

# A comprehensive guide to setup S/4HANA with High Availability in Azure

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**USING ANF FOR FILE SHARES**

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## Overview

Deploying high availability for each production system is a requirement. One way to achieve high availability for S4HANA systems in Azure is using an ANF file share. This document helps you to setup your demo environment so you can learn and understand each step and component of such a complex setup. This is a semi automation approach where all the commands are given to you but you execute them so you understand better what is happening, and then can better assist/setup during production landscape.

**This document does NOT replace any of the documents published on docs.microsoft.com. The intention here is to provide end to end setup in one single document with screen shots and error resolution, if any.**

## Terminology

Let's get familiar with the terms and terminologies referred in this document.

- ANF – Azure NetApp Files
- ASCS cluster – SUSE pacemaker cluster for ASCS and ERS instances
- HANA database cluster – SUSE pacemaker cluster for the HANA database in the HSR configuration
- PAS – SAP Primary Application Server
- AAS – SAP Additional Application Server
- HSR – HANA System Replication
- S4H – SAP S4HANA
- Pacemaker – cluster from SUSE
- STONITH – Fencing mechanism (Shoot-The-Other-Node-In-The-Head)
- SBD – iSCSI based STONITH device

In this document, we discuss the high availability of the S4HANA with HANA database using an ANF file system in the SUSE pacemaker cluster in Azure. The setup includes the following components:

- SUSE pacemaker cluster for high availability of the application layer (S4HANA)
- iSCSI based SBD device for pacemaker to achieve STONITH feature with high availability
- SUSE pacemaker cluster for the high availability of the HANA database (HSR setup)

We will cover the end to end process including the infrastructure deployment, clustering setup, SAP S4H and HANA installation, application instances installation, and failover test.

This is one of the most complex setups, however by following this document **you can complete the end to end deployment in couple days**. This document provides the templates for easy infra installation, and all the required instructions with the screen shots.

Here is the overall flow for deployment go:

1. Create the infrastructure in Azure

2. Create and configure the cluster
  - a. Setup an iSCSI-based SBD device
  - b. Setup the ANF file shares
  - c. Setup the ASCS cluster
  - d. Setup the HANA database cluster
3. Install the SAP S4H and HANA database
  - a. Download the installation bits
  - b. Install the ASCS instance on the cluster
  - c. Install the ERS instance on the cluster
  - d. Install the HANA database and setup HSR
  - e. Install the PAS instance
  - f. Install the AAS instance(s)
4. Perform the tests

## Deployment Standards

In this deployment, the following configuration is used. All the diagrams, commands, and screen shots reflect the same. If you intend to change any of the parameters or name, please adjust the execution accordingly. Please be watchful of the **highlighted** statement while you perform the execution.

### Infrastructure resources

These resources need to be deployed in the Azure. We chose region **US West 2** for this deployment. All the compute resources (VMs) have SUSE 12 SP3 for SAP operating system with pay-as-you-go option installed.

| Resource         | Name         | IP address              | SKU                                    | Notes      |
|------------------|--------------|-------------------------|--|------------|
| Resource group   | demo-s4h-ha  | NA                      | NA                                     |            |
| Virtual Network  | vnet         | NA                      | NA                                     |            |
| Availability Set | ascs-avset   | NA                      | NA                                     |            |
| Availability Set | db-avset     | NA                      | NA                                     |            |
| Availability Set | iscsi-avset  | NA                      | NA                                     |            |
| Availability Set | dialog-avset | NA                      | NA                                     |            |
| NFS Volumes      | sapmntSGH    | 10.15.3.4:/sapmntSGH    |  | NFS volume |
| NFS Volumes      | transSGH     | 10.15.3.5:/transSGH     |  | NFS volume |
| NFS Volumes      | usrsapSGH    | 10.15.3.4:/usrsapSGH    |  | NFS volume |
| NFS Volumes      | usrsapSGHers | 10.15.3.4:/usrsapSGHers |  | NFS volume |
| VM               | iscsivm1     | 10.15.1.11              | Standard D2s v3 (2 vcpus, 8 GB memory) |            |

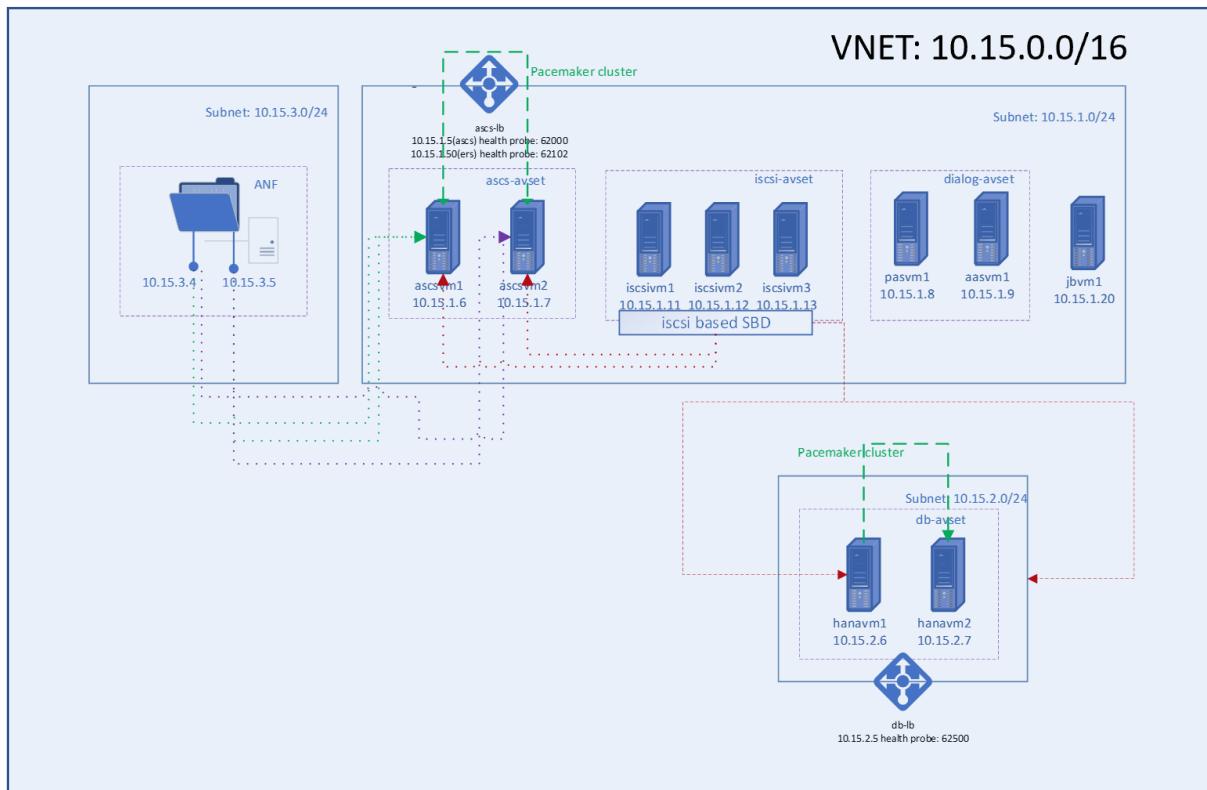
|               |          |  |  |   |
|---------------|----------|--|--|---|
| VM            | iscsivm2 | 10.15.1.12                                     | Standard D2s v3 (2 vcpus, 8 GB memory)   |   |
| VM            | iscsivm3 | 10.15.1.13                                     | Standard D2s v3 (2 vcpus, 8 GB memory)   |   |
| VM            | ascsvm1  | 10.15.1.6                                      | Standard DS12 v2 (4 vcpus, 28 GB memory) |   |
| VM            | ascsvm2  | 10.15.1.7                                      | Standard DS12 v2 (4 vcpus, 28 GB memory) |   |
| VM            | pasvm1   | 10.15.1.8                                      | Standard DS12 v2 (4 vcpus, 28 GB memory) |   |
| VM            | aasvm1   | 10.15.1.9                                      | Standard D12 v2 (4 vcpus, 28 GB memory)  |   |
| VM            | hanavm1  | 10.15.2.6                                      | Standard M32ts (32 vcpus, 192 GB memory) |   |
| VM            | hanavm2  | 10.15.2.7                                      | Standard M32ts (32 vcpus, 192 GB memory) |   |
| VM            | jbvm1    | 10.15.0.20                                     | Standard DS2 v2 (2 vcpus, 7 GiB memory)  |   |
| Load Balancer | ascslb   | 10.15.1.5 (for ascslb)<br>10.15.1.50 (for ERS) | Basic                                    | Frontend names: sgh-ascslb and sgh-ers-lb |

|               |       |           |       |                           |
|---------------|-------|-----------|-------|---------------------------|
| Load Balancer | db-lb | 10.15.2.5 | Basic | Frontend name: hanadb-ilb |
|---------------|-------|-----------|-------|---------------------------|

### Software and Instance details

- S4H Version: S4HANA 1809
- ASCS Instance: 00
- ERS Instance: 02
- PAS Instance: 10
- AAS Instance: 11
- S4H SID: SGH
- HANA version: HANA 2 SPS4
- HANA Database Instance: 00
- HANA SID: SGH

## Architecture overview



## Check list for the deployment

Here is the check list of steps you need to perform. Each item in the list has a link to the detailed steps in this document. **These steps must be performed in the sequence.** Some steps can be done out of sequence or in parallel (like VM creation), but since this is already a very complex step, to avoid any missing action, better you perform them in sequence. You can also print this table and track each step and mark completed when done, this way you know where you are with the deployment.

| Step ID                     | Action                                    | Resource name           | Notes  | Status |
|-----------------------------|---|-------------------------|--|--------|
| <b>Infrastructure setup</b> |   |                         |  |        |
| 1                           | <a href="#">Create a Resource group</a>   | Sachin_ANF_S4H          | One resource group for all the objects of this setup |        |
| 2                           | <a href="#">Create a VNET and subnets</a> | vnet                    |  |        |
| 3                           | <a href="#">Create Availability set</a>   | ascsm-avset<br>db-avset | Create Four AvSets                                   |        |

|  |  |  |   |  |
|--|--|--|---|--|
|  |  | dialog-avset<br>iscsi-avset              |   |  |
| <b>4. Create VMs</b>                   |  |  |   |  |
| 4.1                                    | <a href="#">Create iSCSC VMs</a>                                       | iscscvm1<br>iscscvm2<br>iscscvm3         | 3 VMs required                                    |  |
| 4.2                                    | <a href="#">Create ASCS VMs</a>  | ascsvm1<br>ascsvm2                       | 2 VMs required                                    |  |
| 4.3                                    | <a href="#">Create HANA DB VMs</a>                                     | hanavm1<br>hanavm2                       | 2 VMs required                                    |  |
| 4.4                                    | <a href="#">Create PAS VM</a>  | pasvm1                                   | 1 VM required                                     |  |
| 4.5                                    | <a href="#">Create AAS VM</a>  | aasvm1                                   | 1 VM required                                     |  |
| 4.6                                    | <a href="#">Create a jump box VM</a>                                   | jbvm1                                    | 1 VM required                                     |  |
| <b>5. Create Load Balancer</b>         |  |  |   |  |
| 5.2                                    | <a href="#">Create load balancer for ASCS and ERS</a>                  | ascslb                                   | Used for ASCS and ERS both                        |  |
| 5.3                                    | <a href="#">Create load balancer for HANA DB</a>                       | db-lb                                    |   |  |
| <b>6. Create ANF Infrastructure</b>    |  |  |   |  |
| 6.1                                    | Setup ANF account, pool, and volumes                                   |  |   |  |
| <b>iSCSC and SBD setup</b>             |  |  |   |  |
| 7                                      | <a href="#">Setup iSCSI</a>  |  |   |  |
| 7.1                                    | <a href="#">Setup iSCSI target</a>                                     | iscscvm1<br>iscscvm2<br>iscscvm3         | This is to enable iSCSC VMs for targetcli service |  |
| 7.2                                    | <a href="#">Create iSCSI device (SBD)</a>                              | iscscvm1<br>iscscvm2<br>iscscvm3         |   |  |
| 7.3                                    | <a href="#">Setup(connect) the SBD device(s) to the cluster nodes</a>  | ascsvm1<br>ascsvm2<br>hanavm1<br>hanavm2 | Perform it for ASCS, and HANADB cluster nodes     |  |
| <b>Cluster Setup and Configuration</b> |  |  |   |  |
| 8                                      | <a href="#">Configure the pacemaker cluster</a>                        | ascsvm1<br>ascsvm2<br>hanavm1<br>hanavm2 | Perform it for ASCS, and HANADB cluster nodes     |  |
| 9                                      | <a href="#">HANA database cluster configuration</a>                    | hanavm1<br>hanavm2                       |   |  |
| 9.1                                    | <a href="#">Hana Installation</a>                                      | hanavm1<br>hanavm2                       |   |  |
| 9.2                                    | <a href="#">HSR configuration</a>                                      | hanavm1<br>hanavm2                       |   |  |
| 9.3                                    | <a href="#">Add HANA topology and resources to the HANA DB cluster</a> | hanavm1<br>hanavm2                       |   |  |

|                               |  |  |  |  |
|-------------------------------|--|--|--|--|
| <b>10</b>                     | <a href="#"><u>Prepare ASCS cluster for SAP S4H installation</u></a>       | ascsvm1<br>ascsvm2   |  |  |
| <b>S4H Installation</b>       |  |  |  |  |
| <b>11</b>                     | <a href="#"><u>ASCS Instance Installation</u></a>                          | Run from ascsvm1   |  |  |
| <b>12</b>                     | <a href="#"><u>ESR Instance Installation</u></a>                           | Run from ascsvm2   |  |  |
| <b>13</b>                     | <a href="#"><u>Post installation activities for ASCS/ERS instances</u></a> | ascsvm1<br>ascsvm2   |  |  |
| <b>14</b>                     | <a href="#"><u>Database Instance Installation</u></a>                      | Run from ascsvm1 but it creates the schema, tables etc. on hanavm1 |  |  |
| <b>15</b>                     | <a href="#"><u>Primary Application Instance Installation</u></a>           | pasvm1   |  |  |
| <b>16</b>                     | <a href="#"><u>Additional Application Instance Installation</u></a>        | aasvm1   |  |  |
| <b>17. Test cases</b>         |  |  |  |  |
| <b>18. Important Commands</b> |  |  |  |  |
| <b>19. Appendix</b>           |  |  |  |  |

## Infrastructure setup

This section describes the infrastructure required in the Azure for the high availability end to end setup for ASCS, ANF, SBD, and HANA DB.

In this document, we are using the Azure ARM templates. Each infrastructure deployment section (further below in this document), illustrate that what these ARM templates does and what to expect after their execution. Run the respective ARM template “template.json” using the procedure below. You find the folder for each scenario under which the ARM template resides.

**Please update the subscription (variable EnterYourSubscription) and resource-group (variable EnterYourResourceGroup) value before executing those templates. Ensure to do it on ARM templates and parameters.json file as well.**

|                         |  |                     |
|-------------------------|--|---------------------|
| 01 Create-DataDisks     |  | deploy              |
| 02 Create-NSGs          |  | deploy              |
| 03 Create-PublicIPs     |  | deployer.rb         |
| 04 Create-LoadBalancers |  | DeploymentHelper.cs |
| 05 Create-NWInterfaces  |  | parameters.json     |
| 06 Create-VMs           |  |                     |
| Create-AvSet            |  |                     |
| Create-VNET             |  | template.json       |

To deploy the ARM templates, search “Deploy a custom template” option from the Azure search box, then click “Build your own template in the editor” . Now, load the respective “template.json” file. Click Save. Review the parameters, and when ready, click the “Purchase” button.

The screenshot shows the Azure portal's "Custom deployment" interface. At the top, there's a breadcrumb navigation: Home > Custom deployment. Below that, a title "Custom deployment" and a subtitle "Deploy from a custom template". There are four input fields for parameters:

- Disks\_hanavm1log\_name: hanavm1log
- Disks\_hanavm2log\_name: hanavm2log
- Disks\_jbvm1\_bits\_name: jbvm1\_bits
- Disks\_hanavm1data\_name: hanavm1data

On the right side, there are two more fields: "Disks\_ascsvm1\_usrsap\_name" (with value "ascsvm1\_usrsap") and "ascsvm1\_usrsap". At the bottom right is a large blue "Purchase" button.

