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SAP Convergent Mediation ControlZone High Availability Cluster

Setup Guide

SUSE Linux Enterprise Server for SAP Applications 15
SAP Convergent Mediation

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Setup Guide

Date: 2025-03-13

SUSE® Linux Enterprise Server for SAP Applications is optimized in various ways for SAP® applications. This document explains how to configure a Convergent Mediation ControlZone High Availability Cluster solution. It is based on SUSE Linux Enterprise Server for SAP Applications 15 SP4. The concept, however, can also be used with newer service packs of SUSE Linux Enterprise Server for SAP Applications.

Contents

1 About this guide

The following sections focus on background information and purpose of this document.

1.1 Abstract

This guide describes configuration and basic testing of SUSE Linux Enterprise Server for SAP Applications 15 SP4 as a high availability cluster for Convergent Mediation (CM) ControlZone services.

From an application perspective, the following concept is covered:

- ControlZone platform and UI services are running together.
- ControlZone software is installed on central NFS.
- ControlZone software is copied to local disks of both nodes.

From an infrastructure perspective, the following concept is covered:

- Two-node cluster with disk-based SBD fencing
- Central NFS share statically mounted on both nodes
- On-premises deployment on physical and virtual machines

Despite the above meniontedfocus of this setup guide, other variants can be implemented as well. See *Section 2, "Overview"* below. The concept can also be used with newer service packs of SUSE Linux Enterprise Server for SAP Applications 15.

Note

This solution is supported only in the context of SAP RISE (https://www.sap.com/products/erp/rise.html).

1.2 Additional documentation and resources

Several chapters in this document contain links to additional documentation resources which are available either in the system or on the Internet.

For the latest product documentation updates, see:

https://documentation.suse.com/

More whitepapers, guides and best practices documents referring to SUSE Linux Enterprise Server and SAP can be found and downloaded at the SUSE Best Practices Web page:

https://documentation.suse.com/sbp/sap/

Here you can access guides for SAP HANA system replication automation and High Availability (HA) scenarios for SAP NetWeaver and SAP S/4HANA.

Find an overview of high availability solutions supported by SUSE Linux Enterprise Server for SAP Applications here:

https://documentation.suse.com/sles-sap/sap-ha-support/html/sap-ha-support/article-sap-ha-support.html

Finally, there are manual pages shipped with the product.

1.3 Feedback

Several feedback channels are available:

Bugs and Enhancement Requests

For services and support options available for your product, refer to http://www.suse.com/support/.

To report bugs for a product component, go to https://scc.suse.com/support/ requests, log in, and select *Submit New SR* (Service Request).

Mail

For feedback on the documentation of this product, you can send a mail to doc-team@suse.com (mailto:doc-team@suse.com). Make sure to include the document title, the product version and the publication date of the documentation. To report errors or suggest enhancements, provide a concise description of the problem and refer to the respective section number and page (or URL).

2 Overview

The CM ControlZone platform is responsible for providing services to other instances. Several platform containers may exist in a CM system, for high availability, but only one is active at a time. The CM ControlZone UI is used to query, edit, import, and export data.

SUSE Linux Enterprise Server for SAP Applications is optimized in various ways for SAP applications. Particularly, it contains the SUSE Linux Enterprise High Availability cluster and specfic HA resource agents.

From the application perspective the following variants are covered:

- ControlZone platform service running alone
- ControlZone platform and UI services running together
- ControlZone binaries stored and started on central NFS (not recommended)
- ControlZone binaries copied to and started from local disks
- Java VM stored and started on central NFS (not recommended)
- Java VM started from local disks

From the infrastructure perspective the following variants are covered:

- Two-node cluster with disk-based SBD fencing
- Three-node cluster with disk-based or diskless SBD fencing, not explained in detail here
- Other fencing is possible, but not explained here
- File system managed by the cluster - either on shared storage or NFS, not explained in detail here
- On-premises deployment on physical and virtual machines
- Public cloud deployment (usually needs additional documentation on cloud specific details)

2.1 High availability for the Convergent Mediation ControlZone platform and UI

The HA solution for CM ControlZone is a two-node active/passive cluster. A shared NFS file system is statically mounted by the operating system on both cluster nodes. This file system holds work directories. Client-side write caching needs to be disabled. The ControlZone software is installed into the central shared NFS, but is also copied to both nodes´ local file systems. The HA cluster uses the central directory for starting/stopping the ControlZone services. However, for monitoring the local copies of the installation are used.

The cluster can run monitor actions even when the NFS temporarily is blocked. Further, software upgrade is possible without downtime (rolling upgrade).

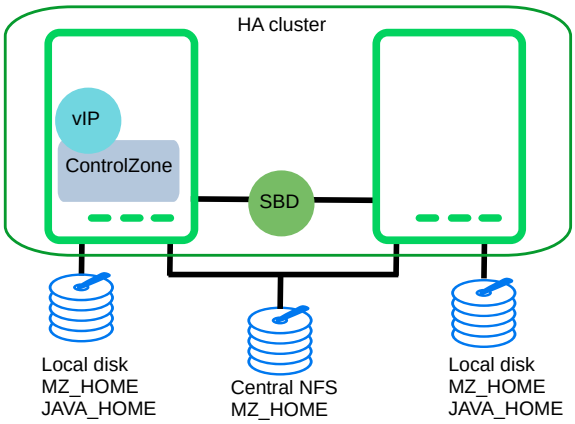

FIGURE 1: TWO-NODE HA CLUSTER AND STATICALLY MOUNTED FILE SYSTEMS

The ControlZone services platform and UI are handled as active/passive resources. The related virtual IP adress is managed by the HA cluster as well. A file system resource is configured for a bind-mount of the real NFS share. In case of file system failures, the cluster takes action. However, no mount or umount on the real NFS share is done.

All cluster resources are organized as one resource group. This results in a correct start/stop order and placement, while keeping the configuration simple.

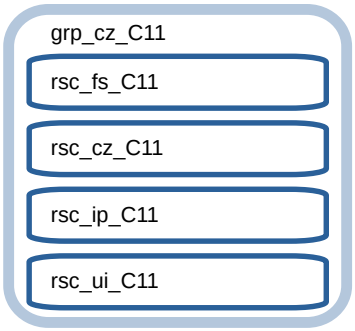

FIGURE 2: CONTROLZONE RESOURCE GROUP

See *Section 5, "Integrating Convergent Mediation ControlZone with the Linux cluster"* and manual page ocf_suse_SAPCMControlZone(7) for details.

2.2 Scope of this document

For the SUSE Linux Enterprise High Availability two-node cluster described above, this guide explains how to:

- check basic settings of the two-node HA cluster with disk-based SBD.
- check basic capabilities of the ControlZone components on both nodes.
- configure an HA cluster for managing the ControlZone components platform and UI, together with related IP address.
- perform functional tests of the HA cluster and its resources.
- perform basic administrative tasks on the cluster resources.

Note

Neither installation of the basic SUSE Linux Enterprise High Availability cluster, nor installation of the CM ControlZone software is covered in the document at hand.

