

High Availability For SAP Application Servers Using ENSA-2 Enqueue Replication

HOL-1225

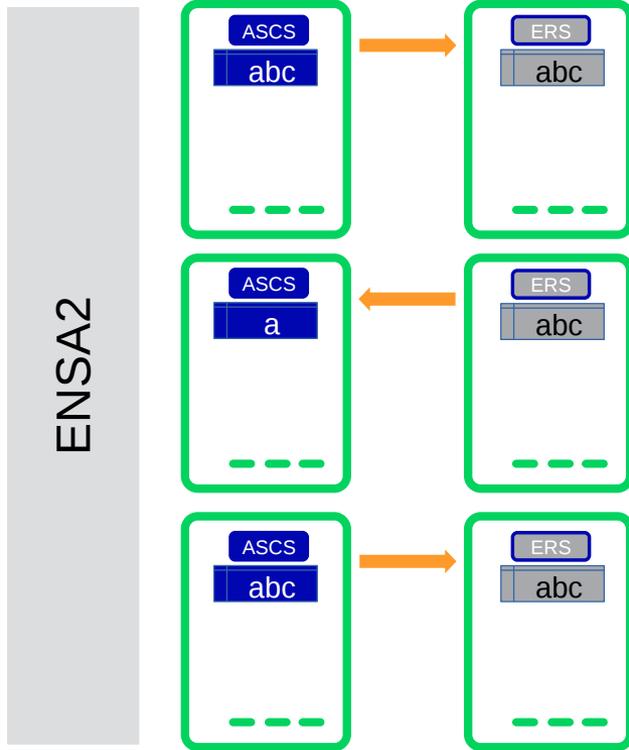
Fabian Herschel
Distinguished Architect SAP, SUSE

Bernd Schubert
SAP Solution Architect, SUSE

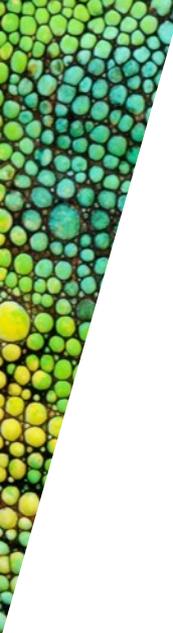
Agenda

1. SAP Enqueue replication
2. Lab infrastructure
3. Starting Hands-on

SAP Standalone Enqueue Server 2



*ASCS local restart allowed by error and admin



What Could You Expect?

- Configure SAP MC
- Work with Pacemaker
- ASCS and ERS HA setup
- Verify ASCS and ERS HA setup
- Doing SAP maintenance

Let's Start...

You get in touch with,

SUSE tools:

- GUI: HAWK
- CLI: (crm, ps, ...)

SAP tools:

- GUI: SAP MC
- CLI: (sapcontrol)

You start with,

@SUSE:

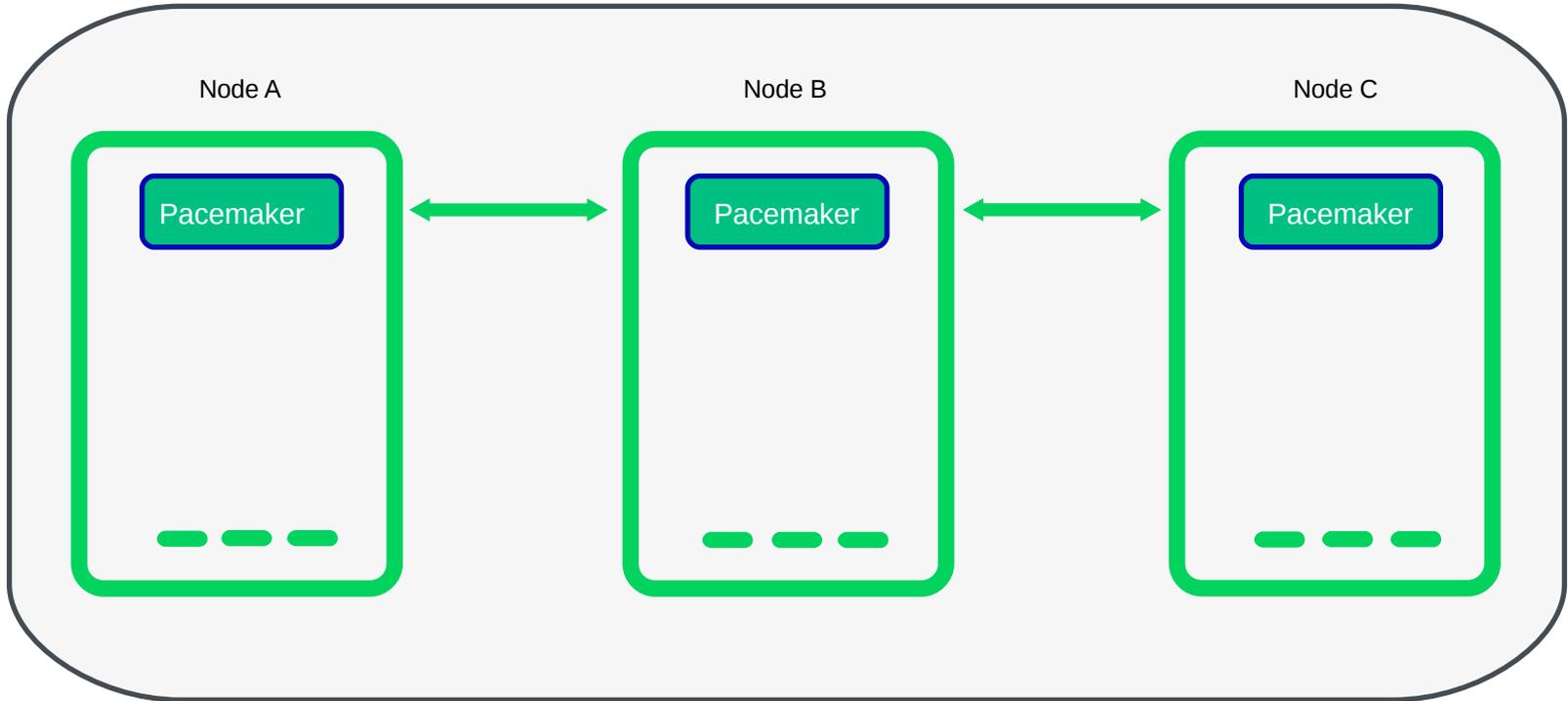
- SLES for SAP Applications 15 SP1
- Empty three node cluster
- HAWK configured