## 1. Create a Resource group

Click Resource groups from the portal > Select Subscription under which you want to create a resource group > Enter Resource group name “Sachin\_ANF\_S4H” > Select region > Click Review + Create

## 2. Create a VNET and subnets

Deploy using the **Create-VNET** ARM templates. This deploys the VNET with the following configuration:

- Location: US West2
- Address space: 10.15.0.0/16
- Subnets: application (10.15.1.0/24); and database (10.15.2.0/24)

## 3. Create Availability set

Deploy using the **Create-AvSet** ARM templates. This deploys the four availability sets with the following configuration:

- Location: US West2
- Fault domain:2
- Update domain:5
- Availability set names: demo-app-avset; demo-db-avset; demo-dia-avset; demo-iscsi-avset

## 4. Create VMs

Ensure that you have quota for the following SKUs in the US West2 region. **Please update the resource group (if chosen different one) and subscription in the template before you execute them.**

Run the ARM templates **in the following order**:

1. Data Disks – This creates the set of disks for the VMs. **(change subs and RG before executing the ARM)**
2. Network security group – This creates the set of network security groups for the VMs. **(change subs and RG before executing the ARM)**
3. Public IP – This creates the set of disks for the VMs. **(change subs and RG before executing the ARM)**
4. Load Balancer **(change subs before executing the ARM)**
5. Network Interface **(change subs before executing the ARM)**
6. Virtual machine **(change subs and RG before executing the ARM)**
  - a. Update password (parameter: "adminPassword":)
  - b. Update subs
  - c. Update resource group

**Note: If the IPs are not created as defined in the table below, please either**

1. **Update the IP address of the VM thru network card**
2. **Or, update the IP addresses in all the configuration steps accordingly.**

#### 4.1 Create iSCSC VMs

- We already created the iscsi servers thru the ARM template before.
- Login to the iSCSI servers thru putty using account you used during VM creation in ARM template.
- Run the command `sudo su -` to change user to root.
- Change the root user password with the command `passwd root`.
- Add the following entries to the host file of each node

```
# load balancers
10.15.1.5      ascs-lb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1
```

#### 4.2 Create ASCS VMs

We already created the load balancer thru the ARM template before. **Perform the following on both the ascs nodes: ascsvm1 and ascsvm2.**

- Login to the ASCS VMs thru putty using account you used during VM creation in ARM template.
- Run the command `sudo su -` to change user to root.
- Change the root user password with the command `passwd root`.
- Partition the disk: `yast> System>Partitioner>Click Yes on warning (if appear)>Hard Disks>select dev/sdc (256GB)>Click Enter>select primary partition>Next>Next>Next>File System: Ext4> Mount point: /usr/sap>Finish>Next>Finish>Quit`. You should see the following mount point now.

```
# df -kh
Filesystem  Size  Used Avail Use% Mounted on
devtmpfs    14G   8.0K  14G  1% /dev
tmpfs       21G   0    21G  0% /dev/shm
tmpfs       14G  42M  14G  1% /run
/dev/sda4   29G  1.7G  26G  7% /
```

```

/dev/sda3    976M 77M 849M 9% /boot
tmpfs       14G  0 14G 0% /sys/fs/cgroup
/dev/sda2    200M 664K 200M 1% /boot/efi
/dev/sdb1    55G 52M 53G 1% /mnt/resource
tmpfs       2.8G 0 2.8G 0% /run/user/1000
/dev/sdc1    252G 60M 251G 1% /usr/sap

```

- Add the following entries to the host file of each node

```

# load balancers
10.15.1.5      ascs-lb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1

```

#### 4.3 Create HANA DB VMs

- We already created the load balancer thru the ARM template before.
- Login to the HANA DB VMs thru putty using account you used during VM creation in ARM template.
- Run the command `sudo su -` to change user to root.
- Change the root user password with the command `passwd root`.
- Partition the disk: `yast> System>Partitioner>Click Yes on warning (if appear)>Hard Disks>select disks /dev/sdc (1.1T) >Click Enter>select primary partition>Next>Next>Next>File System: Ext4> Mount point: /hana/data >Finish>Next>Finish>Quit.`
- Repeat partitioning the disk.
  - `/dev/sdd 256G /hana/log`
  - `/dev/sde 541G /hana/shared`
  - `/dev/sdf 1.1T /hana/logbackup`

You should see the following mount point now.

```
# df -kh
Filesystem  Size  Used Avail Use% Mounted on
devtmpfs    63G   0  63G  0% /dev
tmpfs       95G   0  95G  0% /dev/shm
tmpfs       63G 210M 63G  1% /run
tmpfs       63G   0  63G  0% /sys/fs/cgroup
/dev/sda4    29G  1.8G 26G  7% /
/dev/sda3   976M 77M 849M  9% /boot
/dev/sda2   200M 664K 200M  1% /boot/efi
/dev/sdb1   252G 60M 239G  1% /mnt/resource
tmpfs       13G   0  13G  0% /run/user/1000
/dev/sdc1   1007G 72M 1006G  1% /hana/data
/dev/sdd1   252G 60M 251G  1% /hana/log
/dev/sde1   504G 70M 503G  1% /hana/shared
/dev/sdf1   1007G 72M 1006G  1% /hana/logbackup
```

- Add the following entries to the host file of each node

```
# load balancers
10.15.1.5      ascs-lb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1
```

#### 4.4 Create PAS VM

- We already created the load balancer thru the ARM template before.
- Login to the PAS VM thru putty using account you used during VM creation in ARM template.
- Run the command sudo su - to change user to root.
- Change the root user password with the command passwd root.

- Partition the disk: yast> System>Partitioner>Click Yes on warning (if appear)>Hard Disks>select dev/sdc (256GB)>Click Enter>select primary partition>Next>Next>File System: Ext4> Mount point: /usr/sap>Finish>Next>Finish>Quit. You should see the following mount point now.

```
pasvm1:~ # df -kh
Filesystem  Size  Used Avail Use% Mounted on
devtmpfs    14G   8.0K  14G  1% /dev
tmpfs       21G    0  21G  0% /dev/shm
tmpfs       14G 114M  14G  1% /run
/dev/sda4    29G  1.8G  26G  7% /
/dev/sda3   976M  77M 849M  9% /boot
tmpfs       14G    0  14G  0% /sys/fs/cgroup
/dev/sda2   200M 664K 200M  1% /boot/efi
/dev/sdb1    55G  52M  53G  1% /mnt/resource
tmpfs       2.8G    0  2.8G  0% /run/user/0
/dev/sdc1   252G  60M 251G  1% /usr/sap
```

- Add the following entries to the host file of each node

```
# load balancers
10.15.1.5      ascs-lb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1
```

#### 4.5 Create AAS VM

- We already created the load balancer thru the ARM template before.
- Login to the AAS VM thru putty using account you used during VM creation in ARM template.
- Run the command sudo su - to change user to root.
- Change the root user password with the command passwd root.

- Partition the disk: yast> System>Partitioner>Click Yes on warning (if appear)>Hard Disks>select dev/sdc (256GB)>Click Enter>select primary partition>Next>Next>Next>File System: Ext4> Mount point: /usr/sap>Finish>Next>Finish>Quit. You should see the following mount point now.

```
aasvm1:~ # df -kh
Filesystem  Size  Used Avail Use% Mounted on
devtmpfs    14G   8.0K  14G  1% /dev
tmpfs       21G    0  21G  0% /dev/shm
tmpfs       14G  114M  14G  1% /run
/dev/sda4    29G  1.8G  26G  7% /
/dev/sda3   976M  77M  849M  9% /boot
tmpfs       14G    0  14G  0% /sys/fs/cgroup
/dev/sda2   200M  664K  200M  1% /boot/efi
/dev/sdb1    55G  52M  53G  1% /mnt/resource
tmpfs       2.8G    0  2.8G  0% /run/user/0
/dev/sdc1   252G  60M  251G  1% /usr/sap
```

- Add the following entries to the host file of each node

```
# load balancers
10.15.1.5      ascs-lb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1
```

#### 4.6 Create a jump box VM

On the **Jumpbox vm jbvm1**, perform the following:

- Disable IE security from server manager to allow IE to download

IE Enhanced Security Configuration      **Off**

- Format the disk of 512B capacity (disk2). Let's call it F: drive.
- Download HANA and S4H bits on the jbvm1. Download to F: drive.
- Download and install putty: <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>
- Download and install winscp : <https://winscp.net/eng/download.php>
- Download and install SAPGUI.
- Add the following entries to the host file of each node

```

#iscsi nodes
10.15.0.9      iscsivm1
10.15.0.7      iscsivm2
10.15.0.6      iscsivm3

# nfs nodes
10.15.0.12     nfsvm1
10.15.0.10     nfsvm2

#ascsc nodes
10.15.0.8      ascsvm1
10.15.0.11     ascsvm2

# application vm
10.15.0.4      pasvm1
10.15.0.15     aasvm1

#hana DB nodes
10.15.1.4      hanavm1
10.15.1.6      hanavm2

#Load balancers
10.15.0.5      demo-app-ilb
10.15.0.50     demo-ers-ilb
10.15.0.51     demo-nfs-ilb
10.15.1.5      demo-db-ilb

#jump box
10.15.0.13     jbvm1

```

## 5. Create Load Balancer

### 5.1 Create load balancer for ASCS and ERS

We already created the load balancer thru the ARM template before. Just validate the settings as following.

Name of the load balancer: **ascslb**

Frontend IPs

**ascslb - Frontend IP configuration**

Load balancer

Search (Ctrl+ /) Add

Overview Activity log Access control (IAM) Tags Diagnose and solve problems Settings

Frontend IP configuration

| NAME   | IP ADDRESS | RULES COUNT |
|--------|------------|-------------|
| ers-lb | 10.15.1.50 | 5           |
| ascslb | 10.15.1.5  | 7           |

**Backend pool**

| VIRTUAL MACHINE                         | VIRTUAL MACHINE STATUS | NETWORK INTERFACE | PRIVATE IP ADDRESS |
|---|------------------------|-------------------|--------------------|
| <b>ascser-pool (2 virtual machines)</b> |                        |                   |                    |
| ascsvm1                                 | Running                | ascsvm1982        | 10.15.1.6          |
| ascsvm2                                 | Running                | ascsvm2788        | 10.15.1.7          |

**Health probe**

| NAME                  | PROTOCOL | PORT  | USED BY |
|-----------------------|----------|-------|---------|
| healthProbeASCS_62000 | TCP      | 62000 | 7 rules |
| healthProbeERS_62102  | TCP      | 62102 | 5 rules |

**Load balancing rule**

| NAME        | LOAD BALANCING RULE     | BACKEND POOL | HEALTH PROBE          |
|-------------|-------------------------|--------------|-----------------------|
| ascslb3200  | ascslb3200 (TCP/3200)   | ascser-pool  | healthProbeASCS_62000 |
| ascslb3600  | ascslb3600 (TCP/3600)   | ascser-pool  | healthProbeASCS_62000 |
| ascslb3900  | ascslb3900 (TCP/3900)   | ascser-pool  | healthProbeASCS_62000 |
| ascslb50013 | ascslb50013 (TCP/50013) | ascser-pool  | healthProbeASCS_62000 |
| ascslb50014 | ascslb50014 (TCP/50014) | ascser-pool  | healthProbeASCS_62000 |
| ascslb50016 | ascslb50016 (TCP/50016) | ascser-pool  | healthProbeASCS_62000 |
| ascslb8100  | ascslb8100 (TCP/8100)   | ascser-pool  | healthProbeASCS_62000 |
| ers3202     | ers3202 (TCP/3202)      | ascser-pool  | healthProbeERS_62102  |
| ers3302     | ers3302 (TCP/3302)      | ascser-pool  | healthProbeERS_62102  |
| ers50213    | ers50213 (TCP/50213)    | ascser-pool  | healthProbeERS_62102  |
| ers50214    | ers50214 (TCP/50214)    | ascser-pool  | healthProbeERS_62102  |
| ers50216    | ers50216 (TCP/50216)    | ascser-pool  | healthProbeERS_62102  |

## 5.2 Create load balancer for HANA DB

We already created the load balancer thru the ARM template before. Just validate the settings as following.

Load balancer name: db-lb

### Frontend IP

| NAME  | IP ADDRESS | RULES COUNT |
|-------|------------|-------------|
| db-lb | 10.15.2.5  | 5           |

### Backend pools

| VIRTUAL MACHINE                     | VIRTUAL MACHINE STATUS | NETWORK INTERFACE | PRIVATE IP ADDRESS |
|-------------------------------------|------------------------|-------------------|--------------------|
| <b>db-pool (2 virtual machines)</b> |                        |                   |                    |
| hanavm1                             | Running                | hanavm1421        | 10.15.2.6          |
| hanavm2                             | Running                | hanavm2421        | 10.15.2.7          |

### Health probes

| NAME                | PROTOCOL | PORT  | USED BY |
|---------------------|----------|-------|---------|
| healthProbeDB_62500 | TCP      | 62500 | 5 rules |

### Load balancing rules

| NAME           | LOAD BALANCING RULE        | BACKEND POOL | HEALTH PROBE        |
|----------------|----------------------------|--------------|---------------------|
| sgh_30003      | sgh_30003 (TCP/30003)      | db-pool      | healthProbeDB_62500 |
| sgh_30007      | sgh_30007 (TCP/30007)      | db-pool      | healthProbeDB_62500 |
| systemdb_30013 | systemdb_30013 (TCP/30013) | db-pool      | healthProbeDB_62500 |
| systemdb_30014 | systemdb_30014 (TCP/30014) | db-pool      | healthProbeDB_62500 |
| systemdb_50013 | systemdb_50013 (TCP/50013) | db-pool      | healthProbeDB_62500 |

[\[Back to Check list for the deployment\]](#)

## 6. Setup ANF account, pool, and volumes

To create an ANF account, pool, and volumes, follow the steps here:

Search “**Azure NetApp Files**” in the Azure services

Create an ANF account: aznetappaccount

Create a capacity pool: anfcapacitypool (4 TiB)

Create the volumes as below

| NAME         | ↑↓ | QUOTA   | ↑↓ | PROTOCOL ... ↑↓ | MOUNT PATH              | ↑↓ | SERVICE LEVEL |
|--------------|----|---------|----|-----------------|-------------------------|----|---------------|
| sapmntSGH    |    | 512 GiB |    | NFS             | 10.15.3.4:/sapmntSGH    |    | Premium       |
| transSGH     |    | 512 GiB |    | NFS             | 10.15.3.5:/transSGH     |    | Premium       |
| usrsapSGH    |    | 512 GiB |    | NFS             | 10.15.3.4:/usrsapSGH    |    | Premium       |
| usrsapSGHers |    | 256 GiB |    | NFS             | 10.15.3.4:/usrsapSGHers |    | Premium       |
| usrsapSGHsys |    | 512 GiB |    | NFS             | 10.15.3.4:/usrsapSGHsys |    | Premium       |

As of now, ANF service is in public preview. Please request your subscription to be whitelisted here:  
<https://docs.microsoft.com/en-us/azure/azure-netapp-files/azure-netapp-files-register>. Whitelisting is only required until service is generally available.

When you create ANF account, it requires a separate subnet. If Create-VNET ARM templates created a subnet for ANF already, please delete the subnet for ANF as during the ANF account setup, it will automatically create the subnet for ANF.

## 7. iSCSI and SBD Setup

We will setup an SBD device which we can use in pacemaker cluster for ASCS, and HANADB clusters to achieve the STONITH function. We will setup 3 iSCSI servers. These servers will have an iSCSI-based SBD device.