Consult the SUSE Linux Enterprise High Availability product documentation at https://documentation.suse.com/sle-ha/15-SP4/single-html/SLE-HA-administration/#part-install for installation instructions.

For Convergent Mediation installation instructions, refer to the respective product documentation at https://infozone.atlassian.net/wiki/spaces/MD9/pages/4849683/Installation+Instructions.

2.3 Prerequisites

For requirements of Convergent Mediation ControlZone, refer to the product documentation at https://infozone.atlassian.net/wiki/spaces/MD9/pages/4849685/System+Requirements.

For requirements of SUSE Linux Enterprise Server for SAP Applications and SUSE Linux Enterprise High Availability, refer to the product documentation at https://documentation.suse.com/sle-ha/15-SP4/html/SLE-HA-all/article-installation.html#sec-ha-inst-quick-req.

Specific requirements of the SUSE high availability solution for CM ControlZone are as follows:

- This solution is supported only in the context of SAP RISE.
- Convergent Mediation ControlZone version 9.0.1.1 or higher is installed and configured on both cluster nodes. If the software is installed into a shared NFS file system, the binaries are copied into both cluster nodes´ local file systems. Finally the local configuration needs to be adjusted. Refer to Convergent Mediation documentation for details.
- CM ControlZone is configured identically on both cluster nodes. User, path names and environment settings are the same.
- There is only **one** ControlZone instance per Linux cluster. Accordingly, there is only one platform service and one UI service per cluster.
- The platform and UI are installed into the same MZ_HOME.
- Linux shell of the mzadmin user is `/bin/bash`.
- The mzadmin´s `~/.bashrc` inherits MZ_HOME, JAVA_HOME and MZ_PLATFORM from SAPCMControlZone RA. These variables need to be set as described in the RA´s documentation, that is the manual page ocf_suse_SAPCMControlZone(7).
- When called by the resource agent, `mzsh` connnects to CM ControlZone services via network. The service´s virtual host name or virtual IP address managed by the cluster should not be used when called by RA monitor actions.
- Technical users and groups are defined locally in the Linux system. If users are resolved by remote service, local caching is neccessary. `Substitute user` (su) to the mzadmin needs to work reliable and without customized actions or messages.
- Name resolution for host names and virtual host names is crucial. Host names of cluster nodes and services are resolved locally in the Linux system.
- Strict time synchronization between the cluster nodes, for example NTP, is required. All nodes of a cluster have configured the same timezone.
- Needed NFS shares (for example `/usr/sap/<SID>`) are mounted statically or by automounter. No client-side write caching is happening. File locking should be configured for application needs.
- The RA monitoring operations need to be active.

- RA runtime almost completely depends on call-outs to controlled resources, operating system, and Linux cluster. The infrastructure needs to allow these call-outs to return in time.
- The ControlZone application is not started/stopped by the operating system. Thus, there is no SystemV, systemd or cron job.
- As long as the ControlZone application is managed by the Linux cluster, the application is not started/stopped/moved from outside. Thus, no manual actions are done. The Linux cluster does not prevent from administrative mistakes. However, if the Linux cluster detects the application is running on both sites in parallel, both are stopped and one of them is restarted.
- The interface for the RA to the ControlZone services is the command `mzsh`. Ideally, `mzsh` should be accessed on the cluster nodes´ local file systems. `mzsh` is called with the arguments `startup -f`, `shutdown` and `status`. Its return code and output is interpreted by the RA. Thus, the command and its output need to be stable. The mzsh shall not be customized. Particularly environment variables set thru `~/.bashrc` must not be changed.
- `mzsh` is called on the active node with a defined interval for regular resource monitor operations. It also is called on the active or passive node in certain situations. Those calls might run in parallel.

2.4 The setup procedure at a glance

For a better understanding and overview, the installation and setup is divided into nine steps.

- *Section 3.1, "Collecting information"*
- *Section 3.2, "Checking the operating system basic setup"*
- *Section 3.3, "Checking HA cluster basic setup"*
- *Section 4, "Checking the ControlZone setup"*
- *Section 5.1, "Preparing mzadmin user ~/.bashrc file"*
- *Section 5.2, "Preparing the operating system for NFS monitoring"*
- *Section 5.3, "Adapting the cluster basic configuration"*
- *Section 5.4, "Configuring ControlZone cluster resources"*
- *Section 5.7, "Testing the HA cluster"*

3 Checking the operating system and the HA cluster basic setup

3.1 Collecting information

The installation should be planned properly. You should have all required parameters already in place. It is good practice to first fill out the parameter sheet.

TABLE 1: TABLE COLLECTING NEEDED PARAMETERS

Parameter	Example	Value
NFS server and share	`192.168.1.1:/s/C11/cm`	
NFS mount options	`vers=4,rw,noac,sync,default`	
central MZ_HOME	`/usr/sap/C11`	
local MZ_HOME	`/opt/cm/C11`	
MZ_PLATFORM	`http://localhost:9000`	`http://localhost:9000`
JAVA_HOME	`/usr/lib64/jvm/jre-17-openjdk`	
node1 hostname	`akka1`	
node2 hostname	`akka2`	
node1 IP addr	`192.168.1.11`	
node2 IP addr	`192.168.1.12`	
SID	`C11`	
mzadmin user	`c11adm`	
virtual IP addr	`192.168.1.112`	
virtual hostname	`c11cz`	

3.2 Checking the operating system basic setup

3.2.1 Java virtual machine

See https://infozone.atlassian.net/wiki/spaces/MD9/pages/4849685/System+Requirements for supported Java VMs.

```
# zypper se java-17-openjdk

S | Name                     | Summary                              | Type
--+--------------------------+--------------------------------------+--------
i | java-17-openjdk          | OpenJDK 17 Runtime Environment       | package
  | java-17-openjdk-demo     | OpenJDK 17 Demos                     | package
  | java-17-openjdk-devel    | OpenJDK 17 Development Environment   | package
  | java-17-openjdk-headless | OpenJDK 17 Runtime Environment       | package
```

Check this on both nodes.

3.2.2 HA software and tools

```
# zypper se --type pattern ha_sles

S  | Name    | Summary           | Type
---+---------+-------------------+--------
i  | ha_sles | High Availability | pattern
```

```
# zypper se ClusterTools2

S | Name                     | Summary                              | Type
--+--------------------------+--------------------------------------+--------
i | ClusterTools2            | Tools for cluster management         | package
```

Check this on both nodes.

3.2.3 IP addresses and virtual names

Check if the file `/etc/hosts` contains at least the address resolution for both cluster nodes `akka1`, `akka1`, and the ControlZone virtual host name `sapc11cz`. Add these entries if they are missing.

```
# grep -e akka1 -e akka2 -e c11cz /etc/hosts
```

```
192.168.1.11  akka1.fjaell.lab   akka1
192.168.1.12  akka2.fjaell.lab  akka2
192.168.1.112   c11cz.fjaell.lab  c11cz
```

Check this on both nodes. See also manual page hosts(8).