@SAP:

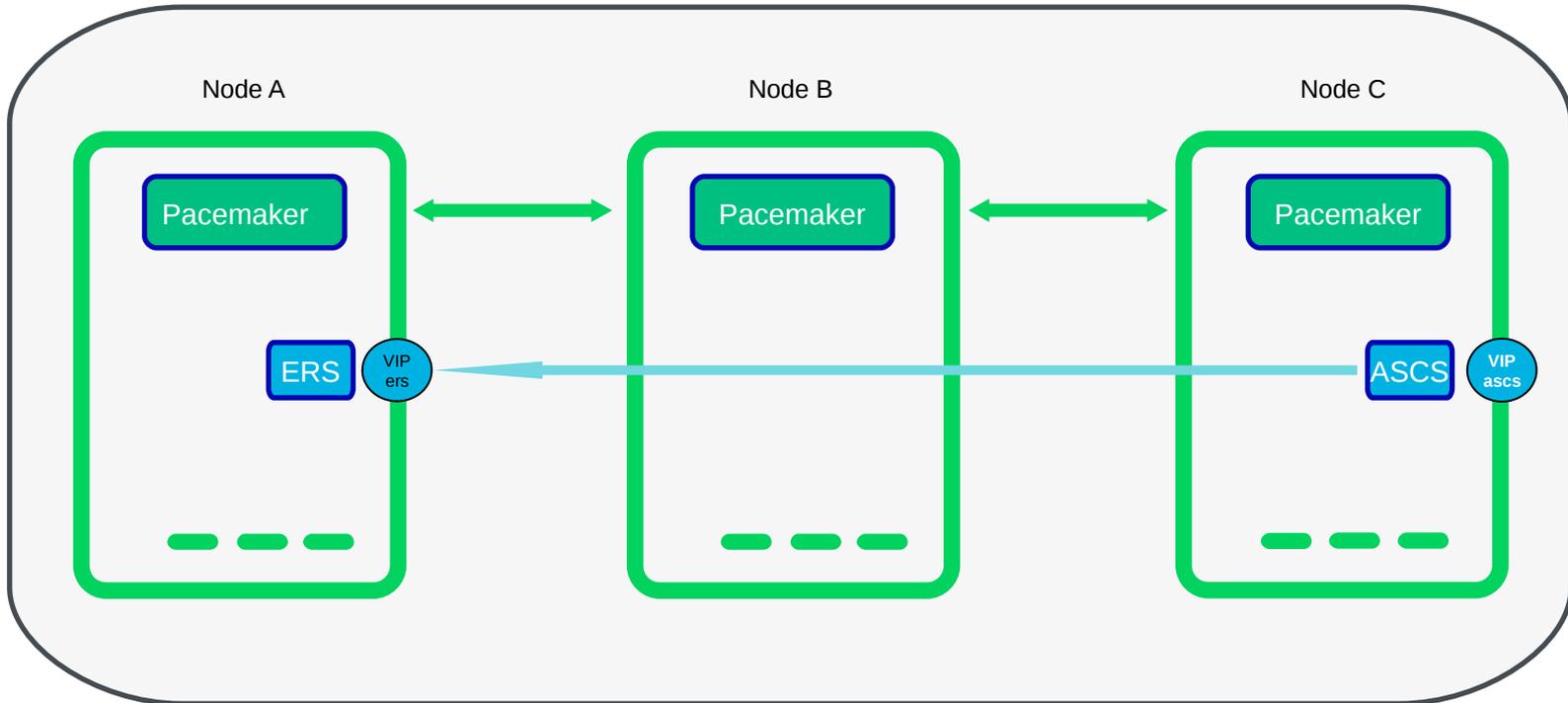
- S/4HANA 1909 central services installed
- SAP MC on admin host installed