To do this, you need to perform the following steps

1. Setup iSCSI target i.e. enable these VMs for targetcli service
2. Create iSCSI device (SBD) on these iSCSI servers
3. Setup(connect) the SBD device(s) to the cluster nodes (ASCS, and HANADB clusters)

## 7.1 Setup iSCSI target

To setup the iSCSI target on the iSCSC VMs, perform the following steps:

1. Connect to all the 3 iSCSI servers using putty. You must have already created 3 iSCSI servers with following config
  - 1.1. OS: SUSE12SP3 for SAP
  - 1.2. Disk: Premium OS disk – this is what we will use as SBD device
  - 1.3. All three iSCSI servers are in the availability set demo-app-avset
  - 1.4. All three iSCSI servers are using application-subnet
2. Pre-requisite
  - 2.1. Do the packages update to get the latest packages installed on the iSCSI VMs. Perform it **on all the three iSCSI servers** iscsivm1, iscsivm2, and iscsivm3.

```
#zypper update
```

- 2.2. Remove the packages `lio-utils` `python-rtslib` `python-configshell` `targetcli` to avoid known errors with SLES12Sp3 and `targetcli`. Perform it **on all the three iSCSI servers** iscsivm1, iscsivm2, and iscsivm3.

```
#zypper remove lio-utils python-rtslib python-configshell targetcli
Loading repository data...
Reading installed packages...
Package 'python-configshell' not found.
Package 'python-rtslib' not found.
'targetcli' not found in package names. Trying capabilities.
No provider of 'targetcli' found.
Resolving package dependencies...

The following 2 packages are going to be REMOVED:
  lio-utils yast2-iscsi-lio-server

2 packages to remove.
After the operation, 471.8 KiB will be freed.
Continue? [y/n/...? shows all options] (y): y
(1/2) Removing yast2-iscsi-lio-server-3.2.1-1.23.noarch
.....[done]
(2/2) Removing lio-utils-4.1-17.3.2.x86_64
.....[done]
```

- 2.3. Ensure that you have packages `targetcli-fb` `dbus-1-python` installed on each iSCSI server. Perform it **on all the three iSCSI servers** iscsivm1, iscsivm2, and iscsivm3.

```
# zypper install targetcli-fb dbus-1-python
Refreshing service 'SMT-http_smt-azure_susecloud_net'.
```

Loading repository data...  
 Reading installed packages...  
 Resolving package dependencies...

Problem: installed python-dbus-python-1.2.4-2.5.2.x86\_64 obsoletes dbus-1-python < 1.2.4 provided by dbus-1-python-1.2.0-4.194.x86\_64

Solution 1: Following actions will be done:

deinstallation of python-dbus-python-1.2.4-2.5.2.x86\_64

deinstallation of python-SecretStorage-2.3.1-2.5.1.noarch

downgrade of python-keyring-5.7-8.9.1.noarch to python-keyring-5.7-8.2.1.noarch

Solution 2: do not install dbus-1-python-1.2.0-4.194.x86\_64

**Choose from above solutions by number or cancel [1/2/c] (c): 1**

3. Enable iSCSI target. Perform it **on all the three iSCSI servers** iscsivm1, iscsivm2, and iscsivm3.

This enables and start the targetcli service on iSCSI VMs

```
# systemctl enable targetcli
```

Created symlink from /etc/systemd/system/remote-fs.target.wants/targetcli.service to /usr/lib/systemd/system/targetcli.service.

```
iscsivm1:/etc/systemd/system # systemctl start targetcli
```

4. Verify targetcli service is started on all the three iSCSI servers. Perform it **on all the three iSCSI servers** iscsivm1, iscsivm2, and iscsivm3.

```
# systemctl status targetcli
```

- targetcli.service - "Generic Target-Mode Service (fb)"  
 Loaded: **loaded** (/usr/lib/systemd/system/targetcli.service; enabled; vendor preset: disabled)  
 Active: **active** (exited) since Thu 2019-04-25 17:43:13 UTC; 9s ago  
 Process: 113117 ExecStart=/usr/bin/targetcli restoreconfig \$CONFIG\_FILE (code=exited, status=0/SUCCESS)  
 Main PID: 113117 (code=exited, status=0/SUCCESS)

Apr 25 17:43:13 iscsivm1 systemd[1]: Starting "Generic Target-Mode Ser....

Apr 25 17:43:13 iscsivm1 targetcli[113117]: Warning: Could not load pre...

Apr 25 17:43:13 iscsivm1 targetcli[113117]: Restore file /etc/target/sa...

Apr 25 17:43:13 iscsivm1 systemd[1]: Started "Generic Target-Mode Serv....

Hint: Some lines were ellipsized, use -l to show in full.

## 7.2 Create iSCSI device (SBD) on these iSCSI servers

This is to create iSCSI-based SBD device(disk) on all the three iSCSI servers. These SBDs will be used by the clusters (ASCS, and HANADB clusters) to achieve STONITH capability.

- Run the following commands to create iSCSI device, add ACLs for the SBD (so cluster nodes can access it). Perform it **on all the three iSCSI servers** iscsivm1, iscsivm2, and iscsivm3.  
This creates the SBD for ASCS and HANADB.

```
# Create the root folder for all SBD devices
sudo mkdir /sbd

# Create the SBD device for the ASCS server of SAP System SGH
sudo targetcli backstores/fileio create sbdascssgh /sbd/sbdascssgh 50M write_back=false
sudo targetcli iscsi/ create iqn.2006-04.ascssgh.local:ascssgh
sudo targetcli iscsi/inqn.2006-04.ascssgh.local:ascssgh/tpg1/luns/ create
/backstores/fileio/sbdascssgh
sudo targetcli iscsi/inqn.2006-04.ascssgh.local:ascssgh/tpg1/acls/ create iqn.2006-
04.ascsvm1.local:ascsvm1
sudo targetcli iscsi/inqn.2006-04.ascssgh.local:ascssgh/tpg1/acls/ create iqn.2006-
04.ascsvm2.local:ascsvm2

# Create the SBD device for the database cluster of SAP System SGH
sudo targetcli backstores/fileio create sbddbsgh /sbd/sbddbsgh 50M write_back=false
sudo targetcli iscsi/ create iqn.2006-04.dbsgh.local:dbsgh
sudo targetcli iscsi/inqn.2006-04.dbsgh.local:dbsgh/tpg1/luns/ create
/backstores/fileio/sbddbsgh
sudo targetcli iscsi/inqn.2006-04.dbsgh.local:dbsgh/tpg1/acls/ create iqn.2006-
04.hanavm1.local:hanavm1
sudo targetcli iscsi/inqn.2006-04.dbsgh.local:dbsgh/tpg1/acls/ create iqn.2006-
04.hanavm2.local:hanavm2

# save the targetcli changes
sudo targetcli saveconfig
```

- Validate the config

```
sudo targetcli ls

# -- Expected output --
o- / ..... [...]
o- backstores ..... [...]
| o- block ..... [Storage Objects: 0]
| o- fileio ..... [Storage Objects: 3]
| | o- sbdascssgh ..... [/sbd/sbdascssgh (50.0MiB) write-thru activated]
| | | o- alua ..... [ALUA Groups: 1]
| | | | o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
| | | o- sbddbsgh ..... [/sbd/sbddbsgh (50.0MiB) write-thru activated]
| | | | o- alua ..... [ALUA Groups: 1]
| | | | | o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
| | | o- sbdnfs ..... [/sbd/sbdnfs (50.0MiB) write-thru activated]
| | | | o- alua ..... [ALUA Groups: 1]
| | | | | o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
| | o- pscsi ..... [Storage Objects: 0]
```

```

| o- ramdisk ..... [Storage Objects: 0]
o- iscsi ..... [Targets: 3]
| o- iqn.2006-04.ascssgh.local:ascssgh ..... [TPGs: 1]
| | o- tpg1 ..... [no-gen-acls, no-auth]
| | | o- acls ..... [ACLs: 2]
| | | | o- iqn.2006-04.ascsvm1.local:ascsvm1 ..... [Mapped LUNs: 1]
| | | | | o- mapped_lun0 ..... [lun0 fileio/sbdascssgh (rw)]
| | | | | o- iqn.2006-04.ascsvm2.local:ascsvm2 ..... [Mapped LUNs: 1]
| | | | | | o- mapped_lun0 ..... [lun0 fileio/sbdascssgh (rw)]
| | | o- luns ..... [LUNs: 1]
| | | | o- lun0 ..... [fileio/sbdascssgh (/sbd/sbdascssgh) (default_tg_pt_gp)]
| | | o- portals ..... [Portals: 1]
| | | | o- 0.0.0.0:3260 ..... [OK]
o- iqn.2006-04.dbsgh.local:dbsgh ..... [TPGs: 1]
| o- tpg1 ..... [no-gen-acls, no-auth]
| | o- acls ..... [ACLs: 2]
| | | o- iqn.2006-04.hanavm1.local:hanavm1 ..... [Mapped LUNs: 1]
| | | | o- mapped_lun0 ..... [lun0 fileio/sbddsgh (rw)]
| | | | o- iqn.2006-04.hanavm2.local:hanavm2 ..... [Mapped LUNs: 1]
| | | | | o- mapped_lun0 ..... [lun0 fileio/sbddsgh (rw)]
| | | o- luns ..... [LUNs: 1]
| | | | o- lun0 ..... [fileio/sbddsgh (/sbd/sbddsgh) (default_tg_pt_gp)]
| | | o- portals ..... [Portals: 1]
| | | | o- 0.0.0.0:3260 ..... [OK]
o- iqn.2006-04.nfs.local:nfs ..... [TPGs: 1]
| o- tpg1 ..... [no-gen-acls, no-auth]
| | o- acls ..... [ACLs: 2]
| | | o- iqn.2006-04.nfsvm1.local:nfsvm1 ..... [Mapped LUNs: 1]
| | | | o- mapped_lun0 ..... [lun0 fileio/sbdnfs (rw)]
| | | | o- iqn.2006-04.nfsvm2.local:nfsvm2 ..... [Mapped LUNs: 1]
| | | | | o- mapped_lun0 ..... [lun0 fileio/sbdnfs (rw)]
| | | o- luns ..... [LUNs: 1]
| | | | o- lun0 ..... [fileio/sbdnfs (/sbd/sbdnfs) (default_tg_pt_gp)]
| | | o- portals ..... [Portals: 1]
| | | | o- 0.0.0.0:3260 ..... [OK]
o- loopback ..... [Targets: 0]
o- vhost ..... [Targets: 0]
o- xen-pvscsi ..... [Targets: 0]

```

```
# ls /sbd
sbdacssgh sbddsgh
```

### 7.3 Setup(connect) the SBD device(s) to the cluster nodes (ASCS, and HANADB clusters)

Now, you have created the SBD in iSCSI servers, connect these SBDs to the respective cluster servers.

For example: You will connect sbdacssgh to ASCS and sbddsgh to the HANADB cluster.

1. Enable the SBD on the cluster nodes. Run the following on **both** the cluster nodes of ASCS (ascsvm1, ascsvm2), and HANA (hanavm1, hanavm2).

```
# systemctl enable iscsid
Created symlink from /etc/systemd/system/multi-user.target.wants/iscsid.service to
/usr/lib/systemd/system/iscsid.service.

# systemctl enable iscsi

# systemctl enable sbd
Created symlink from /etc/systemd/system/corosync.service.requires/sbd.service to
/usr/lib/systemd/system/sbd.service.
Created symlink from /etc/systemd/system/pacemaker.service.requires/sbd.service to
/usr/lib/systemd/system/sbd.service.
Created symlink from /etc/systemd/system/dlm.service.requires/sbd.service to
/usr/lib/systemd/system/sbd.service.
```

2. Update the initiator for to update the initiator name we created.

```
# -- FOR ASCS NODES - #
#on ascsvm1 node
Update: vi /etc/iscsi/initiatorname.iscsi
InitiatorName=iqn.2006-04.ascsvm1.local:ascsvm1

#on ascsvm2 node
Update: vi /etc/iscsi/initiatorname.iscsi
InitiatorName=iqn.2006-04.ascsvm2.local:ascsvm2
```

```
# -- FOR HANADB NODES - #
#on hanavm1 node
Update: vi /etc/iscsi/initiatorname.iscsi
InitiatorName=iqn.2006-04.hanavm1.local:hanavm1

#on hanavm2 node
Update: vi /etc/iscsi/initiatorname.iscsi
InitiatorName=iqn.2006-04.hanavm2.local:hanavm2
```

3. Restart the iSCSI service **on each cluster nodes (ascsvm1, ascsvm2, hanavm1, hanavm2)** so it can read the newly updated initiator name.

```
#systemctl restart iscsid
#systemctl restart iscsi
```

4. Connect to the SBD devices (of iSCSI nodes) **on each cluster nodes (ascsvm1, ascsvm2, hanavm1, hanavm2)**.

```
# -- FOR ASCS NODES – Run on ascsvm1, ascsvm2#
#To connect first iSCSI SBD device (iscsivm1)
iscsiadm -m discovery --type=st --portal=10.15.1.11:3260
iscsiadm -m node -T iqn.2006-04.ascssgh.local:ascssgh --login --portal=10.15.1.11:3260
iscsiadm -m node -p 10.15.1.11:3260 --op=update --name=node.startup --value=automatic

#To connect second iSCSI SBD device (iscsivm2)
iscsiadm -m discovery --type=st --portal=10.15.1.12:3260
iscsiadm -m node -T iqn.2006-04.ascssgh.local:ascssgh --login --portal=10.15.1.12:3260
iscsiadm -m node -p 10.15.1.12:3260 --op=update --name=node.startup --value=automatic

#To connect third iSCSI SBD device (iscsivm3)
iscsiadm -m discovery --type=st --portal=10.15.1.13:3260
iscsiadm -m node -T iqn.2006-04.ascssgh.local:ascssgh --login --portal=10.15.1.13:3260
iscsiadm -m node -p 10.15.1.13:3260 --op=update --name=node.startup --value=automatic
```

```
# -- FOR HANADB NODES - #
#To connect first iSCSI SBD device (iscsivm1)
iscsiadm -m discovery --type=st --portal=10.15.1.11:3260
iscsiadm -m node -T iqn.2006-04.dbsgh.local:dbsgh --login --portal=10.15.1.11:3260
iscsiadm -m node -p 10.15.1.11:3260 --op=update --name=node.startup --value=automatic

#To connect second iSCSI SBD device (iscsivm2)
iscsiadm -m discovery --type=st --portal=10.15.1.12:3260
iscsiadm -m node -T iqn.2006-04.dbsgh.local:dbsgh --login --portal=10.15.1.12:3260
iscsiadm -m node -p 10.15.1.12:3260 --op=update --name=node.startup --value=automatic

#To connect third iSCSI SBD device (iscsivm3)
iscsiadm -m discovery --type=st --portal=10.15.1.13:3260
iscsiadm -m node -T iqn.2006-04.dbsgh.local:dbsgh --login --portal=10.15.1.13:3260
iscsiadm -m node -p 10.15.1.13:3260 --op=update --name=node.startup --value=automatic
```

5. Verify that SBD devices are available on each cluster nodes (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
# - OUTPUT FOR ASCS NODES - #
# lsblk
[1:0:0:0] cd/dvd Msft Virtual CD/ROM 1.0 /dev/sr0
[2:0:0:0] disk Msft Virtual Disk 1.0 /dev/sda
[3:0:1:0] disk Msft Virtual Disk 1.0 /dev/sdb
```

```
[5:0:0:0] disk Msft Virtual Disk 1.0 /dev/sdc
[6:0:0:0] disk LIO-ORG sbdascssgh 4.0 /dev/sdd
[7:0:0:0] disk LIO-ORG sbdascssgh 4.0 /dev/sde
[10:0:0:0] disk LIO-ORG sbdascssgh 4.0 /dev/sdf
```

```
# - OUTPUT FOR HANADB NODES -
# lsscsi
[1:0:0:0] cd/dvd Msft Virtual CD/ROM 1.0 /dev/sr0
[2:0:0:0] disk Msft Virtual Disk 1.0 /dev/sda
[3:0:1:0] disk Msft Virtual Disk 1.0 /dev/sdb
[5:0:0:0] disk Msft Virtual Disk 1.0 /dev/sdc
[5:0:0:1] disk Msft Virtual Disk 1.0 /dev/sdf
[5:0:0:2] disk Msft Virtual Disk 1.0 /dev/sdd
[5:0:0:3] disk Msft Virtual Disk 1.0 /dev/sde
[6:0:0:0] disk LIO-ORG sbddbsgh 4.0 /dev/sdh
[7:0:0:0] disk LIO-ORG sbddbsgh 4.0 /dev/sdg
[8:0:0:0] disk LIO-ORG sbddbsgh 4.0 /dev/sdi
```

6. Get the SCSI ID from sdd, sde, and sdf. This SCSI ID is required to create an SBD cluster resource in NFS cluster. **Perform it on FIRST node ONLY.**

```
# - FOR ASCS NODE – On ascsvm1 node #
# ls -l /dev/disk/by-id/scsi-* | grep sdd
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-1LIO-ORG_sbdascssgh:2a90d596-f15f-4891-801b-79e29e37fc3b -> ../../sdd
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-
360014052a90d596f15f4891801b79e29 -> ../../sdd
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-SLIO-ORG_sbdascssgh_2a90d596-f15f-4891-801b-79e29e37fc3b -> ../../sdd

# ls -l /dev/disk/by-id/scsi-* | grep sde
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-1LIO-ORG_sbdascssgh:fda7b277-c3be-4bf9-8bdf-4cccc867b438 -> ../../sde
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-
36001405fdaf7b277c3be4bf98bdf4cccc -> ../../sde
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-SLIO-ORG_sbdascssgh_fda7b277-c3be-4bf9-8bdf-4cccc867b438 -> ../../sde

# ls -l /dev/disk/by-id/scsi-* | grep sdf
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-1LIO-ORG_sbdascssgh:75a25b08-7836-4603-a020-4328ebf4f8c9 -> ../../sdf
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-
3600140575a25b0878364603a0204328e -> ../../sdf
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-SLIO-ORG_sbdascssgh_75a25b08-7836-4603-a020-4328ebf4f8c9 -> ../../sdf
```

For HANA, get the SCSI ID from sdg, sdh, and sdi.