3.2.4 Mount points and NFS shares

Check if the file `/etc/fstab` contains the central NFS share MZ_HOME. The file system is statically mounted on all nodes of the cluster. The correct mount options depend on the NFS server. However, client-side write caching needs to be disabled in any case.

```
# grep "/usr/sap/C11" /etc/fstab

192.168.1.1:/s/C11/cz /usr/sap/C11 nfs4 rw,noac,sync,default 0 0

# mount | grep "/usr/sap/C11"

...
```

Check this on both nodes. See also manual page mount(8), fstab(5) and nfs(5), and TID 20830, TID 19722.

3.2.5 Linux user and group number scheme

Check if the file `/etc/passwd` contains the mzadmin user `c11adm`.

```
# grep c11adm /etc/passwd

c11adm:x:1001:100:Convergent Mediation user:/opt/cm/C11:/bin/bash
```

Check this on both nodes. See also manual page passwd(5).

3.2.6 Password-free SSH login

```
akka1:~ # ssh akka2
akka2:~ # ssh akka1
akka1:~ # exit
akka2:~ # exit
```

Check this on both nodes. See also manual page ssh(1) and ssh-keygen(1).

3.2.7 Time synchronization

```
#  systemctl status chronyd | grep Active

     Active: active (running) since Tue 2024-05-14 16:37:28 CEST; 6min ago

# chronyc sources

MS Name/IP address         Stratum Poll Reach LastRx Last sample
===============================================================================
^* long.time.ago                2   10   377   100  -1286us[-1183us] +/-   15ms
```

Check this on both nodes. See also manual page chronyc(1) and chrony.conf(5).

3.3 Checking HA cluster basic setup

3.3.1 Watchdog

Check if the **watchdog** module is loaded correctly.

```
# lsmod | grep -e dog -e wdt

iTCO_wdt               16384  1
iTCO_vendor_support    16384  1 iTCO_wdt

# ls -l /dev/watchdog

crw------- 1 root root 10, 130 May 14 16:37 /dev/watchdog

# lsof dev/watchdog

COMMAND PID USER   FD   TYPE DEVICE SIZE/OFF NODE NAME
sbd     686 root    4w   CHR 10,130      0t0  410 /dev/watchdog
```

Check this on both nodes. Both nodes should use the same watchdog driver. Which driver that is depends on your hardware or hypervisor. For more information, see https://documentation.suse.com/sle-ha/15-SP4/single-html/SLE-HA-administration/#sec-ha-storage-protect-watchdog.

3.3.2 SBD device

It is a good practice to check if the SBD device can be accessed from both nodes and contains valid records. Only one SBD device is used in this example. For production, three devices should always be used.

```
# egrep -v "(^#|^$)" /etc/sysconfig/sbd

SBD_PACEMAKER=yes
SBD_STARTMODE="clean"
SBD_WATCHDOG_DEV="/dev/watchdog"
SBD_WATCHDOG_TIMEOUT="20"
SBD_TIMEOUT_ACTION="flush,reboot"
SBD_MOVE_TO_ROOT_CGROUP="auto"
SBD_OPTS=""
SBD_DEVICE="/dev/disk/by-id/Example-A-part1"

# cs_show_sbd_devices

==Dumping header on disk /dev/disk/by-id/Example-A-part1
Header version     : 2.1
UUID               : 0f4ea13e-fab8-4147-b9b2-3cdcfff07f86
Number of slots    : 255
Sector size        : 512
Timeout (watchdog) : 20
Timeout (allocate) : 2
Timeout (loop)     : 1
Timeout (msgwait)  : 120
==Header on disk /dev/disk/by-id/Example-A-part1 is dumped
0     akka1      clear
0     akka2      clear

# systemctl status sbd | grep Active

     Active: active (running) since Tue 2024-05-14 16:37:22 CEST; 13min ago
```

Check this on both nodes. For more information on SBD configuration, see:

- https://documentation.suse.com/sle-ha/15-SP4/single-html/SLE-HA-administration/#cha-ha-storage-protect
- TID 7016880 and TID 7008216
- manual page sbd(8), stonith_sbd(7), and cs_show_sbd_devices(8)

3.3.3 Corosync cluster communication

```
akka1:~ # corosync-cfgtool -s

Printing ring status.
Local node ID 2
RING ID 0
        id      = 192.168.1.11
        status  = ring 0 active with no faults
```

Check this on both nodes. See appendix *Section 8.3, "Corosync configuration of the two-node cluster"* for a `corosync.conf` example. See also manual page systemctl(1), corosync.conf(5) and corosync-cfgtool(1).

3.3.4 `systemd` cluster services

```
# systemctl status pacemaker | grep Active

 Active: active (running) since Tue 2024-05-14 16:37:28 CEST; 17min ago
```

Check this on both nodes. See also manual page systemctl(1).

3.3.5 Basic Linux cluster configuration

```
# crm_mon -1r

Cluster Summary:
  * Stack: corosync
  * Current DC: akka1 (version 2.1.2+20211124...) - partition with quorum
  * Last updated: Tue May 14 17:03:30 2024
  * Last change:  Mon Apr 22 15:00:58 2024 by root via cibadmin on akka2
  * 2 nodes configured
  * 1 resource instances configured

Node List:
  * Online: [ akka1 akka2 ]

Full List of Resources:
  * rsc_stonith_sbd     (stonith:external/sbd):  Started akka1
```

Check this on both nodes. See also manual page crm_mon(8).

4 Checking the ControlZone setup

The ControlZone needs to be tested without the Linux cluster before integrating both. Each test needs to be done on both nodes.

4.1 Checking ControlZone on central NFS share

Check the mzadmin´s environment variables MZ_HOME, JAVA_HOME, PATH. Then check the `mzsh startup/shutdown/status` functionality for MZ_HOME on central NFS. This is needed on both nodes. Before starting the ControlZone services on one node, ensure they are not running on the other node.

```
# su - c11adm
~> echo $MZ_HOME $JAVA_HOME

/usr/sap/C11 /usr/lib64/jvm/jre-17-openjdk

~> which mzsh

/usr/sap/C11/bin/mzsh
```

```
~> echo "are you sure platform is not running on the other node?"

are you sure platform is not running on the other node?

~> mzsh startup -f platform

Starting platform...done.

~> mzsh status platform; echo $?

platform is running
0
```

```
~> mzsh startup -f ui

Starting ui...done.

~> mzsh status ui; echo $?

ui is running
0
```

```
~> mzsh shutdown ui

Shutting down ui....done.

~> mzsh status ui; echo $?

ui is not running
2
```

```
~> mzsh shutdown platform

Shutting down platform......done.

~> mzsh status platform; echo $?

platform is not running
2
```

Perform the above steps on both nodes.