- * GUI: **g**raphical **u**ser interface
- * CLI: **c**ommand **l**ine interface
- * SAP MC: SAP **m**anagement **c**onsole

Lab Infrastructure – Starting Point



Lab Infrastructure – Goal



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SUSE LLC

1800 South Novell Place

Provo, UT 84606

USA

<https://documentation.suse.com> 

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1 Getting Familiar with the Infrastructure

1.1 HAWK (GUI)

1. Login to admin server if needed using *root* and *SuSE1234*.
2. Open the Firefox (icon on your desktop) browser and login at HAWK. Please use the credential: user → *hacluster* and password → *linux* .



Note

If you get a security warning please except the risk and add the security exception to proceed.



FIGURE 1.1: (A) MONITORING ENTRY POINT (B) CLUSTER RESOURCE TAB (C) CLUSTER NODE TAB (D) INFORMATION ABOUT CLUSTER RESOURCE

3. Choose on the left site MONITORING (a) → Status.
4. Choose in the middle Resources (b) and Nodes (c).
 - you will find one resource and three nodes there (d).
5. Choose on the left site MONITORING → Dashboard.
 - you will find the node who is providing the resource.
6. Open the pull down menu of **Legend**(on the right side in the Dashboard window) this will help to understand the symbols.
7. Look around to other options if you like. **Do not change any value in the CONFIGURATION section.**

1.2 Terminal (crmsh)

- Open a terminal on **admin** node and connect to **suse3**.

```
# ssh suse3
# crm status
# crm corosync status
# crm cluster status
# crm cluster health
## optional
# crm cluster run "date; hostname"
```

Conclusion:

- Three node cluster with diskless SBD.
- One resource configured, admin IP for cluster access.
- Cluster is healthy, no error so far.

Kepp the terminal window open please.

2 Checking installed S/4HANA Central services

- Open a new terminal and connect to cluster node suse1.

```
# ssh suse1
# su - en2adm
# sapcontrol -nr 00 -function GetSystemInstanceList
# sapcontrol -nr 00 -function GetProcessList
# sapcontrol -nr 10 -function GetProcessList -host sapen2er
```

Verify that all services shown a green status.



Warning

If not all services are green please raise your hand and inform your instructor.

```
susel:en2adm 52> sapcontrol -nr 00 -function GetProcessList
27.02.2020 14:50:49
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
msg_server, MessageServer, GREEN, Running, 2020 02 27 14:48:41, 0:02:08, 7123
enq_server, Enqueue Server 2, GREEN, Running, 2020 02 27 14:48:41, 0:02:08, 7124
susel:en2adm 53> sapcontrol -nr 10 -function GetProcessList -host sapen2er
27.02.2020 14:51:06
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
enq_replicator, Enqueue Replicator 2, GREEN, Running, 2020 02 27 14:47:50, 0:03:16, 1825
susel:en2adm 54>
```

a b c d e

FIGURE 2.1: (A) SAP SERVICE PROCESS NAME (B) SAP SERVICE STATUS (C) SAP INSTANCE NUMBER (D) OPTION TO CONNECT TO A REMOTE HOST (E) PROCESS IDENTIFIER (PID)

2.1 Optional:



Note

Open multiple terminal windows or tab's and connect to each system separately if you like.

- Connect to ASCS and verify status local.

```
# ssh sapen2as
# su - en2adm
# sapcontrol -nr 00 -function GetProcessList
```

- Connect to ERS and verify status local.

```
# ssh sapen2er
# su - en2adm
# sapcontrol -nr 10 -function GetProcessList
```

Conclusion:

- You can get a host specific or instance global overview
- You can use either node names or virtual hostnames and connect to a node
- SAP ASCS is running and all services are green
- SAP ERS is running and all services are green