```
# - FOR HANADB NODE – On hanavm1 node#
# ls -l /dev/disk/by-id/scsi-* | grep sdg
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-1LIO-ORG_sbddbsgh:79340dae-23c6-44f5-bf53-57ce3e1b89e7 -> ../../sdg
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-3600140579340dae23c644f5bf5357ce3 -> ../../sdg
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-SLIO-ORG_sbddbsgh_79340dae-23c6-44f5-bf53-57ce3e1b89e7 -> ../../sdg

# ls -l /dev/disk/by-id/scsi-* | grep sdh
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-1LIO-ORG_sbddbsgh:bc9e656f-9fe3-4f17-8cef-ef862e8ff587 -> ../../sdh
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-36001405bc9e656f9fe34f178cefef862 -> ../../sdh
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-SLIO-ORG_sbddbsgh_bc9e656f-9fe3-4f17-8cef-ef862e8ff587 -> ../../sdh

# ls -l /dev/disk/by-id/scsi-* | grep sdi
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-1LIO-ORG_sbddbsgh:167bc3b9-f714-4668-a281-288a0b7afbf1 -> ../../sdi
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-36001405167bc3b9f7144668a281288a0 -> ../../sdi
lrwxrwxrwx 1 root root 9 Apr 25 22:52 /dev/disk/by-id/scsi-SLIO-ORG_sbddbsgh_167bc3b9-f714-4668-a281-288a0b7afbf1 -> ../../sdi
```

7. Create an SBD device – Perform it on **FIRST** cluster node ONLY (i.e. ascsvm1, and hanavm1). Use the SBD ID from the previous steps (bold marked)

```
# - FOR ASCS NODE -#
sudo sbd -d /dev/disk/by-id/scsi-360014052a90d596f15f4891801b79e29 -1 60 -4 120 create

# Also create the second and third SBD devices
sudo sbd -d /dev/disk/by-id/scsi-36001405fda7b277c3be4bf98bdf4cccc -1 60 -4 120 create
sudo sbd -d /dev/disk/by-id/scsi-3600140575a25b0878364603a0204328e -1 60 -4 120
create
```

```
# - FOR HANADB NODE -#
sudo sbd -d /dev/disk/by-id/scsi-3600140579340dae23c644f5bf5357ce3 -1 60 -4 120 create

# Also create the second and third SBD devices
sudo sbd -d /dev/disk/by-id/scsi-36001405bc9e656f9fe34f178cefef862 -1 60 -4 120 create
sudo sbd -d /dev/disk/by-id/scsi-36001405167bc3b9f7144668a281288a0 -1 60 -4 120 create
```

8. Adapt the SBD config. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
Change the file vi /etc/sysconfig/sbd with following  
[...]  
SBD_DEVICE="/dev/disk/by-id/scsi-3600140542947810fca0483c812b2154e;/dev/disk/by-  
id/scsi-360014059ad4d6e0bbaa441c8d225abe0;/dev/disk/by-id/scsi-  
36001405b3febbe7ff6c4e4aaa71f15a7"  
[...]  
SBD_PACEMAKER=yes  
[...]  
SBD_STARTMODE=always  
[...]  
SBD_WATCHDOG=yes
```

9. Since in the above step, you used the soft-watchdog, we need to create a watch dog. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
echo softdog | sudo tee /etc/modules-load.d/softdog.conf
```

10. Finally, load the softdog module. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
:/etc/modules-load.d # modprobe -v softdog  
insmod /lib/modules/4.4.175-94.79-default/kernel/drivers/watchdog/softdog.ko
```

[\[Back to Check list for the deployment\]](#)

## Cluster Setup and Configuration

This section describes the pacemaker cluster setup for the ASCS, and HANA database.

## 8. Configure the pacemaker cluster

Perform these steps for ASCS and HANADB cluster nodes.

1. Update SLES. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
#zypper update
```

2. Configure the operating system for pacemaker. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

Pacemaker creates many processes, and can exceed the limit of max defined processes. If this happens, cluster nodes may lose heartbeat and cause a failover. To avoid this, we need to perform the following config (increase the max allowed processes).

```
# Edit the configuration file
sudo vi /etc/systemd/system.conf

# Change the DefaultTasksMax
#DefaultTasksMax=512
DefaultTasksMax=4096

#To activate the above setting
sudo systemctl daemon-reload

# test if the change was successful
sudo systemctl --no-pager show | grep DefaultTasksMax
#Output
DefaultTasksMax=4096
```

3. Reduce the dirty cache. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
#sudo vi /etc/sysctl.conf

# Change/set the following settings
vm.dirty_bytes = 629145600
vm.dirty_background_bytes = 314572800
```

4. Configure CLOUD\_NETCONFIG\_MANAGE. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

This is to prevent cloud network plugin removing the vIP.

```
# Edit the configuration file
sudo vi /etc/sysconfig/network/ifcfg-eth0
```

```
# Change CLOUD_NETCONFIG_MANAGE
# CLOUD_NETCONFIG_MANAGE='yes'
CLOUD_NETCONFIG_MANAGE='no'
```

5. Enable SSH access

- a. On Node1 ascsvm1

```
#sudo ssh-keygen

# Enter file in which to save the key (/root/.ssh/id_rsa): -> Press ENTER
# Enter passphrase (empty for no passphrase): -> Press ENTER
# Enter same passphrase again: -> Press ENTER

# copy the public key
sudo cat /root/.ssh/id_rsa.pub
```

On Node2 ascsvm2

```
#sudo ssh-keygen

# Enter file in which to save the key (/root/.ssh/id_rsa): -> Press ENTER
# Enter passphrase (empty for no passphrase): -> Press ENTER
# Enter same passphrase again: -> Press ENTER

# insert the public key you copied in the last step into the authorized keys file on the
# second server
#sudo vi /root/.ssh/authorized_keys

# copy the public key
sudo cat /root/.ssh/id_rsa.pub
```

- b. On Node1 ascsvm1

```
# insert the public key you copied in the last step into the authorized keys file on the
# first server
#sudo vi /root/.ssh/authorized_keys
```

- c. Perform the steps “a” ,“b” and “c” above for node pair hanavm1/hanavm2.

6. Install SUSE fence agent. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
#sudo zypper install fence-agents
```

7. Update hosts file for name resolution. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
vi /etc/hosts

# load balancers
10.15.1.5      ascslb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# asc nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1
```

8. Install cluster. Perform it on FIRST node of the clusters ( ascsvm1, hanavm1).

9.

```
# sudo ha-cluster-init
! NTP is not configured to start at system boot.
Do you want to continue anyway (y/n)? y
! Could not detect IP address for eth0
/root/.ssh/id_rsa already exists - overwrite (y/n)? n
Configuring csync2
Generating csync2 shared key (this may take a while)...done
csync2 checking files...done
```

#### Configure Corosync:

This will configure the cluster messaging layer. You will need to specify a network address over which to communicate (default is eth0's network, but you can use the network address of any active interface).

Network address to bind to (e.g.: 192.168.1.0) [169.254.169.254]10.15.1.6  
 Multicast address (e.g.: 239.x.x.x) [239.149.134.224]  
 Multicast port [5405]

#### Configure SBD:

If you have shared storage, for example a SAN or iSCSI target, you can use it avoid split-brain scenarios by configuring SBD. This requires a 1 MB partition, accessible to all nodes in the cluster. The device path must be persistent and consistent across all nodes in the cluster, so /dev/disk/by-id/\* devices are a good choice. Note that all data on the partition you specify here will be destroyed.

```
SBD is already configured to use /dev/disk/by-id/scsi-36001405572ef87cb9b944afa0dde42d9;/dev/disk/by-id/scsi-3600140547e965f1169540e9b5b3a7cc1;/dev/disk/by-id/scsi-360014052b860e7dd8da4acea60541c0c - overwrite (y/n)? n
```

Hawk cluster interface is now running. To see cluster status, open:  
<https://None:7630/>

Log in with username 'hacluster', password 'linux'

! You should change the hacluster password to something more secure!  
 Waiting for cluster.....done  
 Loading initial cluster configuration

Configure Administration IP Address:

Optionally configure an administration virtual IP address. The purpose of this IP address is to provide a single IP that can be used to interact with the cluster, rather than using the IP address of any specific cluster node.

**Do you wish to configure an administration IP (y/n)?n**

8.1 At this time, `crm_mon` shows below.

```
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu May 16 22:20:40 2019
Last change: Thu May 16 22:14:00 2019 by root via crm_attribute on ascsvm1
```

```
1 node configured
1 resource configured
```

```
Online: [ ascsvm1 ]
```

```
Active resources:
```

```
stonith-sbd (stonith:external/sbd): Started ascsvm1
```

10. Add node to the cluster. **Perform it on SECOND node of the clusters (ascsvm2, hanavm2).**

If you run `crm_mon` on any of the nodes, you don't see two nodes there yet. Don't worry, you still need to perform some more steps (mentioned below).

```
#ha-cluster-join
```

```
ascsvm2:~ # ha-cluster-join
! NTP is not configured to start at system boot.
Do you want to continue anyway (y/n)? y
! Could not detect IP address for eth0
Join This Node to Cluster:
You will be asked for the IP address of an existing node, from which
configuration will be copied. If you have not already configured
passwordless ssh between nodes, you will be prompted for the root
password of the existing node.

IP address or hostname of existing node (e.g.: 192.168.1.1) []10.15.1.6 ← IP address of the
primary node
Retrieving SSH keys - This may prompt for root@10.15.1.6:
Password:
/root/.ssh/id_rsa already exists - overwrite (y/n)? n
No new SSH keys installed
Password:
Configuring csync2
Password:
Password:
Password:
Merging known_hosts
! Failed to get known_hosts from ascsvm1: Exited with error code 255, Error output: Warning:
Permanently added 'ascsvm1' (ECDSA) to the list of known hosts.
parallax error: SSH requested a password. Please create SSH keys or
use the -A option to provide a password.
parallax error: SSH requested a password. Please create SSH keys or
use the -A option to provide a password.
Permission denied (publickey,password,keyboard-interactive).

! Failed to get known_hosts from ascsvm2: Exited with error code 255, Error output: Warning:
Permanently added 'ascsvm2,10.15.1.7' (ECDSA) to the list of known hosts.
parallax error: SSH requested a password. Please create SSH keys or
use the -A option to provide a password.
parallax error: SSH requested a password. Please create SSH keys or
use the -A option to provide a password.
Permission denied (publickey,password,keyboard-interactive).

Probing for new partitions...done
Password:
Hawk cluster interface is now running. To see cluster status, open:
https://None:7630/
Log in with username 'hacluster', password 'linux'
```

```
! You should change the hacluster password to something more secure!
Waiting for cluster.....done
Done (log saved to /var/log/ha-cluster-bootstrap.log)
```

11. Change user hacluster password, if needed. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
passwd hacluster
```

12. Configure corosync. Add the following bold content to the file if the values are not there or different. Make sure to change the token to 30000 to allow Memory preserving maintenance. Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
# -- FOR ASCS NODES for ascsvm1, ascsvm2 - #
#vi /etc/corosync/corosync.conf

[...]
token:      30000
token_retransmits_before_loss_const: 10
join:       60
consensus:   36000
max_messages: 20

interface {
    [...]
}
transport:  udpu
# remove parameter mcastaddr
# mcastaddr: IP
}
nodelist {
    node {
        # IP address of node1
        ring0_addr:10.15.1.6
    }
    node {
        # IP address of node2
        ring0_addr:10.15.1.7
    }
}
logging {
    [...]
}
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
}

```

```

# -- FOR HANA NODES hanavm1, hanavm2 - #
#vi /etc/corosync/corosync.conf

[...]
token:      30000
token_retransmits_before_loss_const: 10
join:       60
consensus:   36000
max_messages: 20

interface {
    [...]
}

transport:  udpu
# remove parameter mcastaddr
# mcastaddr: IP
}

nodelist {
    node {
        # IP address of node1
        ring0_addr:10.15.2.6
    }
    node {
        # IP address of node2
        ring0_addr:10.15.2.7
    }
}

logging {
    [...]
}

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
}

```

13. Restart the corosync service on both the nodes.

Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

```
#service corosync restart
```

14. Now crm\_mon, should show the 2 nodes and 1 resource.

Perform it on all the nodes of clusters ASCS, and HANA (ascsvm1, ascsvm2, hanavm1, hanavm2).

Note: it may take a while (approximately 2-3 minutes) for cluster to initialize.

```
Stack: corosync
Current DC: nfsvm1 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Thu Apr 25 21:01:51 2019
Last change: Thu Apr 25 20:47:04 2019 by root via crm_attribute on nfsvm1

2 nodes configured
1 resource configured

Online: [ nfsvm1 nfsvm2 ]

Active resources:

stonith-sbd    (stonith:external/sbd): Started nfsvm1
```

[\[Back to Check list for the deployment\]](#)

## 9. HANA Database Cluster Configuration

### 9.1 Hana Installation

Install the HANA database on both nodes hanavm1, and hanavm2.

1. Ensure to update the packages

```
zypper install libgcc_s1 libstdc++6 libatomic1
```

2. Copy the HANA Installation bits to /hana/logbackup/SAP\_HANA\_DATABASE on both the nodes.

Ensure that signature file is also copied and kept outside of the folder SAP\_HANA\_DATABASE.

3. Change the permission

```
#chmod -R 755 /hana/logbackup/SAP_HANA_DATABASE
```

4. Install the HANA using command line tool hdblcm. You can run on both the hana VMs in parallel.

```
hanavm1:/hana/logbackup/SAP_HANA_DATABASE # ./hdblcm --ignore=check_signature_file
```

```
SAP HANA Lifecycle Management - SAP HANA Database 2.00.040.00.1553674765
```

```
*****
```

Scanning software locations...  
 Detected components:  
 SAP HANA Database (2.00.040.00.1553674765) in  
 /hana/logbackup/SAP\_HANA\_DATABASE/server

Choose an action

| Index | Action | Description |
|-------|--------|-------------|
|-------|--------|-------------|

- |   |                    |                    |
|---|--------------------|--------------------|
| 1 | install            | Install new system |
| 2 | extract_components | Extract components |
| 3 | Exit (do nothing)  |                    |

**Enter selected action index [3]: 1**

Enter Installation Path [/hana/shared]: Press ENTER  
 Enter Local Host Name [hanavm1]: Press ENTER  
 Do you want to add hosts to the system? (y/n) [n]: Press ENTER  
 Enter SAP HANA System ID: SGH  
 Enter Instance Number [00]: Press ENTER  
 Enter Local Host Worker Group [default]:

| Index | System Usage | Description |
|-------|--------------|-------------|
|-------|--------------|-------------|

- |   |             |  |
|---|-------------|--|
| 1 | production  | System is used in a production environment               |
| 2 | test        | System is used for testing, not production               |
| 3 | development | System is used for development, not production           |
| 4 | custom      | System usage is neither production, test nor development |

Select System Usage / **Enter Index [4]: 4**

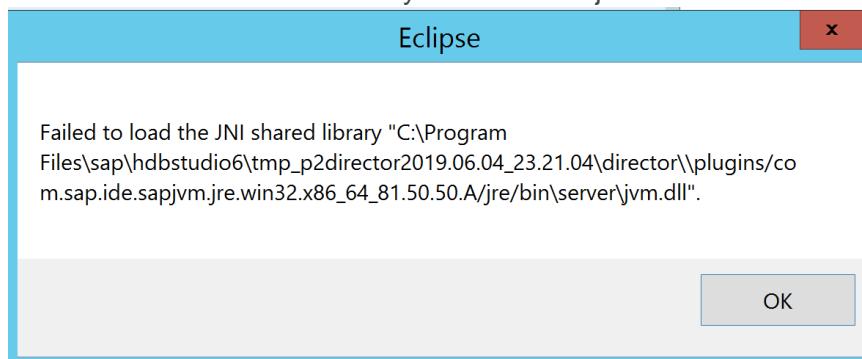
Enter Location of Data Volumes [/hana/data/SGH]: Press ENTER  
 Enter Location of Log Volumes [/hana/log/SGH]: Press ENTER  
 Restrict maximum memory allocation? [n]: Press ENTER  
 Enter Certificate Host Name For Host 'hanavm1' [hanavm1]: Press ENTER  
 Enter SAP Host Agent User (sapadm) Password:  
 Confirm SAP Host Agent User (sapadm) Password:  
 Enter System Administrator (sghadm) Password:  
 Confirm System Administrator (sghadm) Password:  
 Enter System Administrator Home Directory [/usr/sap/SGH/home]: Press ENTER  
 Enter System Administrator Login Shell [/bin/sh]:  
 Enter System Administrator User ID [1001]:  
 Enter ID of User Group (sapsys) [79]:  
 Enter System Database User (SYSTEM) Password:  
 Confirm System Database User (SYSTEM) Password:  
 Restart system after machine reboot? [n]:

Summary before execution:

```
=====
SAP HANA Database System Installation
  Installation Parameters
    SAP HANA System ID: SGH
    Instance Number: 00
    Local Host Worker Group: default
    System Usage: custom
    Location of Data Volumes: /hana/data/SGH
    Location of Log Volumes: /hana/log/SGH
    Certificate Host Names: hanavm1 -> hanavm1
    System Administrator Home Directory: /usr/sap/SGH/home
    System Administrator Login Shell: /bin/sh
    System Administrator User ID: 1001
    ID of User Group (sapsys): 79
    Remote Execution: ssh
    Database Isolation: low
    Install Execution Mode: standard
    Installation Path: /hana/shared
    Local Host Name: hanavm1
  Software Components
    SAP HANA Database
      Install version 2.00.040.00.1553674765
      Location: /hana/logbackup/SAP_HANA_DATABASE/server
    Log File Locations
      Log directory: /var/tmp/hdb_SGH_hdblcm_install_2019-04-26_22.07.24
      Trace location: /var/tmp/hdblcm_2019-04-26_22.07.24_101096.trc
```

Do you want to continue? (y/n): y

5. HANA installation takes about 10 minutes.
6. For HANA Studio installation, if you get the following error on jumpmserver (jbvm1)  
Failed to load JNI Shared Library ... \bin\server\jvm.dll



Then ensure that you install vcredist\_x64.