4.2 Checking ControlZone on each node´s local disk

Check the mzadmin´s environment variables MZ_HOME, JAVA_HOME, PATH. Then check the `mzsh status` functionality for MZ_HOME on the local disk. This is needed on both nodes.

```
# su - c11adm
~> export MZ_HOME="/opt/cm/C11"
~> export PATH="/opt/cm/C11/bin:$PATH"

~> echo $MZ_HOME $JAVA_HOME

/opt/cm/C11 /usr/lib64/jvm/jre-17-openjdk

~> which mzsh

/opt/cm/C11/bin/mzsh
```

```
~> mzsh status platform; echo $?

platform is running
0
```

```
~> mzsh status ui; echo $?
```

```
ui is running
0
```

Perform the above steps on both nodes. The ControlZone services should be running on either node, but not on both in parallel.

5 Integrating Convergent Mediation ControlZone with the Linux cluster

5.1 Preparing mzadmin user ~/.bashrc file

For the environment variables JAVA_HOME, MZ_HOME and MZ_PLATFORM, certain values are required. For cluster actions, the values are inherited from the RA through related RA_… variables. For manual admin actions, the values are set as default. This is needed on both nodes.

```
akka1:~# su - c11adm
akka1:~> vi ~/.bashrc

# MZ_PLATFORM, MZ_HOME, JAVA_HOME are set by HA RA
export MZ_PLATFORM=${RA_MZ_PLATFORM:-"http://localhost:9000"}
export MZ_HOME=${RA_MZ_HOME:-"/usr/sap/C11"}
export JAVA_HOME=${RA_JAVA_HOME:-"/usr/lib64/jvm/jre-17-openjdk"}

akka1:~> scp ~/.bashrc akka2:~/
akka1:~> md5sum ~/.bashrc
...
akka1:~> ssh akka2 "md5sum ~/.bashrc"
...
```

See *Table 2, "Table Description of important resource agent parameters"* and manual page ocf_suse_SAPCMControlZone(7) for details.

5.2 Preparing the operating system for NFS monitoring

This is needed on both nodes.

```
akka1:~ # mkdir -p /usr/sap/C11/.check /usr/sap/.check_C11
akka1:~ # ssh akka2 "mkdir -p /usr/sap/C11/.check /usr/sap/.check_C11"
```

See manual page ocf_suse_SAPCMControlZone(7), ocf_heartbeat_Filesystem(7) and mount(8).

5.3 Adapting the cluster basic configuration

All steps to load the configuration into the Cluster Information Base (CIB) only need to be performed on one node.

5.3.1 Adapting cluster bootstrap options and resource defaults

The first example defines the cluster bootstrap options, the resource and operation defaults. The STONITH timeout value should be greater than 1.2 times the SBD on-disk msgwait timeout value. The priority fencing delay value should be at least twice the SBD CIB pcmk_delay_max value.

```
# vi crm-cib.txt

# enter the below to crm-cib.txt
property cib-bootstrap-options: \
    have-watchdog=true \
    cluster-infrastructure=corosync \
    cluster-name=hacluster \
    dc-deadtime=20 \
    stonith-enabled=true \
    stonith-timeout=150 \
    priority-fencing-delay=30 \
    stonith-action=reboot
rsc_defaults rsc-options: \
    resource-stickiness=1 \
    migration-threshold=3 \
    failure-timeout=86400
op_defaults op-options: \
    timeout=120 \
    record-pending=true
```

Load the file to the cluster.

```
# crm configure load update crm-cib.txt
```

See also manual page crm(8), sbd(8) and SAPCMControlZone_basic_cluster(7).

5.3.2 Adapting SBD STONITH resource

The next configuration step defines a disk-based SBD STONITH resource. Timing is adapted for priority fencing.

```
# vi crm-sbd.txt

# enter the below to crm-sbd.txt
primitive rsc_stonith_sbd stonith:external/sbd \
    params pcmk_delay_max=15
```

Load the file to the cluster.

```
# crm configure load update crm-sbd.txt
```

See also manual pages crm(8), sbd(8), stonith_sbd(7), and SAPCMControlZone_basic_cluster(7).

5.4 Configuring ControlZone cluster resources

5.4.1 Virtual IP address resource

Next, configure an IP adress resource `rsc_ip_C11`. In the event of an IP address failure (or monitor timeout), the IP address resource is restarted until it is successful or the migration threshold is reached.

```
# vi crm-ip.txt

# enter the below to crm-ip.txt
primitive rsc_ip_C11 ocf:heartbeat:IPaddr2 \
    op monitor interval=60 timeout=20 on-fail=restart \
    params ip=192.168.1.112 \
    meta maintenance=true
```

Load the file to the cluster.

```
# crm configure load update crm-ip.txt
```

See also manual page crm(8) and ocf_heartbeat_IPAddr2(7).

5.4.2 File system resource (only monitoring)

A shared file system might be statically mounted by the operating system on both cluster nodes. This file system holds work directories. It must not be confused with the ControlZone application itself. Client-side write caching needs to be disabled.

A file system resource `rsc_fs_C11` is configured for a bind-mount of the real NFS share. This resource is grouped with the ControlZone platform and IP address. In the event of a file system failures, the node gets fenced. No mount or umount on the real NFS share is done. An example for the real NFS share is `/usr/sap/C11/.check` , an example for the bind-mount is `/usr/sap/.check_C11` . Both mount points need to be created before the cluster resource is activated.

```
# vi crm-fs.txt

# enter the below to crm-fs.txt
primitive rsc_fs_C11 ocf:heartbeat:Filesystem \
    params device=/usr/sap/C11/.check directory=/usr/sap/.check_C11 \
    fstype=nfs4 options=bind,rw,noac,sync,defaults \
    op monitor interval=90 timeout=120 on-fail=fence \
    op_params OCF_CHECK_LEVEL=20 \
    op start timeout=120 \
    op stop timeout=120 \
    meta maintenance=true
```

Load the file to the cluster.

```
# crm configure load update crm-fs.txt
```

See also manual page crm(8), SAPCMControlZone_basic_cluster(7), ocf_heartbeat_Filesystem(7) and nfs(5).

5.4.3 SAP Convergent Mediation ControlZone platform and UI resources

A ControlZone platform resource `rsc_cz_C11` is configured, handled by the operating system user `c11adm`. The local `/opt/cm/C11/bin/mzsh` is used for monitoring, but for other actions, the central `/usr/sap/C11/bin/mzsh` is used. In the event of a ControlZone platform failure (or monitor timeout), the platform resource is restarted until it is successful or the migration threshold is reached. If the migration threshold is reached, or if the node where the group is running fails, the group will be moved to the other node. A priority is configured for correct fencing in split-brain situations.

```
# vi crm-cz.txt

# enter the below to crm-cz.txt
primitive rsc_cz_C11 ocf:suse:SAPCMControlZone \
    params SERVICE=platform USER=c11adm \
    MZSHELL=/opt/cm/C11/bin/mzsh;/usr/sap/C11/bin/mzsh \
    MZHOME=/opt/cm/C11/;/usr/sap/C11/ \
    MZPLATFORM=http://localhost:9000 \
```

```
    JAVAHOME=/usr/lib64/jvm/jre-17-openjdk \
    op monitor interval=90 timeout=150 on-fail=restart \
    op start timeout=300 \
    op stop timeout=300 \
    meta priority=100 maintenance=true
```