3 Integrate the SAP Instance into the SAP MC

1. Click on the icon **SAP MC** on your desktop to open the **SAP MC**.

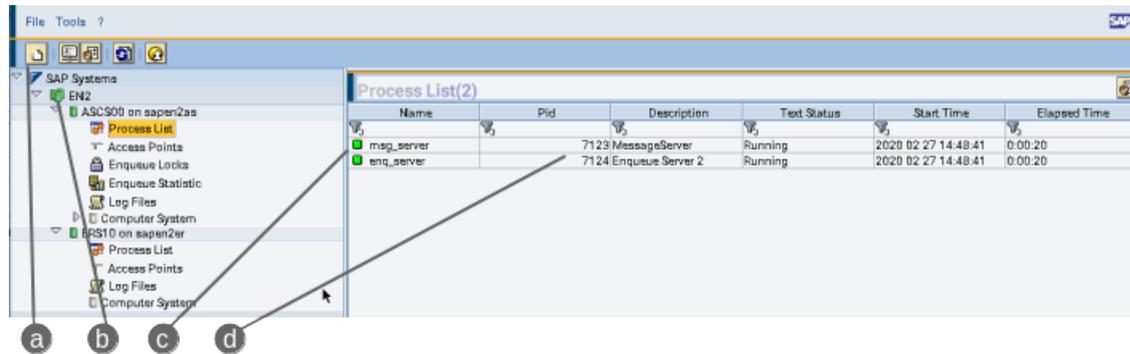


FIGURE 3.1: (A) ADD NEW INSTANCE (B) NEW ADDED SID (C) SAP SERVICES FROM THE ASCS INSTANCE (D) PID AS IT WAS SHOWN FROM THE COMMAND LINE

2. Click in the upper left on the icon "add new instance" (a).
3. Fill in **Instance Nr.** → 00 and **Instance Host** → sapen2as.
4. Click on **Finish**.
5. Click on the new entry EN2 (b) and logon to the system with *en2adm* and *SuSE1234* .
6. Open the instances by click on the arrow in front of EN2.
7. You should see the ASCS and ERS.
8. Select the ASCS and open the substructure.
9. Repeat this step for ERS.
10. Select the *Process List* and verify that all services are online and green (c).
11. Explore the **SAP MC**.
12. Optional, needed if only ASCS is shown:
 - Left click on the entry EN2 and selected them, right click and choose **Discover Instances** from the context menu.

Conclusion:

- SAP instance ASCS and ERS for EN2 are visible in the **SAP MC**
- PID (d) of running services are the same as from the output of the terminal window

4 Integrate the SAP Instance EN2 in the Three Node Cluster

(According to the SUSE Best Practice with sap-suse-cluster-connector)

4.1 Preparation Steps

At first we have to shutdown the SAP instance EN2.

1. Reuse an open terminal or open a new one from your local host as user: `<sid> adm` with password: `SuSE1234`

```
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function StopSystem
```

- Verify that the SAP system is down as `<sid> adm`.

```
# sapcontrol -nr 00 -function GetProcessList
# sapcontrol -nr 00 -function GetSystemInstanceList
```

- Stop SAP sapstartsrv

```
# sapcontrol -nr 00 -function StopService
# ssh sapen2er
# sapcontrol -nr 10 -function StopService
```

- Check status via command line as `<sid> adm`:

Please repeat the command as mentioned before for both instances (e.g. `# sapcontrol -nr 10 -function GetProcessList` **and after exit run** `sapcontrol -nr 00 -function GetProcessList`). The result on both nodes should be like this: **# FAIL: NIECONN_REFUSED (Connection refused), NiRawConnect failed in plugin_fopen()**

- Check status via SAP MC:
 1. The SAP system with EN2 is shown **grey** with a **red** sphere.



Note

If your **SAP MC** was closed and you open it again you are not able to see the SID. Because the sapstartsrv is not responding and you will only see a communication error.

4.2 Adapting SAP Profile

1. Reuse an open ssh session or connect again with a new terminal to sapen2as or sapen2er as **root** user.
 - Edit the profile for ASCS.
 - Find section: "# Start SAP enqueue server"
 - Change the *Restart_Program_0...* to *Start_Program_0...*

```
# ssh sapen2as
# vi /usr/sap/EN2/SYS/profile/EN2_ASCS00_sapen2as
```

```
...
# Start SAP enqueue server
...
Start_Program_01 = local $_ENQ pf=$_PF
...
```

- Verify that this two lines are in the SAP instance file. **Normally they are not there.** They have to be added to make the SAP control framework able to provide information to the cluster framework.
- Comment the two lines below and remove the #.

```
# vi /usr/sap/EN2/SYS/profile/EN2_ASCS00_sapen2as
...
service/halib = $(DIR_CT_RUN)/saphascriptco.so
service/halib_cluster_connector = /usr/bin/sap_suse_cluster_connector
...
```

- Safe and close the file.
- Edit the profile for ERS in the same way as the ASCS profile.
- Find section: "# Start SAP enqueue replicator"
- Change the *Restart_Program_0...* to *Start_Program_0...*

```
# vi /usr/sap/EN2/SYS/profile/EN2_ERS10_sapen2er
```

```
...
# Start SAP enqueue replicator
...
Start_Program_00 = local $_ENQR pf=$_PF
...
```

- Verify that this two lines are in the SAP instance file. **Normally they are not there.** They have to be added to make the SAP control framework able to provide information to the cluster framework.
- Comment the two lines below and remove the #.

```
# vi /usr/sap/EN2/SYS/profile/EN2_ERS10_sapen2er
...
service/halib = $(DIR_CT_RUN)/saphascriptco.so
service/halib_cluster_connector = /usr/bin/sap_suse_cluster_connector
...
```

- Safe and close the file.
- The next step must be done as user *root*. Add the user *en2adm* to the unix user group *haclient*.

```
# crm cluster run "usermod -aG haclient en2adm"
# crm cluster run "grep haclient /etc/group"
```