## 9.2 HSR Configuration

7. For HA setup, ensure that package is installed SAPHanaSR **on both the HANA nodes**.

```
#zypper se SAPHanaSR
```

8. Take system and tenant database backup

```
sghadm@hanavm1:/usr/sap/SGH/HDB00/exe> hdbsql -d SYSTEMDB -u SYSTEM -p "mypassword" -i 00 "BACKUP DATA USING FILE ('initialbackupSYS')"
0 rows affected (overall time 13.020002 sec; server time 13.018478 sec)

sghadm@hanavm1:/usr/sap/SGH/HDB00/exe> hdbsql -d SGH -u SYSTEM -p "mypassword" -i 00 "BACKUP DATA USING FILE ('initialbackupSGH')"
0 rows affected (overall time 13.289985 sec; server time 13.287974 sec)
```

9. Copy the dat and key files from hanavm1 to hanavm2

```
scp /usr/sap/SGH/SYS/global/security/rsecssfs/data/SSFS_SGH.DAT
hanavm2:/usr/sap/SGH/SYS/global/security/rsecssfs/data/

scp /usr/sap/SGH/SYS/global/security/rsecssfs/key/SSFS_SGH.KEY
hanavm2:/usr/sap/SGH/SYS/global/security/rsecssfs/key/
```

10. Enable system replication **on primary node (hanavm1)**

```
sghadm@hanavm1:/usr/sap/SGH/HDB00/exe> hdbnsutil -sr_enable --name=hanavm1
nameserver is active, proceeding ...
successfully enabled system as system replication source site
done.
```

11. Stop the HANA on second system (hanavm2)

```
sghadm@hanavm2:/usr/sap/SGH/HDB00> HDB stop
hdbdaemon will wait maximal 300 seconds for NewDB services finishing.
Stopping instance using: /usr/sap/SGH/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -
function Stop 400

17.05.2019 23:33:22
Stop
OK
Waiting for stopped instance using: /usr/sap/SGH/SYS/exe/hdb/sapcontrol -prot NI_HTTP
-nr 00 -function WaitforStopped 600 2

17.05.2019 23:33:56
WaitforStopped
OK
```

hdbdaemon is stopped.

12. Register the second system (hanavm2) for replication

```
sghadm@hanavm2:/usr/sap/SGH/HDB00/exe> hdbnsutil -sr_register --  
remoteHost=hanavm1 --remoteInstance=00 --replicationMode=sync --name=hanavm2  
--operationMode not set; using default from  
global.ini/[system_replication]/operation_mode: logreplay  
adding site ...  
nameserver hanavm2:30001 not responding.  
collecting information ...  
updating local ini files ...  
done.
```

13. Ensure that HSR is in sync

```
sghadm@hanavm1:/usr/sap/SGH/HDB00/exe> ./hdbnsutil -sr_state  
  
System Replication State  
~~~~~  
  
online: true  
  
mode: primary  
operation mode: primary  
site id: 1  
site name: hanavm1  
  
is source system: true  
is secondary/consumer system: false  
has secondaries/consumers attached: true  
is a takeover active: false  
  
Host Mappings:  
~~~~~  
  
hanavm1 -> [hanavm2] hanavm2  
hanavm1 -> [hanavm1] hanavm1  
  
Site Mappings:  
~~~~~  
hanavm1 (primary/primary)  
|--hanavm2 (syncmem/delta_datashipping)  
  
Tier of hanavm1: 1  
Tier of hanavm2: 2  
  
Replication mode of hanavm1: primary  
Replication mode of hanavm2: syncmem  
  
Operation mode of hanavm1: primary  
Operation mode of hanavm2: delta_datashipping  
  
Mapping: hanavm1 -> hanavm2  
done.
```

### 9.3 Add HANA topology and resources to the HANA DB cluster

This is to create the HANA topology and HANA resources in the HANADB cluster.

1. Create the HANA topology. Perform it on FIRST node hanavm1.

```
# Create the HANA topology

crm configure property maintenance-mode=true

# Replace the bold string with your instance number and HANA system ID

crm configure primitive rsc_SAPHanaTopology_SGH_HDB00 ocf:suse:SAPHanaTopology
operations \${id="rsc_sap_SGH_HDB00-operations" op monitor interval="10" timeout="600"
op start interval="0" timeout="600" op stop interval="0" timeout="300" params SID="SGH"
InstanceNumber="00"}

crm configure clone cln_SAPHanaTopology_SGH_HDB00 rsc_SAPHanaTopology_SGH_HDB00
meta is-managed="true" clone-node-max="1" target-role="Started" interleave="true"
```

2. Create the resources. Perform it on FIRST node hanavm1.

```
# Configure the HANA resources

# Replace the bold string with your instance number, HANA system ID, and the front-end IP address of the Azure load balancer.

crm configure primitive rsc_SAPHana_SGH_HDB00 ocf:suse:SAPHana operations \${id="rsc_sap2_SGH_HDB00-operations" op
start interval="0" timeout="3600" op stop interval="0" timeout="3600" op promote interval="0" timeout="3600" op monitor
interval="60" role="Master" timeout="700" op monitor interval="61" role="Slave" timeout="700" params SID="SGH"
InstanceNumber="00" PREFER_SITE_TAKEOVER="true" DUPLICATE_PRIMARY_TIMEOUT="7200" AUTOMATED_REGISTER="false"

crm configure ms msl_SAPHana_SGH_HDB00 rsc_SAPHana_SGH_HDB00 meta is-managed="true" notify="true" clone-max="2"
clone-node-max="1" target-role="Started" interleave="true"

crm configure primitive rsc_ip_SGH_HDB00 ocf:heartbeat:IPaddr2 meta target-role="Started" is-managed="true" operations
\${id="rsc_ip_SGH_HDB00-operations" op monitor interval="10s" timeout="20s" params ip="10.15.2.5"

crm configure primitive rsc_nc_SGH_HDB00 anything params binfile="/usr/bin/nc" cmdline_options="-l -k 62500" op monitor
timeout=20s interval=10 depth=0

crm configure group g_ip_SGH_HDB00 rsc_ip_SGH_HDB00 rsc_nc_SGH_HDB00

crm configure colocation col_saphana_ip_SGH_HDB00 4000: g_ip_SGH_HDB00:Started msl_SAPHana_SGH_HDB00:Master
crm configure order ord_SAPHana_SGH_HDB00 Optional: cln_SAPHanaTopology_SGH_HDB00 msl_SAPHana_SGH_HDB00

# Clean up the HANA resources. The HANA resources might have failed because of a known issue.
crm resource cleanup rsc_SAPHana_SGH_HDB00

crm configure property maintenance-mode=false
crm configure rsc_defaults resource-stickiness=1000
crm configure rsc_defaults migration-threshold=5000
```

3. Verify the cluster status

```
hanavm1:/ # crm_mon -r
Stack: corosync
Current DC: hanavm1 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Sat Apr 27 18:31:03 2019
```

Last change: Sat Apr 27 18:30:01 2019 by root via crm\_attribute on hanavm1

2 nodes configured  
7 resources configured

Online: [ hanavm1 hanavm2 ]

Full list of resources:

```
stonith-sbd  (stonith:external/sbd): Started hanavm1
Clone Set: cln_SAPHanaTopology_SGH_HDB00 [rsc_SAPHanaTopology_SGH_HDB00]
  Started: [ hanavm1 hanavm2 ]
Master/Slave Set: msl_SAPHana_SGH_HDB00 [rsc_SAPHana_SGH_HDB00]
  Masters: [ hanavm1 ]
  Slaves: [ hanavm2 ]
Resource Group: g_ip_SGH_HDB00
  rsc_ip_SGH_HDB00 (ocf::heartbeat:IPaddr2): Started hanavm1
  rsc_nc_SGH_HDB00 (ocf::heartbeat:anything): Started hanavm1
```

How to get ports used by the tenant database – run this on tenant database

```
SELECT SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT FROM
SYS.M_SERVICES WHERE ((SERVICE_NAME='indexserver' and
COORDINATOR_TYPE= 'MASTER') or (SERVICE_NAME='xsengine'))
```

Hawk console dashboard status for HANA cluster

| Status hacluster |                               |                  |  |                                  |                          |                                 |
|------------------|-------------------------------|------------------|--|----------------------------------|--------------------------|---------------------------------|
| Resources 7      |                               | Nodes 2          |  |                                  |                          |                                 |
| Status           | Name                          | Location         |  | Type                             | Operations               |                                 |
| ●                | cln_SAPHanaTopology_SGH_HDB00 | hanavm1, hanavm2 |  | ocf:suse:SAPHanaTopology (Clone) | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | rsc_SAPHanaTopology_SGH_HDB00 | hanavm1, hanavm2 |  | ocf:suse:SAPHanaTopology         | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | g_ip_SGH_HDB00                | hanavm1          |  | Group (2)                        | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | rsc_ip_SGH_HDB00              | hanavm1          |  | ocf:heartbeat:IPaddr2            | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | rsc_nc_SGH_HDB00              | hanavm1          |  | ocf:heartbeat:anything           | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | msl_SAPHana_SGH_HDB00         | hanavm1, hanavm2 |  | Multi-state                      | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | rsc_SAPHana_SGH_HDB00         | hanavm1, hanavm2 |  | ocf:suse:SAPHana                 | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | stonith-sbd                   | hanavm1          |  | stonith:external/sbd             | <input type="checkbox"/> | <input type="button" value=""/> |

| Status hacluster |         |                                 |                                 |                          |                                 |
|------------------|---------|---------------------------------|---------------------------------|--------------------------|---------------------------------|
| Resources 7      |         | Nodes 2                         |                                 |                          |                                 |
| Status           | Name    | Maintenance                     | Standby                         | Operations               |                                 |
| ●                | hanavm1 | <input type="button" value=""/> | <input type="button" value=""/> | <input type="checkbox"/> | <input type="button" value=""/> |
| ●                | hanavm2 | <input type="button" value=""/> | <input type="button" value=""/> | <input type="checkbox"/> | <input type="button" value=""/> |

[\[Back to Check list for the deployment\]](#)

## 10. Prepare ASCS cluster for SAP S4H installation

In this section, Prepare ASCS cluster for SAP S4H installation. You create autofs file configuration so ANF shares can be attached to the ASCS cluster nodes.

### 1. Pre-requisite

- a. ANF accounts, pool, and volumes
- b. VM and Load Balancer deployed – we did it before already
- c. Pacemaker cluster – we did setup it before

```
#crm_mon
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Mon Apr 29 20:40:45 2019
Last change: Fri Apr 26 02:50:13 2019 by root via cmm_attribute on ascsvm1

2 nodes configured
1 resource configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
```

### 2. Prepare cluster for SAP

- a. Install SUSE connector. Perform it on both the ASCS nodes.

```
#zypper install sap-suse-cluster-connector
```

- b. Update SAP resource agents. Perform it on both the ASCS nodes.

```
# sudo grep 'parameter name="IS_ERS"' /usr/lib/ocf/resource.d/heartbeat/SAPIstance
```

```
# output
<parameter name="IS_ERS" unique="0" required="0">
```

### 3. Prepare ANF for ASCS.

- a. Create shared directories. Perform it on both the ASCS nodes.

```
mkdir -p /sapmnt/SGH
mkdir -p /usr/sap/trans
mkdir -p /usr/sap/SGH/SYS
mkdir -p /usr/sap/SGH/ASCS00
mkdir -p /usr/sap/SGH/ERS02

chattr +i /sapmnt/SGH
chattr +i /usr/sap/trans
chattr +i /usr/sap/SGH/SYS
chattr +i /usr/sap/SGH/ASCS00
```

```
chattr +i /usr/sap/SGH/ERS02
```

- b. Configure autofs. Perform it on **both** the ASCS nodes.

```
sudo vi /etc/auto.master
```

```
# Add the following line to the file, save and exit
+auto.master
/- /etc/auto.direct
```

Create a file /etc/auto.direct. Perform it on both the ASCS nodes.

```
# create a file
vi /etc/auto.direct
```

```
# Add the following lines to the file, save and exit
/sapmnt/SGH -nfsvers=3,nobind,sync 10.15.3.4:/sapmntSGH
/usr/sap/trans -nfsvers=3,nobind,sync 10.15.3.5:/transSGH
/usr/sap/SGH/SYS -nfsvers=3,nobind,sync 10.15.3.4:/usrsapSGHsys
```

**Note:** Currently Azure NetApp Files supports only NFSv3. Don't omit the nfsvers=3 switch.

- c. Start and enable the autofs service. Perform it on both the ASCS nodes.

```
#systemctl enable autofs
#service autofs restart
```

- d. Configure swap file. Perform it on both the ASCS nodes.

```
vi /etc/waagent.conf
```

```
# Set the property ResourceDisk.EnableSwap to y
# Create and use swapfile on resource disk.
ResourceDisk.EnableSwap=y

# Set the size of the SWAP file with property ResourceDisk.SwapSizeMB
# The free space of resource disk varies by virtual machine size. Make sure that you
do not set a value that is too big. You can check the SWAP space with command
swapon
# Size of the swapfile.
ResourceDisk.SwapSizeMB=2000
```

- e. Restart the agent

```
#service waagent restart
```

4. Create a virtual IP resource and health-probe for the ASCS instance. Perform it on **FIRST node**.

```
sudocrm node standby ascsvm2

sudocrm configure primitive fs_SGH_ASCS Filesystem device='10.15.3.4:/usrsapSGH'
directory='/usr/sap/SGH/ASCS00' fstype='nfs' op start timeout=60s interval=0 op stop timeout=60s
interval=0 op monitor interval=20s timeout=40s

sudocrm configure primitive vip_SGH_ASCS IPaddr2 params ip=10.15.1.5 cidr_netmask=24 op monitor
interval=10 timeout=20

sudocrm configure primitive nc_SGH_ASCS anything params binfile="/usr/bin/nc" cmdline_options="-l
-k 62000" op monitor timeout=20s interval=10 depth=0

sudocrm configure group g-SGH_ASCS fs_SGH_ASCS nc_SGH_ASCS vip_SGH_ASCS meta resource-
stickiness=3000
```

- a. Verify that cluster is running ok.