Load the file to the cluster.

```
# crm configure load update crm-cz.txt
```

A ControlZone UI resource `rsc_ui_C11` is configured, handled by the operating system user `c11adm`. The local `/opt/cm/C11/bin/mzsh` is used for monitoring, but for other actions the central `/usr/sap/C11/bin/mzsh` is used. In the event of a ControlZone UI failure (or monitor timeout), the UI resource is restarted until it is successful or the migration threshold is reached. If the migration threshold is reached, or if the node where the group is running fails, the group will be moved to the other node.

```
# vi crm-ui.txt

# enter the below to crm-ui.txt
primitive rsc_ui_C11 ocf:suse:SAPCMControlZone \
    params SERVICE=ui USER=c11adm \
    MZSHELL=/opt/cm/C11/bin/mzsh;/usr/sap/C11/bin/mzsh \
    MZHOME=/opt/cm/C11/;/usr/sap/C11/ \
    MZPLATFORM=http://localhost:9000 \
    JAVAHOME=/usr/lib64/jvm/jre-17-openjdk \
    op monitor interval=90 timeout=150 on-fail=restart \
    op start timeout=300 \
    op stop timeout=300 \
    meta maintenance=true
```

Load the file to the cluster.

```
# crm configure load update crm-ui.txt
```

Find an overview on the RA SAPCMControlZone parameters below:

TABLE 2: TABLE DESCRIPTION OF IMPORTANT RESOURCE AGENT PARAMETERS

Name	Description
USER	OS user who calls mzsh, owner of $MZ_HOME (might be different from $HOME). Optional. Unique, string. Default value: "mzadmin".
SERVICE	The ControlZone service to be managed by the resource agent. Optional. Unique, [platform | ui]. Default value: "platform".

Name	Description
MZSHELL	Path to mzsh. Could be one or two full paths. If one path is given, that path is used for all actions. In case two paths are given, the first one is used for monitor actions, the second one is used for start/stop actions. If two paths are given, the first needs to be on local disk, the second needs to be on the central NFS share with the original CM ControlZone installation. Two paths are separated by a semicolon (;). The mzsh contains settings that need to be consistent with MZ_PLATFORM, MZ_HOME, JAVA_HOME. Refer to Convergent Mediation product documentation for details. Optional. Unique, string. Default value: "/opt/cm/bin/mzsh".
MZHOME	Path to CM ControlZone installation directory, owned by the mzadmin user. Could be one or two full paths. If one path is given, that path is used for all actions. In case two paths are given, the first one is used for monitor actions, the second one is used for start/stop actions. If two paths are given, the first needs to be on local disk, the second needs to be on the central NFS share with the original CM ControlZone installation. See also JAVAHOME. Two paths are separated by semicolon (;). Optional. Unique, string. Default value: "/opt/cm/".
MZPLATFORM	URL used by mzsh for connecting to CM ControlZone services. Could be one or two URLs. If one URL is given, that URL is used for all actions. In case two URLs are given, the first one is used for monitor and stop actions, the second one is used for start actions. Two URLs are separated by semicolon (;). Should usually not be changed. The service´s virtual host name or virtual IP address managed by the cluster must never be used for RA monitor actions. Optional. Unique, string. Default value: "http://localhost:9000".
JAVAHOME	Path to Java virtual machine used for CM ControlZone. Could be one or two full paths. If one path is given, that path is used for all actions. In case two paths are given, the first one is used

Name	Description
	for monitor actions, the second one is used for start/stop actions. If two paths are given, the first needs to be on local disk, the second needs to be on the central NFS share with the original CM ControlZone installation. See also MZHOME. Two paths are separated by semicolon (;). Optional. Unique, string. Default value: "/usr/lib64/jvm/jre-17-openjdk".

See also manual page crm(8) and ocf_suse_SAPCMControlZone(7).

5.4.4 CM ControlZone resource group

ControlZone platform and UI resources `rsc_cz_C11` and `rsc_ui_C11` are grouped with file system `rsc_fs_C11` and IP address resource `rsc_ip_C11` into group `grp_cz_C11`. The file system starts first, then comes the platform. The IP address starts before the UI. The resource group might run on either node, but never in parallel. If the file system resource is restarted, all resources of the group will restart as well. If the platform or IP adress resource is restarted, the UI resource will restart as well.

```
# vi crm-grp.txt

# enter the below to crm-grp.txt
group grp_cz_C11 rsc_fs_C11 rsc_cz_C11 rsc_ip_C11 rsc_ui_C11 \
    meta maintenance=true
```

Load the file to the cluster.

```
# crm configure load update crm-grp.txt
```

5.5 Activating the cluster resources

```
# crm resource refresh grp_cz_C11
...

# crm resource maintenance grp_cz_C11 off
```

5.6 Checking the cluster resource configuration

```
# crm_mon -1r

Cluster Summary:
  * Stack: corosync
  * Current DC: akka1 (version 2.1.2+20211124...) - partition with quorum
  * Last updated: Tue May 14 17:03:30 2024
  * Last change:  Mon Apr 22 15:00:58 2024 by root via cibadmin on akka2
  * 2 nodes configured
  * 5 resource instances configured

Node List:
  * Online: [ akka1 akka2 ]

Full List of Resources:
  * rsc_stonith_sbd     (stonith:external/sbd):  Started akka1
  * Resource Group: grp_cz_C11:
    * rsc_fs_C11 (ocf::heartbeat:Filesystem):    Started akka2
    * rsc_cz_C11 (ocf::suse:SAPCMControlZone):   Started akka2
    * rsc_ip_C11 (ocf::heartbeat:IPaddr2):       Started akka2
    * rsc_ui_C11 (ocf::suse:SAPCMControlZone):   Started akka2
```

Congratulations!

The HA cluster is up and running, controlling the ControlZone resources. It is now advisable to create a backup of the cluster configuration.

```
FIRSTIME=$(date +%s)
# crm configure show > crm-all-${FIRSTIME}.txt

# cat crm-all-${FIRSTIME}.txt
...

# crm_report
...
```

See the appendix *Section 8.2, "CRM configuration for a typical setup"* for a complete CIB example.

5.7 Testing the HA cluster

As with any HA cluster, testing is crucial. Ensure that all test cases derived from customer expectations are executed and passed. Otherwise, the project is likely to fail in production.

- Set up a test cluster for testing configuration changes and administrative procedures before applying them on the production cluster.
- Carefully define, perform, and document tests for all scenarios that should be covered, and do the same for all maintenance procedures.
- Before performing full cluster testing, test the ControlZone features without the Linux cluster.
- Test basic Linux cluster features without ControlZone before perforing full cluster testing.
- Follow general best practices, see *Section 6.1, "Dos and don'ts"*.
- Open an additional terminal window on a node that is expected to not be fenced. In that terminal, continously run `cs_show_cluster_actions` or similar. See manual page cs_show_cluster_actions(8) and SAPCMControlZone_maintenance_examples(7).