After this step the *en2adm* should be member of the *haclient* group. E.g.

```
# suse3:~ # crm cluster run "grep haclient /etc/group"
OK: [suse3]
haclient:x:90:en2adm
OK: [suse2]
haclient:x:90:en2adm
OK: [suse1]
```

```
haclient:x:90:en2adm
```

4.3 Starting SAP System

1. Use the last terminal and start the "sapstartsrv" or open a new terminal or tab.

```
# ssh en2adm@sapen2er
# sapcontrol -nr 10 -function StartService EN2
# exit
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function StartService EN2
# sapcontrol -nr 00 -function StartSystem
### wait some seconds
# sapcontrol -nr 00 -function GetSystemInstanceList
```

Repeat the global status command (...GetSystemInstanceList) as long as all instances became green. Check the status also with the **SAP MC**.

4.4 SAP System Implementation in Pacemaker

Procedure Overview, the detailed steps will follow below:

- First check date and time of all cluster nodes as quick test.
- Set the cluster in maintenance mode.
- Prepare cluster configuration file.
- Load the cluster configuration file.
- End cluster maintenance and check SAP SID EN2.

Use one of the terminal's from cluster node suse1, suse2 or suse3. The next steps has to be done as root user. Please do a pre-flight check and look if all cluster nodes have the same date and time.

```
# ssh suse3
# crm cluster run date
```



Warning

Inform one of the instructors if the time and date differs between the nodes.



Note

If the time and date is equal on all nodes please proceed.

As user root, type the following command on one of the node's(suse1, suse2, suse3):

```
# crm configure property maintenance-mode="true"
```

- Prepare the cluster configuration file for SID EN2 and load them in the cluster.



Tip

Use the substitution function of vi / vim like the example below. The "*" is the separator in that case because a "/" would not work in our example. Please exchange also the < and >.

This is a generic example and must be adapted.

```
# vi filename.txt
...
here is some content
<SID> should be replaced
~
:%s*<SID>*EN2*g
```

- Replace <SID> with EN2
- Replace <INOA> with 00
- Replace <INOE> with 10
- Replace <ASCS-path> with /dev/disk/by-id/scsi-0QEMU_QEMU_HARDDISK_drive-sc-si0-0-0-part1
- Replace <ERS-path> with /dev/disk/by-id/scsi-0QEMU_QEMU_HARDDISK_drive-sc-si0-0-0-part2
- Replace <ASCS-vip> with 192.168.1.112
- Replace <ERS-vip> with 192.168.1.113
- Replace <vh-ascs> with sapen2as
- Replace <vh-ers> with sapen2er

Benefit: If you use the mentioned file names in the example than you can run the prepared check script to verify your changes. This will preventing loading incorrect cluster configurations.

EXAMPLE 4.1: AFTER CHANGING ALL PLACEHOLDERS FOR SAP SID EN2

```
# cd
# cp /sapmnt/hol1225/generic-ha.txt en2-ha.txt
# chmod +w en2-ha.txt
# vi en2-ha.txt
# /sapmnt/hol1225/check-cluster-config EN2
```

After checking your prepared *en2-ha.txt* file with the */sapmnt/hol1225/check-cluster-config*. The result should be ...looks OK.

Conclusion:

- The configuration includes three resources for each SAP instance (filesystem, IP and SAP instance).
- We build two groups and bundle the resource for ASCS and ERS.
- We set co-location constraints between ASCS and ERS.
- Load the configuration:

```
# crm configure load update en2-ha.txt
```

Important

If all worked well you should get the prompt back with no additional information. If you get additional messages here solve the issue before you continue.

- Release the cluster maintenance mode.

The last step is to end the cluster maintenance mode and to allow the cluster to detect already running resources or start them if they are offline.

- As user root, type the following command:

```
# crm configure property maintenance-mode="false"
```

- Monitor and check the cluster for SID EN2

```
# crm_mon -rf
```

- Using **CTRL + C** to leave the live monitoring



Note

You should see no error or inactive resources.

- Please check the SAP SID EN2 in the **SAP MC** and recognize that all services and instances are up and running.

5 Testing the Cluster

5.1 Making the Test more Realistic

At first we will generate some enqueue lock's. They will simulate an active transaction. The ASCS will replicate these lock's to the connected ERS. This will make the test's and behavior a bit more realistic. Because we can see that the lock's are still there after the ASCS was done or migrated.

1. Check the lock entries in the **SAP MC** → click on EN2 → ASCS00 → Enqueue Lock.
2. Use the link "**FillEnqueueTable**" on your desktop to generate enqueue lock's. If a password is needed please use: SuSE1234
3. Verify the lock entries in the **SAP MC** → click on EN2 → ASCS00 → Enqueue Lock.

5.2 The First Test

Check if manually migrating the ASCS instance using HA tools works properly. Check if moving the ASCS instance using SAP tools like *sapcontrol* works properly. Check if the ASCS instance moves correctly after a node failure. This test will immediately trigger a hard reboot of the node.