```
Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Tue Apr 30 17:14:38 2019
Last change: Tue Apr 30 17:11:53 2019 by root via cibadmin on ascsvm1

2 nodes configured
4 resources configured

Node ascsvm2: standby
Online: [ ascsvm1 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
```

Now you see that shares from NFS server is mounted to the ASCS servers.

```
ascsvm1:~ # df -kh
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        14G   8.0K  14G  1% /dev
tmpfs          21G  46M  21G  1% /dev/shm
tmpfs          14G  66M  14G  1% /run
tmpfs          14G    0  14G  0% /sys/fs/cgroup
/dev/sda4       29G  2.3G  25G  9% /
/dev/sda3     976M 102M 824M 11% /boot
/dev/sda2      200M 140K 200M  1% /boot/efi
/dev/sdb1      55G  2.1G  51G  4% /mnt/resource
```

```

tmpfs          2.8G  0 2.8G  0% /run/user/1000
/dev/sdc1      252G  30G 221G 12% /usr/sap
tmpfs          2.8G  0 2.8G  0% /run/user/0
10.15.3.4:/usr/sap/SGH/sys 100T 320K 100T 1% /usr/sap/SGH/SYS
10.15.3.4:/sapmnt/SGH   100T 320K 100T 1% /sapmnt/SGH
10.15.3.5:/trans/SGH    100T 320K 100T 1% /usr/sap/trans
10.15.3.4:/usr/sap/SGH  100T 320K 100T 1% /usr/sap/SGH/ASCS00

```

Mount on node2. Note that ASCS is not mounted on the node2.

```

ascsvm2:~ # df -kh
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        14G  8.0K  14G  1% /dev
tmpfs           21G  61M  21G  1% /dev/shm
tmpfs           14G  50M  14G  1% /run
tmpfs           14G  0  14G  0% /sys/fs/cgroup
/dev/sda4        29G  2.3G  25G  9% /
/dev/sda3       976M 102M 824M 11% /boot
/dev/sda2       200M 140K 200M 1% /boot/efi
/dev/sdb1        55G  2.1G  51G  4% /mnt/resource
/dev/sdc1       252G  31G 221G 13% /usr/sap
tmpfs           2.8G  0 2.8G  0% /run/user/0
10.15.3.4:/usr/sap/SGH/sys 100T 320K 100T 1% /usr/sap/SGH/SYS
10.15.3.4:/sapmnt/SGH   100T 320K 100T 1% /sapmnt/SGH
10.15.3.5:/trans/SGH    100T 320K 100T 1% /usr/sap/trans

```

## 11. ASCS Instance Installation

1. Copy the SWPM and installation bits to ascsvm1
2. Extract the SWPM using `sapcar.exe -xvf SWPMSARFILE`
  - a. Also extract the sapinst file inside the SWPM folder. If you don't use latest sapinst sometimes you get error in SWPM execution "manifest error".
3. Start the S4H Installation for ASCS instance. Start the sapinst using the following command **on ASCS FIRST node**. Ensure that use sapadm is created on the node already.

```

#To create a user
ascsvm1:~ # useradd -m sapadmin
ascsvm1:~ # passwd sapadmin
New password:
Retype new password:
passwd: password updated successfully

```

```

ascsvm1:/usr/sap/SWPM # ./sapinst SAPINST_REMOTE_ACCESS_USER=sapadmin
SAPINST_USE_HOSTNAME=sgh-ascs-ilb
[=====] | extracting... done!

```

```

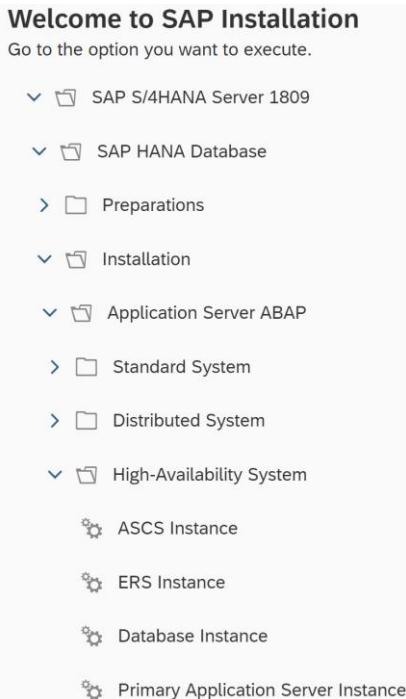
INFO 2019-04-30 17:50:07.728 (mainThread) [sixxcreate.cpp:347]
*****
Initial log directory: /root/.sapinst/ascsvm1/20983
*****
****

-----
You are starting SAPinst using SAPINST_REMOTE_ACCESS_USER option.
Using this option within a GUI client requires the GUI user to be a trusted user because the
installation itself is running within privileged level.
Please refer to SAP Note #1745524.

-----
Please confirm (y/n):y

```

4. On jbvm1, use the link <https://ascsvm1:4237/sapinst/docs/index.html>, login using the sapadmin user.
5. Select SAP S/4HANA Server 1809 > SAP HANA Database > Installation > High Availability System > ASCS Instance



**General SAP System Parameters**

Enter the SAP system ID.

**SAP System**

\*SAP System ID (SAPSID)

SGH

SAP Mount Directory

/sapmnt

**Additional Information**

The SAP System ID is an identifier for your SAP system. It must be unique throughout your system landscape.  
 The system is installed under /usr/sap/<SAPSID>/.... Common directories are linked to <SAP Mount Directory>/<SAPSID>/...

**It may take a while (approximately 15minutes to seach all the packages in this step).**

**DNS Domain Name**

Enter the DNS domain name for the SAP system to calculate the fully qualified domain name (FQDN).

**SAP System Domain Name** Set FQDN for SAP system

DNS Domain Name for SAP System

**Master Password**

Enter the master password for all users.

**Master Password**

The master password is used for all users that are created. Check the tool help for restrictions and dependencies.

\*Password for All Users

\*\*\*\*\*

\*Confirm

\*\*\*\*\*

**SAP System Administrator**Account: *sghadm*

\*Password of SAP System Administrator

\*\*\*\*\*

\*Confirm

\*\*\*\*\*

User ID

Group ID of sapsys

**Software Package Browser**

Specify the path to a download folder containing all software packages, or the paths to media locations or to several individual download locations of software packages.

**Search Location**

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path

**Archive Locations**

You can download the archives from the following locations on SAP Software Download Center:

[SAPEXE.SAR \(any version supporting your release\)](#)

It takes approximately 10-15 minutes to search and extract the file.

**SAP System Administrator**Account: *sapadm*

\*Password of SAP System Administrator

\*Confirm

User ID

Group ID of sapsys

**ASCS Instance**

The following SAP system instances already exist on this host:

|  |                        |
|--|------------------------|
|  | SAP System ID (SAPSID) |
|  |                        |

\*ASCS Instance Number

\*ASCS Instance Host Name

Ensure that you changed default hostname ascsvm1 to ascsv-lb in this screen.

## ABAP Message Server Ports

Enter the required message server ports.

### ABAP Message Server Ports

|                                    |      |
|------------------------------------|------|
| *ABAP Message Server Port          | 3600 |
| *Internal ABAP Message Server Port | 3900 |

## Additional Components to be Included in the ASCS Instance

Choose the additional components you want to have installed in the ASCS instance.

### Enable Additional Components

- Install an SAP Web Dispatcher integrated in the ASCS instance
- Install a Gateway integrated in the ASCS instance

#### Cleanup of Operating System Users

Specify whether operating system users are to be removed from group 'sapinst' on UNIX (the group 'SAPINST' is to be removed from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

#### Limit Installation Directory Access

The `sapinst_instdir` directory belongs to a group named `sapinst`. If this group is not available, it is created automatically as a local group. For security reasons, SAP recommends that you remove operating system users from group `sapinst` on UNIX (respectively remove group `SAPINST` from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

Yes, clean up operating system users

#### Operating System Users to be Cleaned Up:

| OS User  |
|----------|
| 1 sghadm |

#### Additional Information

Operating system users that are created during the execution of Software Provisioning Manager are added to the group `sapinst` on UNIX (respectively the group `SAPINST` is added to the operating system users on IBM i) as they need access to the `sapinst_instdir` directory. For operating system users that are not local, you either need the required administrator permissions or must adjust the `sapinst` group manually.

Define Parameters   »   Review Parameters   »   Execute Service   »   Service Completed

**Parameter Summary**  
Choose 'Next' to start with the values shown. Otherwise, select the parameters to be changed and choose 'Revise'.

**Parameter List**

General SAP System Parameters

SAP System ID (SAPSID)

SAP Mount Directory

DNS Domain Name

Set FQDN for SAP system

Master Password

Password for All Users

SAP System Administrator

Password of SAP System Administrator

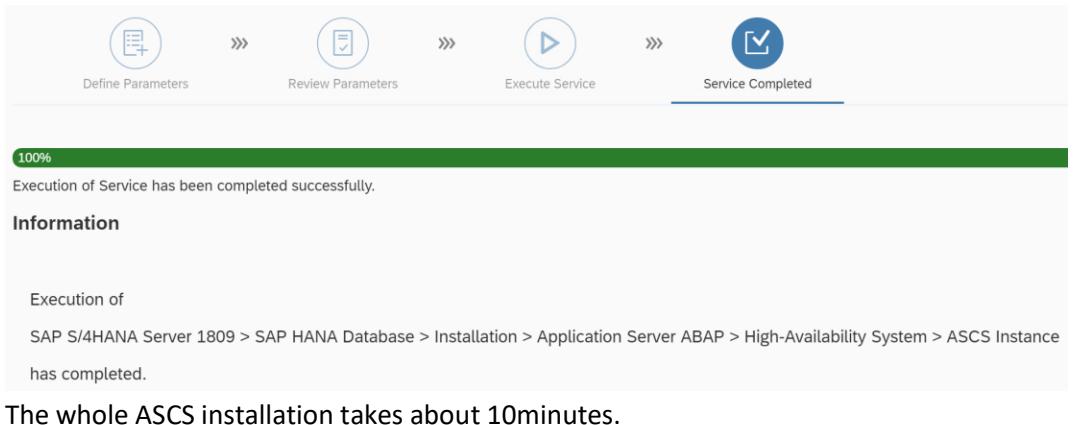
User ID

Group ID of sapsys

Software Package Browser

Define Parameters   »   Review Parameters   »   Execute Service   »   Service Completed

**Progress Bar** 33%



## 12. ERS Preparations

6. Create a virtual IP resource and health-probe for the ERS instance. Perform it on **FIRST node**.

```
sudo crm node online ascsvm2
sudo crm node standby ascsvm1

sudo crm configure primitive fs_SGH_ERS Filesystem device='10.15.3.4:/usrsapSGHers'
directory='/usr/sap/SGH/ERS02' fstype='nfs' op start timeout=60s interval=0 op stop
timeout=60s interval=0 op monitor interval=20s timeout=40s

sudo crm configure primitive vip_SGH_ERS IPaddr2 params ip=10.15.1.50 cidr_netmask=24
op monitor interval=10 timeout=20

sudo crm configure primitive nc_SGH_ERS anything params binfile="/usr/bin/nc"
cmdline_options="-l -k 62102" op monitor timeout=20s interval=10 depth=0

# WARNING: Resources nc_SGH_ASCS,nc_SGH_ERS violate uniqueness for parameter
"binfile": "/usr/bin/nc"
# Do you still want to commit (y/n)? y

sudo crm configure group g-SGH_ERS fs_SGH_ERS nc_SGH_ERS vip_SGH_ERS
```

Verify the cluster status

```
Ascsvm1:/#crm_mon
Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Wed May 1 21:41:38 2019
Last change: Wed May 1 21:40:44 2019 by root via cibadmin on ascsvm1

2 nodes configured
7 resources configured
```

```
Node ascsvm1: standby  
Online: [ ascsvm2 ]
```

Active resources:

```
stonith-sbd (stonith:external/sbd): Started ascsvm2  
Resource Group: g-SGH_ASCS  
    nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm2  
    vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm2  
fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm2  
Resource Group: g-SGH_ERS  
    fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2  
    nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2  
    vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
```

### 13.1 ERS Instance Installation

1. Copy the SWPM and installation bits to ascsvm2
2. Extract the SWPM using `sapcar.exe -xvf SWPMSARFILE`
  - a. Also extract the sapinst file inside the SWPM folder. If you don't use latest sapinst sometimes you get error in SWPM execution "manifest error".
3. Install the ERS instance. Perform it on **SECOND** node ascsvm2.

Create a user sapadmin on ascsvm2 node2.

```
ascsvm2:~ # useradd -m sapadmin
ascsvm2: # passwd sapadmin
New password:
Retype new password:
passwd: password updated successfully
```

1. Start the installation

```
ascsvm2:/usr/sap/SWPM # ./sapinst SAPINST_REMOTE_ACCESS_USER=sapadmin
```

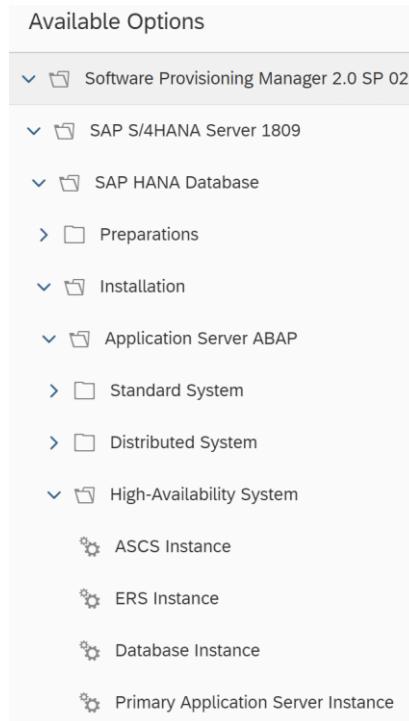
Use <https://ascsvm2:4237/sapinst/docs/index.html> to access the installer.

If installation fails, set the permission on /usr/sap folders. Do it on **SECOND** node.

```
chown sghadm /usr/sap/SGH/ASCS00
chgrp sapsys /usr/sap/SGH/ASCS00
chown sghadm /usr/sap/SGH/ERS02
chgrp sapsys /usr/sap/SGH/ERS02

# if the command above gives error like 'chown: changing ownership of
# '/usr/sap/SGH/ERS02/': Operation not permitted', the run the following
# command and then run the chown command again
Ascsvm2:/usr/sap/SGH # sudo chattr -i ERS02
```

Select SAP S/4HANA Server 1809 > SAP HANA Database > Installation > High Availability System > ERS Instance



## SAP System Identification

Profile Directory

/sapmnt/SGH/profile

If you get error “**Cannot determine SAP system ID from profile directory /usr/sap/SGH/SYS/profile: DEFAULT.PFL does not exist.**” Then ensure that the mount points are available.