The following list shows common test cases for the CM ControlZone resources managed by the HA cluster.

- *Section 5.7.1, "Manually restarting ControlZone resources in-place"*
- *Section 5.7.2, "Manually migrating ControlZone resources"*
- *Section 5.7.3, "Testing ControlZone UI restart by cluster on UI failure"*
- *Section 5.7.4, "Testing ControlZone restart by cluster on platform failure"*
- *Section 5.7.5, "Testing ControlZone takeover by cluster on node failure"*
- *Section 5.7.6, "Testing ControlZone takeover by cluster on NFS failure"*
- *Section 5.7.7, "Testing cluster reaction on network split-brain"*

This is not a complete list. Define additional test cases according to your needs. Some examples are listed in *Section 5.8, "Additional tests"*. Do not forget to perform every test on each node.

Note

Tests for the basic HA cluster and tests for bare CM ControlZone components are not covered in this document. Information about these tests can be found in the relevant product documentation.

Unless otherwise stated, the test prerequisites are always that

- both cluster nodes are booted and connected to the cluster.
- SBD and corosync are fine.
- NFS and local disks are fine.
- the ControlZone resources are all running.
- no fail counts or migration constraints are in the CIB.
- the cluster is idle, no actions are pending.

5.7.1 Manually restarting ControlZone resources in-place

COMPONENT:

- ControlZone resources

DESCRIPTION:

- The ControlZone resources are stopped and restarted in-place.

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

2. Stop the ControlZone resources.

```
# cs_wait_for_idle -s 5; crm resource stop grp_cz_C11
# cs_wait_for_idle -s 5; crm_mon -1r
```

3. Check the ControlZone resources.

```
# su - c11adm -c "mzsh status"
...
# mount | grep "/usr/sap/C11"
...
# df -h /usr/sap/C11
...
```

4. Start the ControlZone resources.

```
# cs_wait_for_idle -s 5; crm resource start grp_cz_C11
# cs_wait_for_idle -s 5; crm_mon -1r
```

5. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster gracefully stops all resources.
2. The file system stays mounted.
3. The cluster starts all resources.
4. No resource failure happens.

5.7.2 Manually migrating ControlZone resources

COMPONENT:

- ControlZone resources

DESCRIPTION:

- The ControlZone resources are stopped and then started on the other node.

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

2. Migrate the ControlZone resources.

```
# cs_wait_for_idle -s 5; crm resource move grp_cz_C11 force
# cs_wait_for_idle -s 5; crm_mon -1r
```

3. Remove migration constraint.

```
# crm resource clear grp_cz_C11
# crm configure show | grep cli-
```

4. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster gracefully stops all resources.
2. The file system stays mounted.
3. The cluster starts all resources on the other node.
4. No resource failure happens.

5.7.3 Testing ControlZone UI restart by cluster on UI failure

COMPONENT:

- ControlZone resources (UI)

DESCRIPTION:

- The ControlZone UI is restarted on same node.

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

2. Manually kill ControlZone UI (on, for example, `akka1`).

```
# ssh root@akka1 "su - c11adm \"mzsh kill ui\""
# cs_wait_for_idle -s 5; crm_mon -1r
```

3. Clean up fail count.

```
# crm resource cleanup grp_cz_C11
# cibadmin -Q | grep fail-count
```

4. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster detects failed resources.

2. The file system stays mounted.
3. The cluster restarts the UI on the same node.
4. One resource failure happens.

5.7.4 Testing ControlZone restart by cluster on platform failure

COMPONENT:

- ControlZone resources (platform)

DESCRIPTION:

- The ControlZone resources are stopped and restarted on same node.

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

2. Manually kill ControlZone platform (on, for example, `akka1`).

```
# ssh root@akka1 "su - c11adm \"mzsh kill platform\""
# cs_wait_for_idle -s 5; crm_mon -1r
```

3. Clean up fail count.

```
# crm resource cleanup grp_cz_C11
# cibadmin -Q | grep fail-count
```

4. Check the ControlZone resources and cluster.

```
# cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster detects faileded resources.
2. The file system stays mounted.
3. The cluster restarts resources on the same node.
4. One resource failure happens.

5.7.5 Testing ControlZone takeover by cluster on node failure

COMPONENT:

- Cluster node

DESCRIPTION:

- The ControlZone resources are started on other node

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

2. Manually kill cluster node, where resources are running (for example `akka1`).

```
akka2:~ # ssh root@akka1 "systemctl reboot --force"
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

3. Rejoin fenced node (for example `akka1`) to cluster.

```
akka2:~ # cs_show_sbd_devices | grep reset
akka2:~ # cs_clear_sbd_devices --all
akka2:~ # crm cluster start --all
```

4. Check the ControlZone resources and cluster.

```
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster detects a failed node.
2. The cluster fences a failed node.
3. The cluster starts all resources on the other node.
4. The fenced node needs to be connected to the cluster.
5. No resource failure happens.

5.7.6 Testing ControlZone takeover by cluster on NFS failure

COMPONENT:

- Network (for NFS)

DESCRIPTION:

- The NFS share fails on one node and the cluster moves resources to other node.

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

2. Manually block port for NFS, where resources are running (for example `akka1`).

```
akka2:~ # ssh root@akka1 "iptables -I INPUT -p tcp -m multiport --ports 2049 -j
 DROP"
akka2:~ # ssh root@akka1 "iptables -L | grep 2049"
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

3. Rejoin fenced node (for example `akka1`) to cluster.

```
akka2:~ # cs_show_sbd_devices | grep reset
akka2:~ # cs_clear_sbd_devices --all
akka2:~ # crm cluster start --all
```

4. Check the ControlZone resources and cluster.

```
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster detects failed NFS.
2. The cluster fences the node.
3. The cluster starts all resources on the other node.
4. The fenced node needs to be connected to the cluster.
5. Resource failure happens.

5.7.7 Testing cluster reaction on network split-brain

COMPONENT:

- Network (for Corosync)

DESCRIPTION:

- The network fails, node without resources gets fenced, resources keep running.

PROCEDURE:

1. Check the ControlZone resources and cluster.

```
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

2. Manually block ports for Corosync.

```
akka2:~ # grep mcastport /etc/corosync/corosync.conf
akka2:~ # ssh root@akka1 "iptables -I INPUT -p udp -m multiport --ports 5405,5407 -j
 DROP"
akka2:~ # ssh root@akka1 "iptables -L | grep -e 5405 -e 5407"
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

3. Rejoin fenced node (for example `akka1`) to cluster.

```
akka2:~ # cs_show_sbd_devices | grep reset
akka2:~ # cs_clear_sbd_devices --all
akka2:~ # crm cluster start --all
```

4. Check the ControlZone resources and cluster.