Note

Please use the table below to make notes and remember from which node to which node the ASCS is moved. Make a X to mark the position or use your own symbol.

Please switch between HAWK, SAP MC* or the terminal with *crmsH* to get the information you need to fill the table during the test's.

ASCS move inside the cluster					
<i>Moving the ASCS instance using cluster tools</i>				<i>Enqueue look</i>	
Test 1.a	suse1	suse2	suse3	exist	gone
ASCS run on					

ASCS move inside the cluster					
ASCS move to					
<i>Moving the ASCS instance using sapcontrol</i>				<i>Enqueue look</i>	
Test 1.b	suse1	suse2	suse3	exist	gone
ASCS run on					
ASCS move to					
<i>Moving the ASCS instance after node failure</i>				<i>Enqueue look</i>	
Test 1.c	suse1	suse2	suse3	exist	gone
ASCS run on					
ASCS move to					

1. Manually Moving ASCS with cluster tools.
2. Check if the locks are still there.
3. Manually Moving ASCS with SAP tools.
4. Check if the locks are still there.
5. Switch of a cluster node.
6. Check if the locks are still there.

5.2.1 Test 1.a

Fill in the first line from the table of Test 1.a

EXAMPLE 5.1: MANUALLY MOVING ASCS WITH CLUSTER TOOLS

```
# ssh suse1
```

```
# crm resource move rsc_sap_EN2_ASCS00 force
## wait until the ASCS is been migrated to free host, use the command below to monitor
the operation
# crm_mon -rf
## use CTRL + c to exit
# crm resource clear rsc_sap_EN2_ASCS00
```

- Check the enqueue lock using **SAP MC** and fill out the table above.

Conclusion:

- After a resource migration with pacemaker tools all enqueue lock are still there. During the resource transition the SAP system is shortly unavailable.

5.2.2 Test 1.b

Fill in the first line from the table of Test 1.b

EXAMPLE 5.2: MANUALLY MOVING ASCS WITH SAP *SAPCONTROL*

```
# ssh sapen2as
# su - en2adm
# sapcontrol -nr 00 -function HAFailoverToNode ""
##
## you will lose that connection as we are connected to vIP which is now moved
##
# ssh sapen2as
# crm_mon -rf
## wait until the ASCS is been moved to free host, use the command below to monitor the
operation
## use CTRL + c to exit
```

- Check the enqueue lock using **SAP MC** and fill out the table above.
- Cleanup the system after the test as **root** user

```
# ssh root@suse3
# crm resource clear rsc_sap_EN2_ASCS00
```

Conclusion:

- After a resource migration with `SAP_sapcontrol_tools` all enqueue lock are still there. During the resource transition the SAP system is shortly unavailable.

5.2.3 Test 1.c

Fill in the first line from the table of Test 1.c

EXAMPLE 5.3: SWITCH OFF THE ASCS CLUSTER NODE

This time you need at least two terminal's.

```
# ssh root@sapen2er
## monitor the ASCS transition with crm_mon
# crm_mon -rf
```

In the second terminal trigger the node failure.

```
# ssh root@sapen2as
# echo b > /proc/sysrq-trigger
```

- Cleanup the system after the test

```
# ssh suse3
# crm resource cleanup rsc_sap_EN2_ASCS00
# crm resource cleanup rsc_sap_EN2_ERS10
```

- Check the enqueue lock using **SAP MC** and fill out the table above.

Conclusion:

- After a node failure which has hosted the ASCS all enqueue lock are still there. During the resource transition the SAP system is shortly unavailable.

5.3 The Second Test

In this scenario the cluster is fully active and not in maintenance mode. All resources are under control and monitored by pacemaker. The first procedure will stop the ASCS and ERS resources during the cluster is active. The second procedure start the cluster resource maintenance mode as `<sid>adm` user.

1. Using *sapcontrol* to set a cluster resource in maintenance mode
2. Using *sapcontrol* to stop and start an instance.



Note

Please use the table below to make notes. Note down the state of ASCS before, during and after the procedure. Make a **X** to mark the state or use what ever you like and make your notes.

Please switch between HAWK, SAP MC* or the terminal with crmsh to get the information you need to fill the table during the test's.

Cluster maintenance as <sid> adm with SAP tool <i>sapcontrol</i>					
<i>Cluster resource maintenance with sapcontrol</i>					
Test 2.a	started	stopped	stopped(disabled)	unmanaged	failed
ASCS initial					
ASCS during test					
ASCS after test					
<i>Stop and start an instance with sapcontrol</i>					
Test 2.b	started	stopped	stopped(disabled)	unmanaged	failed
ASCS initial					
ASCS during test					
ASCS after test					

5.3.1 Test 2.a

Fill in the first line from the table of Test 2.a

EXAMPLE 5.4: RESOURCE MAINTENANCE AS <SID>ADM

This time you need at least two terminal's.

```
# ssh root@suse3
## monitor the resources with crm_mon
# crm_mon -rf
```

In the second terminal do the maintenance.

```
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function HASETMAINTENANCEMODE 1
## check the cluster resources in the first terminal and note down the result of
this action
# sapcontrol -nr 00 -function HASETMAINTENANCEMODE 0
```

- Check the enqueue lock table using **SAP MC** that all enqueue locks's are still there.

