host>:5<nr>13 and start the management console.

9. Log in as the sidadm user to the SAP MMC. If the password does not work, check the SAP note 927637. You must set the SUID bit for the files.

10. To set up the SUID bit configuration, log in as the root user. Change to the executable directory that contains sapuxuserchk and type the following commands:

```bash
# chown root:sapsys sapuxuserchk
# chmod u+s,o-rwx sapuxuserchk
```

11 Troubleshooting Highly Available SAP Application on Oracle Solaris Cluster 4

**Problem:** You cannot switch the primary application server instance on a Java system even when the Oracle database is running. The following error message is displayed:

```bash
root@vzstar1b:~# clrg switch -n vzstar2b pas-rg
clrg: (C748634) Resource group pas-rg failed to start on chosen node and might fail over to other node(s)
root@vzstar1b:~# Jun 4 11:35:17 vzstar1b SAPBNZ_01[29942]: Unable to open trace file sapstartsrv.log. (Error 11 Resource temporarily unavailable) [ntservsserver.cpp 3231]

vzstar2b.console
=============
Jun 4 11:19:11 vzstar2b SAPBNZ_01[13504]: Unable to open trace file sapstartsrv.log. (Error 11 Resource temporarily unavailable) [ntservsserver.cpp 3231]


Jun 4 11:20:07 vzstar2b SC[SUNWscor.oracle_server.monitor]:oracle-rg:oracle-rs: Restarting using scha_control RESOURCE_RESTART

Jun 4 11:20:59 vzstar2b SC[SUNWscor.oracle_server.start]:oracle-rg:oracle-rs: Media error encountered, but Auto_end_bkp is disabled.

Jun 4 11:20:59 vzstar2b SC[SUNWscor.oracle_server.start]:oracle-rg:oracle-rs: Could not start server

**Workaround:** This error occurs because of the following section which exists in the SAP instance profile /usr/sap/<SID>/SYS/profile/<SID>_<Instance>_<hostname> or in the SAP start profile /usr/sap/<SID>/SYS/profile/START_<Instance>_<hostname>.

```bash
# Start J2EE database
```
This section means that the `startj2eedb` script is always executed to check if the database is running. Since the `R3trans` program does not work for a Java system, it only checks if the Oracle processes are running on the host.

The `startj2eedb` script cannot get the correct database status when the database is running on another node. To solve this, comment out the line `Start_Program_xx` of the database in the profile.

## Conclusion

Oracle Solaris Cluster provides high availability for SAP central services instance, enqueue replication server instance, database instance, as well as for primary application server (former central instance except message server and enqueue server) and additional application servers (former dialog instances). You may install each SAP system on its own Oracle Solaris zones to provide more isolation and protection.

To install highly available SAP on Oracle Solaris Cluster, you must have information about SAP products and Oracle Solaris Cluster.

## About the Author

This document is based on Xirui Yang's and Mary Liu’s experience of installing High Available SAP on Solaris Cluster. Xirui Yang is a Software Engineer and expert in Oracle’s ISV-Engineering team for SAP, specializing in HA technologies for SAP. Mary Liu is a Quality Assurance Engineer for Oracle Solaris Cluster Agent products.

Big Thanks to Detlef Ulherr and to Thomas Schüler, Hans-Jürgen Denecke, Markus Bachtler, and Christoph Brune.

## References

For more information about SAP products and Oracle Solaris Cluster, see the following documents:

1. For more information about Oracle Solaris Cluster 4, see [Oracle Solaris cluster 4 documentation](http://service.sap.com/instguides).
2. SAP Installation Guides are available at, SAP Service Market Place [http://service.sap.com/instguides](http://service.sap.com/instguides)
3. SAP Software Download Center http://service.sap.com/swdc
4. SAP note 1669684: SAP on Solaris 11
5. Oracle Solaris Cluster 4.x Release Notes
6. SAP note 1740958: Central Note: HA SAP on Solaris Cluster 4.0/4.1
7. For an overview on Oracle Solaris Cluster, see Oracle Solaris Cluster overview
8. For more information about SAP on Oracle, see Oracle Database and IT Infrastructure for SAP.