```
akka2:~ # cs_wait_for_idle -s 5; crm_mon -1r
```

EXPECTED:

1. The cluster detects failed Corosync.
2. The cluster fences the node.
3. The cluster keeps all resources on the same node.
4. The fenced node needs to be connected to the cluster.
5. No resource failure happens.

5.8 Additional tests

Define additional test cases according to your needs. Some test cases you should test are listed below.

- Remove virtual IP address.
- Stop and restart passive node.
- Stop and restart in parallel all cluster nodes.
- Isolate the SBD.
- Maintenance procedure with cluster is continuously running, but application restarts.
- Maintenance procedure with cluster restarts, but application is running.
- Kill the Corosync process of one cluster node.

See also manual page crm(8) for cluster crash_test.

6 Administration

HA clusters are complex, and the CM ControlZone is also complex. Deploying and running HA clusters for CM ControlZonen needs preparation, caution and care. Fortunately, most of the pitfalls and many best practices are already known. This chapter describes general administrative tasks.

6.1 Dos and don'ts

The following basic rules will help you avoid known issues:

- Carefully test all configuration changes and administrative procedures on the test cluster before applying them to the production cluster.
- Before taking any action, always check the Linux cluster's idle status, remaining migration constraints, and resource failures, plus the ControlZone status. See *Section 6.2, "Showing status of ControlZone resources and HA cluster"*.
- Be patient. The Linux cluster requires a certain amount of time to detect the overall status of the ControlZone, depending on the ControlZone services and the configured intervals and timeouts.
- As long as the ControlZone components are managed by the Linux cluster, they may never be started/stopped/moved from outside. This means that no manual intervention is required.

See also the manual page SAPCMControlZone_maintenance_examples(7), SAPCMControlZone_basic_cluster(7), and ocf_suse_SAPCMControlZone(7).

6.2 Showing status of ControlZone resources and HA cluster

Perform the following steps each time before and after you do any work on the cluster.

```
# su - c11adm -c "mzsh status"
# crm_mon -1r
# crm configure show | grep cli-
# cibadmin -Q | grep fail-count
# cs_clusterstate -i
```

See also manual page SAPCMControlZone_maintenance_examples(7), crm_mon(8), cs_clusterstate(8), and cs_show_cluster_actions(8).

6.3 Watching ControlZone resources and HA cluster

During testing and maintenance, you can run the following command to view near real-time status changes.

```
# watch -s8 cs_show_cluster_actions
```

See also manual page SAPCMControlZone_maintenance_examples(7), crm_mon(8), cs_clusterstate(8), and cs_show_cluster_actions(8).

6.4 Starting the ControlZone resources

Use the cluster for starting the resources.

```
# crm_mon -1r
# cs_wait_for_idle -s 5; crm resource start grp_cz_C11
# cs_wait_for_idle -s 5; crm_mon -1r
```

See also manual page SAPCMControlZone_maintenance_examples(7), crm(8).

6.5 Stopping the ControlZone resources

Use the cluster for stopping the resources.

```
# crm_mon -1r
# cs_wait_for_idle -s 5; crm resource stop grp_cz_C11
# cs_wait_for_idle -s 5; crm_mon -1r
```

See also manual page SAPCMControlZone_maintenance_examples(7), crm(8).

6.6 Migrating the ControlZone resources

To migrate the ControlZone resources to another node, the following steps are performed (see commands below): ControlZone application and Linux cluster are initially checked for a clean and idle state. The ControlZone resources are moved to the other node. The associated location rule will be removed after the takeover took place. Finally, ControlZone application and HA cluster are again checked for a clean and idle state.

```
# su - c11adm -c "mzsh status"
# crm_mon -1r
# crm configure show | grep cli-
# cibadmin -Q | grep fail-count
# cs_clusterstate -i

# crm resource move grp_cz_C11 force
# cs_wait_for_idle -s 5; crm_mon -1r
# crm resource clear grp_cz_C11

# cs_wait_for_idle -s 5; crm_mon -1r
# crm configure show | grep cli-
# su - c11adm -c "mzsh status"
```

See also manual page SAPCMControlZone_maintenance_examples(7).

6.7 Example for generic maintenance procedure

Find below a generic procedure, mainly for maintenance of the ControlZone components. The resources are temporarily removed from cluster control. The Linux cluster remains active.

The individual steps are carried out as follows (see commands below): ControlZone application and HA cluster are initially checked for a clean and idle state. The ControlZone resource group is set to maintenance mode. This is required to enable manual actions on the resources. After the manual actions are completed, the resource group is placed back under cluster control. It is neccessary to wait for the completion of each step and to check the results. Finally, ControlZone application and HA cluster are again checked for a clean and idle state.

```
# su - c11adm -c "mzsh status"
# crm_mon -1r
# crm configure show | grep cli-
# cibadmin -Q | grep fail-count
# cs_clusterstate -i
# crm resource maintenance grp_cz_C11

# echo "PLEASE DO MAINTENANCE NOW"

# crm resource refresh grp_cz_C11
# cs_wait_for_idle -s 5; crm_mon -1r
# crm resource maintenance grp_cz_C11 off
# cs_wait_for_idle -s 5; crm_mon -1r
# su - c11adm -c "mzsh status"
```

See also manual page SAPCMControlZone_maintenance_examples(7).

6.8 Showing resource agent log messages

Failed RA actions on a node are displayed in the current message file.

```
# grep "SAPCMControlZone.*rc=[1-7,9]" /var/log/messages
```

See also manual page ocf_suse_SAPCMControlZone(7).

6.9 Cleaning up resource fail count

Cleaning up resource fail count can be done after the cluster has recovered the resource from a failure.