Conclusion:

- The procedure show you that it is possible to set cluster resources in maintenance mode as user <sid> adm. The example set the ASCS and ERS cluster resource to unmanaged. If a instance would be now stop the cluster will not recognize this state change. There will be no action from the cluster to change this situation.

5.3.2 Test 2.b

Fill in the first line from the table of Test 2.b

EXAMPLE 5.5: STOP AND START AN INSTANCE AS <SID>ADM WITHOUT CLUSTER MAINTENANCE

This time you need at least two terminal's.

```
# ssh root@suse3
## monitor the resources with crm_mon
# crm_mon -rf
```

In the second terminal do the action.

```
# ssh en2adm@sapen2as
```

```
# sapcontrol -nr 00 -function Stop
check the cluster resources in the first terminal and note down the result of this
action
wait till the ASCS is completely down
# sapcontrol -nr 00 -function Start
```

- Cleanup the system after the test

```
# ssh suse3
# crm resource cleanup rsc_sap_EN2_ASCS00
# crm resource cleanup rsc_sap_EN2_ERS10
```

- Check the enqueue lock table using **SAP MC** that all enqueue locks's are still there.

Conclusion:

- The in-place restart of the SAP resources have been processed correctly. The SAP instance should not failover to an other node, it must start on the same node where it has been stopped. The cluster does not interact and try to start the resource. The resource is not marked as failed in the cluster live view.

5.4 Summary Conclusion

- Using ENSA2 ASCS can move to a free host and copy enqueue locks over network
- Using *sapcontrol* and the latest sap-suse-cluster-connector ⇒ cluster is aware of manual stopping and starting of SAP workloads.
- Using *sapcontrol* and the latest sap-suse-cluster-connector ⇒ cluster resource can be set in maintenance as <sid> adm.
- SUSE Linux Enterprise Server for SAP Applications makes your life a bit easier :-)

6 Optional Tasks

The following tasks are independent from each other but can also combined together. Please choose by your own with which one you would like to start first.

6.1 Using SAP ASCS / ERS HAE without sap-suse-cluster-connector

Ask one of your instructors to get the optional task.



Note

This test should show you what happen if the sap-suse-cluster-connector is not in place.

7 Using SAP ASCS / ERS HAE without sap-suse-cluster-connector

Procedure Overview, the detailed steps will follow below:

- Preparing and set cluster maintenance mode
- Stop the SAP instance EN2 and sapstartsrv
- Modify the ASCS and ERS profile (disable sap-suse-cluster-connector integration)
- Start the SAP instance EN2 and sapstartsrv
- Release cluster maintenance mode
- Run the test's again

7.1 Preparation Steps

1. Reuse an open terminal or open a new one from your local host as user **root**, type the following command on one of the node's(suse1, suse2, suse3):

```
# ssh suse3
# crm configure property maintenance-mode="true"
```

2. Reuse an open terminal or open a new one from your local host as user **root**:

```
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function StopSystem
```

3. Verify that the SAP system is down as <sid> adm.

```
# sapcontrol -nr 00 -function GetProcessList
# sapcontrol -nr 00 -function GetSystemInstanceList
```

4. Stop SAP sapstartsrv

```
# sapcontrol -nr 00 -function StopService
# ssh sapen2er
```

```
# sapcontrol -nr 10 -function StopService
```

5. Check status via command line as <sid> adm:

Please repeat the command as mentioned before for both instance numbers (e.g. # sapcontrol -nr 00 -function GetProcessList). The result on both nodes should be like this: # **FAIL: NIE-CONN_REFUSED (Connection refused), NiRawConnect failed in plugin_fopen()**

6. Check status via SAP MC:

- The SAP system with EN2 is shown **grey** with a **red** sphere.

7.2 Adapting SAP Profile

- Reuse an open ssh session or connect again with a new terminal to sapen2as or sapen2er as **root** user.
- Edit the profile for ASCS.
- Find the two line's for the sap-suse-cluster-connector and comment them with #

1. Modify ASCS profile

```
# ssh sapen2as  
# vi /usr/sap/EN2/SYS/profile/EN2_ASCS00_sapen2as
```

```
# vi /usr/sap/EN2/SYS/profile/EN2_ASCS00_sapen2as  
...  
# service/halib = $(DIR_CT_RUN)/saphascriptco.so  
# service/halib_cluster_connector = /usr/bin/sap_suse_cluster_connector  
...
```

1. Save and close the file.

2. Modify ERS profile

```
# vi /usr/sap/EN2/SYS/profile/EN2_ERS10_sapen2er
```

```
# vi /usr/sap/EN2/SYS/profile/EN2_ERS10_sapen2er  
...  
# service/halib = $(DIR_CT_RUN)/saphascriptco.so
```

```
# service/halib_cluster_connector = /usr/bin/sap_suse_cluster_connector
...
```