```
ascsvm2: # df -kh
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        14G   8.0K  14G  1% /dev
tmpfs          21G   61M  21G  1% /dev/shm
tmpfs          14G   51M  14G  1% /run
tmpfs          14G     0  14G  0% /sys/fs/cgroup
/dev/sda4       29G   2.6G  25G 10% /
/dev/sda3      976M  102M 824M 11% /boot
/dev/sda2      200M  140K 200M  1% /boot/efi
/dev/sdb1       55G   2.1G  51G  4% /mnt/resource
/dev/sdc1      252G   31G 221G 13% /usr/sap
tmpfs          2.8G     0  2.8G  0% /run/user/0
10.15.3.4:/usr/sap/SGH/sys 100T 384K 100T 1% /usr/sap/SGH/SYS
10.15.3.4:/sapmnt/SGH  101T 646M 100T 1% /sapmnt/SGH
10.15.3.5:/transSGH   100T 320K 100T 1% /usr/sap/trans
10.15.3.4:/usr/sap/SGH  101T 231M 100T 1% /usr/sap/SGH/ASCS00
10.15.3.4:/usr/sap/SGHers 100T 320K 100T 1% /usr/sap/SGH/ERS02
```

## SAP System Administrator

Account: *sghadm*

\*Password of SAP System Administrator

••••••••••

\*Confirm

••••••••••

User ID

1002

Group ID of sapsys

1001

### Software Package Browser

Specify the path to a download folder containing all software packages, or the paths to media locations or to several individual download locations of software packages.

#### Search Location

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path

/usr/sap/S4H1809



#### Archive Locations

You can download the archives from the following locations on SAP Software Download Center:  
[SAPEXE.SAR](#) (any version supporting your release)

It takes approximately 10-15 minutes to search and extract the file.

## DNS Domain Name

Enter the DNS domain name for the SAP system to calculate the fully qualified domain name (FQDN).

### SAP System Domain Name

Set FQDN for SAP system

DNS Domain Name for SAP System

## Upgrade SAP Host Agent

Decide whether you want to upgrade the existing SAP Host Agent

### Detected SAP Host Agent

Upgrade SAP Host Agent to the version of the provided SAPHOSTAGENT.SAR archive

**ERS Instance****The following instances were detected:**

|   | SAP System ID | Instance Name |
|---|---------------|---------------|
| 1 | SGH           | ASCS00        |

Name of the ASCS Instance to be Replicated

Number of the ASCS Instance to be Replicated

\*Number of the ERS Instance

\*ERS Instance Host

**Activate Changes**

Restart the ASCS instance to activate the applied changes.

**Activation of Instance Changes**

A restart of the ASCS instance and Windows service is required to activate the applied changes.

|  |   |
|--|---|
| ASCS Instance Name   | <input type="text" value="ASCS00"/>       |
| ASCS Instance Host   | <input type="text" value="sgh-ascs-ilb"/> |
| <input checked="" type="checkbox"/> Automatic Instance and Service Restart |   |

**Cleanup of Operating System Users**

Specify whether operating system users are to be removed from group sapinst on UNIX (the group SAPINST is to be removed from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

**Limit Installation Directory Access**

The sapinst\_instdir directory belongs to a group named sapinst. If this group is not available, it is created automatically as a local group. For security reasons, SAP recommends that you remove operating system users from group sapinst on UNIX (respectively remove group SAPINST from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

 Yes, clean up operating system users**Operating System Users to be Cleaned Up:**

| OS User   |
|-----------|
| 1 sgadmin |

**Media**

|   | Medium                        | Package Location | Signature     |
|---|-------------------------------|------------------|---------------|
| 1 | Software Provisioning Manager | /usr/sap/SWPM    | signed by SAP |



Define Parameters



Review Parameters



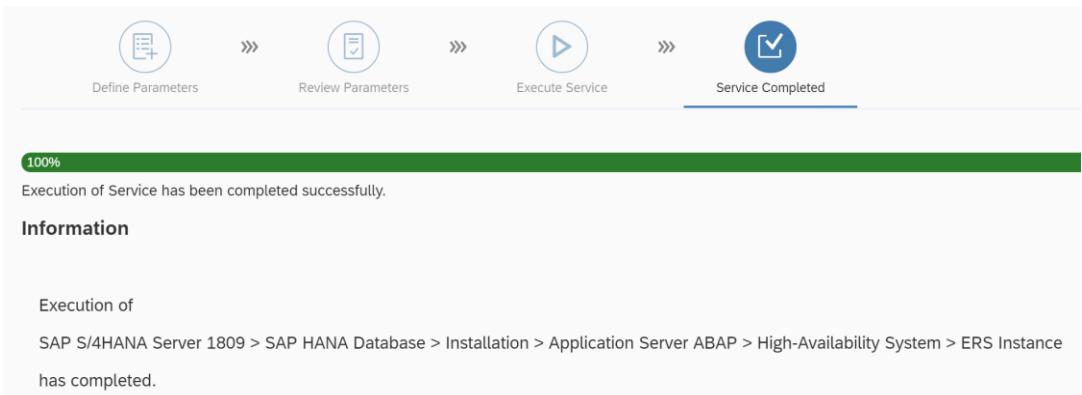
Execute Service



Service Completed

Creating system directories for SAP system SGH...

44%



Installation takes about 5minutes.

### 13.2 Post installation activities for ASCS/ERS instances

This section describes the activity that needs to be performed after the ASCS and ERS installation is complete. Profiles are updated and the cluster resources for ASCS and ERS are created.

**1. Adapt the profiles. Perform it on FIRST node.**

- a. ASCS profile. DO it on FIRST node.

```
sudo vi /sapmnt/SGH/profile/SGH_ASCS00_sgh-ascss-ilb

# Change the restart command to a start command
#Restart_Program_00 = local ${_EN} pf=${_PF}
Start_Program_00 = local ${_EN} pf=${_PF}

# Add the following lines
service/halib = $(DIR_CT_RUN)/saphascriptco.so
service/halib_cluster_connector = /usr/bin/sap_suse_cluster_connector

# Add the keep alive parameter
enqueue/encni/set_so_keepalive = true
```

- b. ERS profile. Perform it on FIRST node.

```
sudo vi /sapmnt/SGH/profile/SGH_ERS02_sgh-ers-ilb

# Change the restart command to a start command
#Restart_Program_00 = local ${_ENQR} pf=${_PF}
Start_Program_00 = local ${_ENQR} pf=${_PF}

# Add the following lines
service/halib = $(DIR_CT_RUN)/saphascriptco.so
service/halib_cluster_connector = /usr/bin/sap_suse_cluster_connector

# remove Autostart from ERS profile
# Autostart = 1
```

2. Configure keep alive. **Perform it on BOTH the ASCS nodes.**

The communication between the SAP NetWeaver application server and the ASCS/SCS is routed through a software load balancer. The load balancer disconnects inactive connections after a configurable timeout. To prevent this you need to set a parameter in the SAP NetWeaver ASCS/SCS profile and change the Linux system settings.

```
# Change the Linux system configuration
sudo sysctl net.ipv4.tcp_keepalive_time=120
```

3. Configure SAP users. **Perform it on both the ASCS nodes.**

```
# Add sidadm to the haclient group
sudo usermod -aG haclient sghadm
```

4. Update sapservice file. **Run it on FIRST node.**

Add the ASCS service entry to the second node and copy the ERS service entry to the first node.

```
cat /usr/sap/sapservices | grep ASCS00 | sudo ssh ascsvm2 "cat >>/usr/sap/sapservices"
sudo ssh ascsvm2 "cat /usr/sap/sapservices" | grep ERS02 | sudo tee -a /usr/sap/sapservices
```

After this, you should two entries in /usr/sap/sapservices file of each ASCS cluster nodes (ascsvm1, and ascsvm2). One for ASCS00 and other for ERS02.

```
# cat /usr/sap/sapservices
#!/bin/sh
LD_LIBRARY_PATH=/usr/sap/SGH/ERS02/exe:$LD_LIBRARY_PATH; export LD_LIBRARY_PATH;
/usr/sap/SGH/ERS02/exe/sapstartsrv pf=/usr/sap/SGH/SYS/profile/SGH_ERS02_ers-lb -D -u
sghadm
LD_LIBRARY_PATH=/usr/sap/SGH/ASCS00/exe:$LD_LIBRARY_PATH; export
LD_LIBRARY_PATH; /usr/sap/SGH/ASCS00/exe/sapstartsrv
pf=/usr/sap/SGH/SYS/profile/SGH_ASCS00_ascs-lb -D -u sghadm
```

5. Create cluster resource. **Perform it on FIRST node.**

```
sudocrm configure property maintenance-mode="true"

sudocrm configure primitive rsc_sap_SGH_ASCS00 SAPIInstance operations
\$id=rsc_sap_SGH_ASCS00-operations op monitor interval=11 timeout=60 on_fail=restart
params InstanceName=SGH_ASCS00_ascs-lb
START_PROFILE="/sapmnt/SGH/profile/SGH_ASCS00_ascs-lb" AUTOMATIC_RECOVER=false
meta resource-stickiness=5000

sudocrm configure primitive rsc_sap_SGH_ERS02 SAPIInstance operations
\$id=rsc_sap_SGH_ERS02-operations op monitor interval=11 timeout=60 on_fail=restart
```

```

params InstanceName=SGH_ERS02_ers-lb
START_PROFILE="/sapmnt/SGH/profile/SGH_ERS02_ers-lb" AUTOMATIC_RECOVER=false
IS_ERS=true

sudo crm configure modgroup g-SGH_ASCS add rsc_sap_SGH_ASCS00
sudo crm configure modgroup g-SGH_ERS add rsc_sap_SGH_ERS02

sudo crm configure colocation col_sap_SGH_no_both -5000: g-SGH_ERS g-SGH_ASCS
sudo crm configure order ord_sap_SGH_first_start_ascs Optional: rsc_sap_SGH_ASCS00:start
rsc_sap_SGH_ERS02:stop symmetrical=false

sudo crm node online ascsvm1
sudo crm configure property maintenance-mode="false"

```

At this time, `crm_mon` should show like below. Cluster may perform failover of ERS group to other node at this time as both ASCS and ERS are not allowed to run on the same nodes. So please allow few minutes to let it happen. You don't need to perform the failover on your own at this time.

```

Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Wed Jun 5 18:39:59 2019
Last change: Wed Jun 5 18:35:51 2019 by root via cibadmin on ascsvm1

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm2
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm1

```

Also file system mount looks like below

| ascsvm1:/sapmnt/SGH/profile # df -kh |      |      |       |      |            |
|--------------------------------------|------|------|-------|------|------------|
| Filesystem                           | Size | Used | Avail | Use% | Mounted on |
| devtmpfs                             | 14G  | 8.0K | 14G   | 1%   | /dev       |
| tmpfs                                | 21G  | 46M  | 21G   | 1%   | /dev/shm   |

```

tmpfs      14G 75M 14G 1% /run
tmpfs      14G 0 14G 0% /sys/fs/cgroup
/dev/sda4   29G 2.6G 25G 10% /
/dev/sda3   976M 102M 824M 11% /boot
/dev/sda2   200M 140K 200M 1% /boot/efi
/dev/sdb1   55G 2.1G 51G 4% /mnt/resource
tmpfs      2.8G 0 2.8G 0% /run/user/1000
/dev/sdc1   252G 31G 221G 13% /usr/sap
tmpfs      2.8G 0 2.8G 0% /run/user/0
10.15.3.4:/usrsapSGHsys 100T 384K 100T 1% /usr/sap/SGH/SYS
10.15.3.4:/sapmntSGH 101T 647M 100T 1% /sapmnt/SGH
10.15.3.5:/transSGH 100T 320K 100T 1% /usr/sap/trans
10.15.3.4:/usrsapSGHers 101T 231M 100T 1% /usr/sap/SGH/ERS02
tmpfs      2.8G 0 2.8G 0% /run/user/1002

ascsvm2:/sapmnt/SGH/profile # df -kh
Filesystem      Size Used Avail Use% Mounted on
devtmpfs        14G 8.0K 14G 1% /dev
tmpfs          21G 61M 21G 1% /dev/shm
tmpfs          14G 51M 14G 1% /run
tmpfs          14G 0 14G 0% /sys/fs/cgroup
/dev/sda4       29G 2.5G 25G 10% /
/dev/sda3       976M 102M 824M 11% /boot
/dev/sda2       200M 140K 200M 1% /boot/efi
/dev/sdb1       55G 2.1G 51G 4% /mnt/resource
/dev/sdc1       252G 31G 221G 13% /usr/sap
tmpfs          2.8G 0 2.8G 0% /run/user/0
10.15.3.4:/usrsapSGHsys 100T 384K 100T 1% /usr/sap/SGH/SYS
10.15.3.4:/sapmntSGH 101T 647M 100T 1% /sapmnt/SGH
10.15.3.5:/transSGH 100T 320K 100T 1% /usr/sap/trans
10.15.3.4:/usrsapSGH 101T 231M 100T 1% /usr/sap/SGH/ASCS00
tmpfs          2.8G 0 2.8G 0% /run/user/1002

```

For the document consistency, we keep ASCS on node1 (ascsvm1) and ERS on node2(ascsvm2). So, if ASCS is on node2, please perform failover to keep ASCS on ascsvm1 and ERS on ascsvm2.

```
# crm resource migrate g-SGH_ASCS ascsvm1
```

After the ASCS move, here is how crm\_mon looks like.

```

Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Wed Jun 5 18:50:19 2019
Last change: Wed Jun 5 18:49:07 2019 by root via crm_resource on ascsvm1

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

```

```

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPInstance): Started ascsvm1

Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPInstance): Started ascsvm2

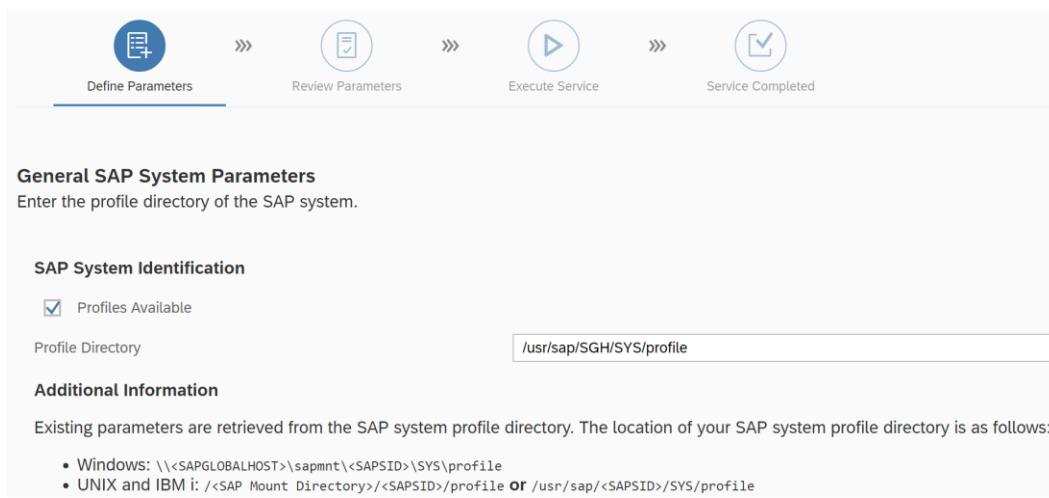
```

## 14. Database Instance Installation

Run it on first ascs node (ascsvm1). Please ensure that ASCS instance is running on the first node.