```
# crm resource cleanup grp_cz_C11
# cibadmin -Q | grep fail-count
```

See also manual page ocf_suse_SAPCMControlZone(7) and SAPCMControlZone_maintenance_examples(7).

7 References

For more information, see the documents listed below.

7.1 Pacemaker

- Pacemaker documentation online: https://clusterlabs.org/pacemaker/doc/

7.2 Related Manual Pages

- chronyc(8)
- chrony.conf(5)
- corosync.conf(8)
- corosync-cfgtool(8)
- corosync_overview(8)
- cibadmin(8)
- crm(8)
- crm_mon(8)
- crm_report(8)
- crm_simulate(8)
- cs_clusterstate(8)
- cs_man2pdf(8)
- cs_show_cluster_actions(8)
- cs_show_sbd_devices(8)
- cs_wait_for_idle(8)
- fstab(5)
- ha_related_sap_notes(7)
- ha_related_suse_tids(7)
- hosts(5)
- mount.nfs(8)
- nfs(5)

- ocf_heartbeat_Filesystem(7)
- ocf_heartbeat_IPAddr2(7)
- ocf_heartbeat_ping(7)
- ocf_suse_SAPCMControlZone(7)
- passwd(5)
- SAPCMControlZone_basic_cluster(7)
- SACMPControlZone_maintenance_procedures(7)
- saptune(8)
- sbd(8)
- stonith_sbd(7)
- supportconfig(8)
- systemctl(8)
- systemd-cgls(8)
- usermod(8)
- votequorum(5)
- zypper(8)

7.3 Related SUSE TIDs

- Diagnostic Data Collection Master TID (https://www.suse.com/support/kb/doc/?id=000019514)
- How to enable cluster resource tracing (https://www.suse.com/support/kb/doc/?id=000019138)
- NFS file system is hung. New mount attempts hang also. (https://www.suse.com/support/kb/doc/?id=000019722)
- An NFS client hangs on various operations, including "df". Hard vs Soft NFS mounts. (https://www.suse.com/support/kb/doc/?id=000020830)

7.4 Related SUSE Documentation

- SUSE Linux Enterprise Server for SAP Applications (https://documentation.suse.com/sles-sap/)
- SUSE Linux Enterprise High Availability (https://documentation.suse.com/sle-ha)

7.5 Related Digital Route Documentation

- ControlZone tool mzsh (https://infozone.atlassian.net/wiki/spaces/MD9/pages/4881672/mzsh)
- ControlZone requirements (https://infozone.atlassian.net/wiki/spaces/MD9/pages/4849685/System+Requirements).
- ControlZone installation https://infozone.atlassian.net/wiki/spaces/MD9/pages/4849683/Installation+Instructions

7.6 Related SAP Documentation

- SAP RISE (https://www.sap.com/products/erp/rise.html)
- SAP BRIM Convergent Mediation (https://www.sap.com/products/financial-management/convergent-mediation.html)
- SAP Product Availability Matrix (https://support.sap.com/en/release-upgrade-maintenance.html#section_1969201630)

7.7 Related SAP Notes

- 1552925 - Linux: High Availability Cluster Solutions (https://launchpad.support.sap.com/#/notes/1552925)
- 1763512 - Support details for SUSE Linux Enterprise for SAP Applications (https://launchpad.support.sap.com/#/notes/1763512)
- 2369910 - SAP Software on Linux: General information (https://launchpad.support.sap.com/#/notes/2369910)

- 2578899 - SUSE Linux Enterprise Server 15: Installation Note (https://launchpad.support.sap.com/#/notes/2578899)
- 3079845 - Standard Practices for SAP CM High Availability (https://launchpad.support.sap.com/#/notes/3079845)

8 Appendix

8.1 The mzadmin user´s ~/.bashrc file

Find below a typical mzadmin user´s ~/.bashrc file.

```
akka1:~ # su - c11adm -c "cat ~./bashrc"

# MZ_PLATFORM, MZ_HOME, JAVA_HOME are set by HA RA
export MZ_PLATFORM=${RA_MZ_PLATFORM:-"http://localhost:9000"}
export MZ_HOME=${RA_MZ_HOME:-"/usr/sap/C11"}
export JAVA_HOME=${RA_JAVA_HOME:-"/usr/lib64/jvm/jre-17-openjdk"}
```

8.2 CRM configuration for a typical setup

Find below a typical CRM configuration for a CM ControlZone instance, with a dummy file system, platform and UI services and related IP address.

```
akka1:~ # crm configure show

node 1: akka1
node 2: akka2
#
primitive rsc_fs_C11 ocf:heartbeat:Filesystem \
    params device=/usr/sap/C11/.check directory=/usr/sap/.check_C11 \
    fstype=nfs4 options=bind,rw,noac,sync,defaults \
    op monitor interval=90 timeout=120 on-fail=fence \
    op_params OCF_CHECK_LEVEL=20 \
    op start timeout=120 interval=0 \
    op stop timeout=120 interval=0
#
primitive rsc_cz_C11 ocf:suse:SAPCMControlZone \
    params SERVICE=platform USER=c11adm \
    MZSHELL=/opt/cm/C11/bin/mzsh;/usr/sap/C11/bin/mzsh \
    MZHOME=/opt/cm/C11/;/usr/sap/C11/ \
    MZPLATFORM=http://localhost:9000 \
    JAVAHOME=/usr/lib64/jvm/jre-17-openjdk \
    op monitor interval=90 timeout=150 on-fail=restart \
    op start timeout=300 interval=0 \
    op stop timeout=300 interval=0 \
    meta priority=100
#
```

```
primitive rsc_ui_C11 ocf:suse:SAPCMControlZone \
    params SERVICE=ui USER=c11adm \
    MZSHELL=/opt/cm/C11/bin/mzsh;/usr/sap/C11/bin/mzsh \
    MZHOME=/opt/cm/C11/;/usr/sap/C11/ \
    MZPLATFORM=http://localhost:9000 \
    JAVAHOME=/usr/lib64/jvm/jre-17-openjdk \
    op monitor interval=90 timeout=150 on-fail=restart \
    op start timeout=300 interval=0 \
    op stop timeout=300 interval=0
#
primitive rsc_ip_C11 IPaddr2 \
    params ip=192.168.1.112 \
    op monitor interval=60 timeout=20 on-fail=restart
#
primitive rsc_stonith_sbd stonith:external/sbd \
    params pcmk_delay_max=15
#
group grp_cz_C11 rsc_fs_C11 rsc_cz_C11 rsc_ip_C11 rsc_ui_C11
#
property cib-bootstrap-options: \
    have-watchdog=true \
    dc-version="2.1.2+20211124.ada5c3b36-150400.2.43-2.1.2+20211124.ada5c3b36" \
    cluster-infrastructure=corosync \
    cluster-name=hacluster \
    dc-deadtime=20 \
    stonith-enabled=true \
    stonith-timeout=150 \
    stonith-action=reboot \
    last-lrm-refresh=1704707877 \
    priority-fencing-delay=30
rsc_defaults rsc-options: \
    resource-stickiness=1 \
    migration-threshold=3 \
    failure-timeout=86400
op_defaults op-options: \
    timeout=120 \
    record-pending=true
#
```

8.3 Corosync configuration of the two-node cluster

Find below the Corosync configuration for one Corosync ring. Ideally two rings would be used.

```
akka1:~ # cat /etc/corosync/corosync.conf
```

```
# Read the corosync.conf.5 manual page
totem {
    version: 2
    secauth: on
    crypto_hash: sha1
    crypto_cipher: aes256
    cluster_name: hacluster
    clear_node_high_bit: yes
    token: 5000
    token_retransmits_before_loss_const: 10
    join: 60
    consensus: 6000
    max_messages: 20
    interface {
        ringnumber: 0
        mcastport: 5405
        ttl: 1
    }
    transport: udpu
}

logging {
    fileline: off
    to_stderr: no
    to_logfile: no
    logfile: /var/log/cluster/corosync.log
    to_syslog: yes
    debug: off
    timestamp: on
    logger_subsys {
        subsys: QUORUM
        debug: off
    }
}

nodelist {
    node {
        ring0_addr: 192.168.1.11
        nodeid: 1
    }
    node {
        ring0_addr: 192.168.1.12
        nodeid: 2
    }
}

quorum {
```

```
    # Enable and configure quorum subsystem (default: off)
    # see also corosync.conf.5 and votequorum.5
    provider: corosync_votequorum
    expected_votes: 2
    two_node: 1
}
```

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