3. Save and close the file.

4. The next step must be done as user *root*. Add the user *en2adm* to the unix user group *haclient*.

```
# crm cluster run "usermod -G sapsys en2adm"
# crm cluster run "grep haclient /etc/group"
```

After this step the *en2adm* should **not** be member of the *haclient* group. E.g.

```
# suse3:~ # crm cluster run "grep haclient /etc/group"
OK: [suse3]
haclient:x:90:
OK: [suse2]
haclient:x:90:
OK: [suse1]
haclient:x:90:
```

7.3 Starting SAP System

1. Use the last terminal and start the "sapstartsrv" or open a new terminal or tab.

```
# ssh en2adm@sapen2er
# sapcontrol -nr 10 -function StartService EN2
# exit
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function StartService EN2
# sapcontrol -nr 00 -function StartSystem
### wait some seconds
# sapcontrol -nr 00 -function GetSystemInstanceList
```

Repeat the global status command (...GetSystemInstanceList) as long as all instances became green. Check the status also with the **SAP MC**.

2. Reuse an open terminal or open a new one from your local host as user **root**, type the following command on one of the node's(suse1, suse2, suse3):

```
# ssh suse3
# crm configure property maintenance-mode="false"
```

7.4 The Optional Test III

In this scenario the cluster is fully active and not in maintenance mode. All resources are under control and monitored by pacemaker. The first procedure start the cluster resource maintenance mode as <sid>adm user. The second procedure will stop the ASCS and ERS resources during the cluster is active.

1. Using *sapcontrol* to set a cluster resource in maintenance mode
2. Using *sapcontrol* to stop and start an instance.



Note

Please use the table below to make notes. Note down the state of ASCS before, during and after the procedure. Make a **X** to mark the state or use what ever you like and make your notes.

Please switch between HAWK, SAP MC* or the terminal with crmsh to get the information you need to fill the table during the test's.

Cluster maintenance as <sid> adm with SAP tool <i>sapcontrol</i>					
<i>Cluster resource maintenance with sapcontrol</i>					
Test III.a	started	stopped	stopped(disabled)	unmanaged	failed
ASCS initial					
ASCS during test					
ASCS after test					
<i>Stop and start an instance with sapcontrol</i>					
Test III.b	started	stopped	stopped(disabled)	unmanaged	failed

Cluster maintenance as <sid> adm with SAP tool <i>sapcontrol</i>					
ASCS initial					
ASCS during test					
ASCS after test					

7.4.1 Test III.a

Fill in the first line from the table of Test I.a

EXAMPLE 7.1: RESOURCE MAINTENANCE AS <SID>ADM

This time you need at least two terminal's.

```
# ssh root@suse3
## monitor the resources with crm_mon
# crm_mon -rf
```

In the second terminal do the maintenance.

```
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function HASETMAINTENANCEMODE 1
## check the cluster resources in the first terminal and note down the result of
  this action
# sapcontrol -nr 00 -function HASETMAINTENANCEMODE 0
```

Conclusion:

- The procedure show you that it is **not** possible to set cluster resources in maintenance mode as user <sid> adm. The ASCS and ERS cluster resource can **not** be managed as <sid> adm. If a instance would be now stop the cluster will recognize this state change and reports an error. The cluster will take care and try to restart the stopped / failed instance.

7.4.2 Test III.b

Fill in the first line from the table of Test III.b

EXAMPLE 7.2: STOP AND START AN INSTANCE AS <SID>ADM WITHOUT CLUSTER MAINTENANCE

This time you need at least two terminal's.

```
# ssh root@suse3
## monitor the resources with crm_mon
# crm_mon -rf
```

In the second terminal do the action.

```
# ssh en2adm@sapen2as
# sapcontrol -nr 00 -function Stop
## check the cluster resources in the first terminal and note down the result of
  this action
# # monitor the cluster on the second terminal or using HAWK, wait for a state
  change of the ASCS,
# # note down the result of your activity
# # wait again ~60sec and monitor the cluster on the second terminal or using HAWK
# # note down the result
```

- Cleanup the system after the test

```
# ssh suse3
# crm resource cleanup rsc_sap_EN2_ASCS00
# crm resource cleanup rsc_sap_EN2_ERS10
```

Conclusion:

- The manual restart of the SAP resources as <sid> adm without setting the cluster in maintenance-mode will have cluster actions. The SAP instance can failover to an other node, it depends on some facts. The cluster does interact and try to start the resource after the monitor has the state change recognized. The resource is temporary marked as failed in the cluster live view.
- Without cluster maintenance-mode the stop of the SAP instance will take cluster in action.
- The maintenance procedure for a cluster controlled ASCS / ERS pair differs if your sap-suse-cluster-connector is activated in the SAP profile or not. The installation of the package sap-suse-cluster-connector is not sufficient. Imaging the direct impact for the SAP maintenance procedure such as SAP Rolling Kernel Switch (RKS).