```
ascsvm1:/usr/sap/SWPM # ./sapinst SAPINST_REMOTE_ACCESS_USER=sapadmin
```

Select SAP S/4HANA Server 1809 > SAP HANA Database > Installation > High Availability System > Database Instance



**Master Password**

Enter the master password for all users.

**Master Password**

The master password is used for all users that are created. Check the tool help for restrictions and dependencies.

\*Password for All Users

\*\*\*\*\*

\*Confirm

\*\*\*\*\*

**DNS Domain Name**

Enter the DNS domain name for the SAP system to calculate the fully qualified domain name (FQDN).

**SAP System Domain Name**

Set FQDN for SAP system

DNS Domain Name for SAP System

**Database for SAP System**

Enter the database parameters.

**SAP HANA Database Tenant**

\*Database Host

db-lb

\*Instance Number of the SAP HANA Database

00

\*Database ID (DBSID)

SGH

\*Password of the Database System Administrator  
(User: SYSTEM)

\*\*\*\*\*

**System Database**

Database Host

db-lb

Instance Number of the SAP HANA Database

00

System Database Name

SystemDB

\*Password of the System Database Administrator (User:  
SYSTEM)

\*\*\*\*\*

## Search Location

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path

/usr/sap/S4H1809

## Archive Locations

This step takes 30-45 minutes to scan the directory and extract the files.

## Upgrade SAP Host Agent

Decide whether you want to upgrade the existing SAP Host Agent

### Detected SAP Host Agent

Upgrade SAP Host Agent to the version of the provided SAPHOSTAGENT.SAR archive

#### Detected Packages

|    | Package Name                     | Individual Package Location                   | Status    |
|----|----------------------------------|---|-----------|
| 1  | S4HANA1809CORE HANA DB Export 1  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_1.zip  | Available |
| 2  | S4HANA1809CORE HANA DB Export 10 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_10.zip | Available |
| 3  | S4HANA1809CORE HANA DB Export 11 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_11.zip | Available |
| 4  | S4HANA1809CORE HANA DB Export 12 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_12.zip | Available |
| 5  | S4HANA1809CORE HANA DB Export 13 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_13.zip | Available |
| 6  | S4HANA1809CORE HANA DB Export 14 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_14.zip | Available |
| 7  | S4HANA1809CORE HANA DB Export 15 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_15.zip | Available |
| 8  | S4HANA1809CORE HANA DB Export 16 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_16.zip | Available |
| 9  | S4HANA1809CORE HANA DB Export 17 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_17.zip | Available |
| 10 | S4HANA1809CORE HANA DB Export 18 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_18.zip | Available |
| 11 | S4HANA1809CORE HANA DB Export 19 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_19.zip | Available |
| 12 | S4HANA1809CORE HANA DB Export 2  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_2.zip  | Available |
| 13 | S4HANA1809CORE HANA DB Export 20 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_20.zip | Available |
| 14 | S4HANA1809CORE HANA DB Export 3  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_3.zip  | Available |
| 15 | S4HANA1809CORE HANA DB Export 4  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_4.zip  | Available |
| 16 | S4HANA1809CORE HANA DB Export 5  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_5.zip  | Available |
| 17 | S4HANA1809CORE HANA DB Export 6  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_6.zip  | Available |
| 18 | S4HANA1809CORE HANA DB Export 7  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_7.zip  | Available |
| 19 | S4HANA1809CORE HANA DB Export 8  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_8.zip  | Available |
| 20 | S4HANA1809CORE HANA DB Export 9  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_9.zip  | Available |

|    |                                 |  |           |
|----|---------------------------------|--|-----------|
| 16 | S4HANA1809CORE HANA DB Export 5 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_5.zip | Available |
| 17 | S4HANA1809CORE HANA DB Export 6 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_6.zip | Available |
| 18 | S4HANA1809CORE HANA DB Export 7 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_7.zip | Available |
| 19 | S4HANA1809CORE HANA DB Export 8 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_8.zip | Available |
| 20 | S4HANA1809CORE HANA DB Export 9 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_9.zip | Available |

**Database Schema**

|   |            |
|---|------------|
| Database ID                                   | SGH        |
| Database Host                                 | db-lb      |
| Instance Number of the SAP HANA Database      | 00         |
| Schema  | DBACOCKPIT |
| <input type="checkbox"/> Drop Existing Schema |            |
| *Schema Password                              | *****      |
| *Confirm                                      | *****      |

**Database Schema**

|   |           |
|---|-----------|
| Database ID                                   | SGH       |
| Database Host                                 | db-lb     |
| Instance Number of the SAP HANA Database      | 00        |
| Schema  | SAPHANADB |
| <input type="checkbox"/> Drop Existing Schema |           |
| *Schema Password                              | *****     |
| *Confirm                                      | *****     |

**SAP HANA Import Parameters**

Enter the import parameters.

**SAP HANA Import****Import Parameters**

|    | *Configuration File | *Section             | *Parameter Name                    | *Parameter Value                         | Keep after Import                   |
|----|---------------------|----------------------|------------------------------------|--|-------------------------------------|
| 1  | indexserver.ini     | distribution         | client_distribution_mode           | statement                                | <input checked="" type="checkbox"/> |
| 2  | global.ini          | table_placement      | method                             | 2  | <input checked="" type="checkbox"/> |
| 3  | global.ini          | table_placement      | prefix                             | /  | <input checked="" type="checkbox"/> |
| 4  | indexserver.ini     | optimize_compression | min_hours_since_last_merge_of_part | 0  | <input type="checkbox"/>            |
| 5  | indexserver.ini     | mergedog             | num_merge_token                    | 200                                      | <input type="checkbox"/>            |
| 6  | indexserver.ini     | mergedog             | token_per_table                    | 2  | <input type="checkbox"/>            |
| 7  | indexserver.ini     | mergedog             | critical_merge_decision_func       | DMS>12000 and (DUC<0.1 or 0.05*DRC>=DUC) | <input type="checkbox"/>            |
| 8  | indexserver.ini     | mergedog             | auto_merge_decision_func           | DMS>5000 and (DUC<0.1 or 0.05*DRC>=DUC)  | <input type="checkbox"/>            |
| 9  | global.ini          | persistence          | savepoint_interval_s               | 300                                      | <input type="checkbox"/>            |
| 10 | global.ini          | persistence          | log_mode                           | overwrite                                | <input type="checkbox"/>            |

Ensure you have db-lb and its IP 10.15.2.5 added to the jump box hosts file. Otherwise web browser for sapinst installation can't resolve the wsdl below.

**Installation Export Load Options**

|                                  |                                    |
|----------------------------------|------------------------------------|
| *Number of Parallel Jobs         | 19                                 |
| <b>SAP HANA Authentification</b> |                                    |
| *HANA<dbsid>adm                  | sghadm                             |
| *Password of HANA<dbsid>adm      | *****                              |
| *SAPControl WSDL URL             | http://db-lb:50013/SAPControl?wsdl |

## SAP HANA Client Software Installation Path

Decide on the client path strategy.

### Client Path Strategy

#### Client Software Path

- Local Client Directory
- Central Client Directory

#### Software Package Browser

Specify the path to a download folder containing all software packages, or the paths to media locations or to several individual download locations of software packages.

##### Search Location

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path  

##### Archive Locations

You can download the archives from the following locations on SAP Software Download Center:  
[SAP HANA CLIENT](#)

The table below is updated with all packages detected at the specified *Package Path* when you choose *Next*.

While staying on this screen you can add or adjust paths for required packages by searching other locations. When all archives are specified and you do not wish to make any further adjustments, I

##### Archive Scanning Information

An [information file](#) is written after the archives have been scanned. There you can find detailed information about matching and non matching archive files.  
 This information file contains only results of the latest archive scan.

##### Detected Packages

|   | Package Name    | Individual Package Location | Status        |
|---|-----------------|-----------------------------|---------------|
| 1 | SAP HANA CLIENT |                             | Still missing |

#### Cleanup of Operating System Users

Specify whether operating system users are to be removed from group 'sapinst' on UNIX (the group 'SAPINST' is to be removed from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

##### Limit Installation Directory Access

The `sapinst_instdir` directory belongs to a group named `sapinst`. If this group is not available, it is created automatically as a local group. For security reasons, SAP recommends that you remove operating system users from group `sapinst` on UNIX (respectively remove group `sapinst` from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

Yes, clean up operating system users

##### Operating System Users to be Cleaned Up:

|   | OS User |
|---|---------|
| 1 | sghadm  |

## Parameter List

General SAP System Parameters

Profiles Available

Profile Directory

/usr/sap/SGH/SYS/profile

Master Password

Password for All Users

\*\*\*\*\*

DNS Domain Name

Set FQDN for SAP system

Database for SAP System

Database Host

db-lb

Instance Number of the SAP HANA Database

00

Database ID (DBSID)

SGH

Password of the Database System Administrator (User: SYSTEM)

\*\*\*\*\*

SAP HANA Multitenant Database Containers

Password of the System Database Administrator (User: SYSTEM)

\*\*\*\*\*

Software Package Browser

### Detected Packages

|   | Package Name                                     | Individual Package Location               | Status    |
|---|--|---|-----------|
| 1 | SAPEXE.SAR (any version supporting your release) | /usr/sap/S4H1809/SAPEXE_28-80003386.SAR   | Available |
| 2 | SAPEXEDB.SAR (matching SAPEXE Version and Patch) | /usr/sap/S4H1809/SAPEXEDB_28-80003385.SAR | Available |

Upgrade SAP Host Agent

Upgrade SAP Host Agent to the version of the provided SAPHOSTAGENT.SAR archive

Software Package Browser

### Detected Packages

|   | Package Name                     | Individual Package Location                   | Status    |
|---|----------------------------------|---|-----------|
| 1 | S4HANA1809CORE HANA DB Export 1  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_1.zip  | Available |
| 2 | S4HANA1809CORE HANA DB Export 10 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_10.zip | Available |
| 3 | S4HANA1809CORE HANA DB Export 11 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_11.zip | Available |
| 4 | S4HANA1809CORE HANA DB Export 12 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_12.zip | Available |

|    |                                  |   |           |
|----|----------------------------------|---|-----------|
| 4  | S4HANA1809CORE HANA DB Export 12 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_12.zip | Available |
| 5  | S4HANA1809CORE HANA DB Export 13 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_13.zip | Available |
| 6  | S4HANA1809CORE HANA DB Export 14 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_14.zip | Available |
| 7  | S4HANA1809CORE HANA DB Export 15 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_15.zip | Available |
| 8  | S4HANA1809CORE HANA DB Export 16 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_16.zip | Available |
| 9  | S4HANA1809CORE HANA DB Export 17 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_17.zip | Available |
| 10 | S4HANA1809CORE HANA DB Export 18 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_18.zip | Available |
| 11 | S4HANA1809CORE HANA DB Export 19 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_19.zip | Available |
| 12 | S4HANA1809CORE HANA DB Export 2  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_2.zip  | Available |
| 13 | S4HANA1809CORE HANA DB Export 20 | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_20.zip | Available |
| 14 | S4HANA1809CORE HANA DB Export 3  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_3.zip  | Available |
| 15 | S4HANA1809CORE HANA DB Export 4  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_4.zip  | Available |
| 16 | S4HANA1809CORE HANA DB Export 5  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_5.zip  | Available |
| 17 | S4HANA1809CORE HANA DB Export 6  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_6.zip  | Available |
| 18 | S4HANA1809CORE HANA DB Export 7  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_7.zip  | Available |
| 19 | S4HANA1809CORE HANA DB Export 8  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_8.zip  | Available |
| 20 | S4HANA1809CORE HANA DB Export 9  | /usr/sap/S4H1809/S4CORE103_INST_EXPORT_9.zip  | Available |

Database Schema

Schema Password

\*\*\*\*\*

Database Schema

Schema Password

\*\*\*\*\*

SAP HANA Import Parameters

#### Import Parameters

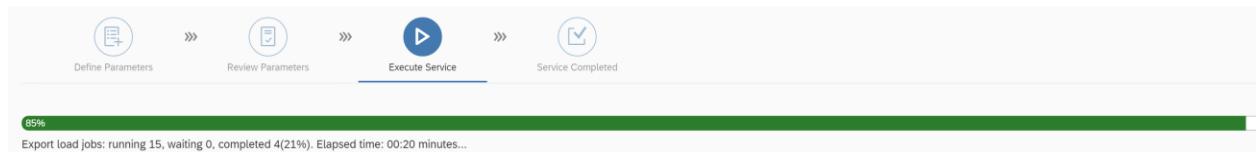
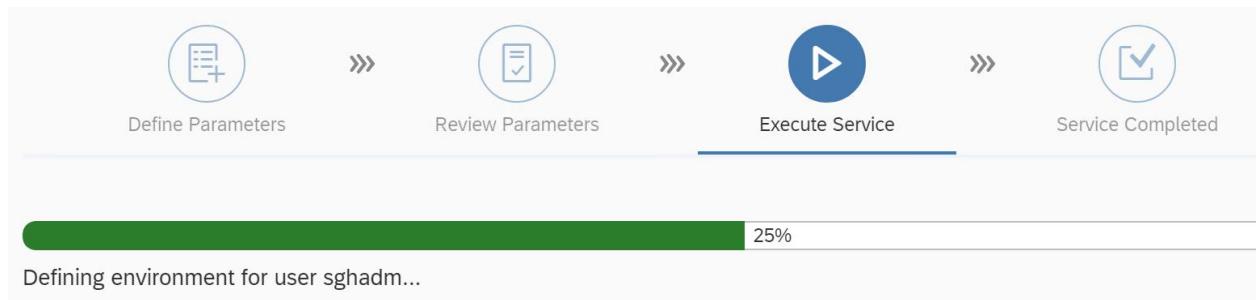
|    | Configuration File | Section              | Parameter Name                     | Parameter Value                          | Keep after Import                   |
|----|--------------------|----------------------|------------------------------------|--|-------------------------------------|
| 1  | indexserver.ini    | distribution         | client_distribution_mode           | statement                                | <input checked="" type="checkbox"/> |
| 2  | global.ini         | table_placement      | method                             | 2  | <input checked="" type="checkbox"/> |
| 3  | global.ini         | table_placement      | prefix                             | /  | <input checked="" type="checkbox"/> |
| 4  | indexserver.ini    | optimize_compression | min_hours_since_last_merge_of_part | 0  | <input type="checkbox"/>            |
| 5  | Indexserver.ini    | mergedog             | num_merge_token                    | 200                                      | <input type="checkbox"/>            |
| 6  | indexserver.ini    | mergedog             | token_per_table                    | 2  | <input type="checkbox"/>            |
| 7  | indexserver.ini    | mergedog             | critical_merge_decision_func       | DMS>12000 and (DUC<0.1 or 0.05*DRC>=DUC) | <input type="checkbox"/>            |
| 8  | indexserver.ini    | mergedog             | auto_merge_decision_func           | DMS>5000 and (DUC<0.1 or 0.05*DRC>=DUC)  | <input type="checkbox"/>            |
| 9  | global.ini         | persistence          | savepoint_interval_s               | 300                                      | <input type="checkbox"/>            |
| 10 | global.ini         | persistence          | log_mode                           | overwrite                                | <input type="checkbox"/>            |

Installation Export

Number of Parallel Jobs

19

| <input type="checkbox"/> Installation Export  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
|---|--|---|---------------|--|--------------|-----------------------------|-----------|---|--|---|---------------|---|--|---|---------------|
| Number of Parallel Jobs   | 19   |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| HANA<dbsid>adm  | sghadm   |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| Password of HANA<dbsid>adm  | *****  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| SAPControl WSDL URL   | http://hanadb-ilb:50013/SAPControl?wsdl          |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="checkbox"/> SAP HANA Client Software Installation Path   |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| Client Software Path  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input checked="" type="radio"/> Local Client Directory   |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="radio"/> Central Client Directory  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="checkbox"/> Software Package Browser   |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <b>Detected Packages</b>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <table border="1"> <thead> <tr> <th></th> <th>Package Name</th> <th>Individual Package Location</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAP HANA CLIENT</td> <td>/usr/sap/HANAClient/MDB_CLIENT20_004_126-80002082.SAR</td> <td>Available</td> </tr> </tbody> </table>  |  |   |               |  | Package Name | Individual Package Location | Status    | 1 | SAP HANA CLIENT                                  | /usr/sap/HANAClient/MDB_CLIENT20_004_126-80002082.SAR | Available     |   |  |   |               |
|   | Package Name                                     | Individual Package Location                           | Status        |  |              |                             |           |   |  |   |               |   |  |   |               |
| 1   | SAP HANA CLIENT                                  | /usr/sap/HANAClient/MDB_CLIENT20_004_126-80002082.SAR | Available     |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="checkbox"/> Cleanup of Operating System Users  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="checkbox"/> Yes, clean up operating system users   |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="checkbox"/> Media  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <b>Media</b>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <table border="1"> <thead> <tr> <th></th> <th>Medium</th> <th>Package Location</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Software Provisioning Manager</td> <td>/usr/sap/SWPM</td> <td>signed by SAP</td> </tr> </tbody> </table>  |  |   |               |  | Medium       | Package Location            | Signature | 1 | Software Provisioning Manager                    | /usr/sap/SWPM   | signed by SAP |   |  |   |               |
|   | Medium   | Package Location                                      | Signature     |  |              |                             |           |   |  |   |               |   |  |   |               |
| 1   | Software Provisioning Manager                    | /usr/sap/SWPM   | signed by SAP |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <input type="checkbox"/> Detected Packages Summary  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <br>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <b>Detected Packages</b>  |  |   |               |  |              |                             |           |   |  |   |               |   |  |   |               |
| <table border="1"> <thead> <tr> <th></th> <th>Package Name</th> <th>Package Location</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAPEXE.SAR (any version supporting your release)</td> <td>/usr/sap/S4H1809/SAPEXE_28-80003386.SAR</td> <td>signed by SAP</td> </tr> <tr> <td>2</td> <td>SAPEXEDB.SAR (matching SAPEXE Version and Patch)</td> <td>/usr/sap/S4H1809/SAPEXEDB_28-80003385.SAR</td> <td>signed by SAP</td> </tr> </tbody> </table> |  |   |               |  | Package Name | Package Location            | Signature | 1 | SAPEXE.SAR (any version supporting your release) | /usr/sap/S4H1809/SAPEXE_28-80003386.SAR               | signed by SAP | 2 | SAPEXEDB.SAR (matching SAPEXE Version and Patch) | /usr/sap/S4H1809/SAPEXEDB_28-80003385.SAR | signed by SAP |
|   | Package Name                                     | Package Location                                      | Signature     |  |              |                             |           |   |  |   |               |   |  |   |               |
| 1   | SAPEXE.SAR (any version supporting your release) | /usr/sap/S4H1809/SAPEXE_28-80003386.SAR               | signed by SAP |  |              |                             |           |   |  |   |               |   |  |   |               |
| 2   | SAPEXEDB.SAR (matching SAPEXE Version and Patch) | /usr/sap/S4H1809/SAPEXEDB_28-80003385.SAR             | signed by SAP |  |              |                             |           |   |  |   |               |   |  |   |               |



Database size in memory originally was about 26GB, after installing it is 76GB.



Execution of Service has been completed successfully.

**Information**

Execution of  
SAP S/4HANA Server 1809 > SAP HANA Database > Installation > Application Server ABAP > High-Availability System > Database Instance

It takes about 60-80 minutes.

6. Install the hana database client on ASCSVM node 2 (ascsvm2). SAPinst didn't install the client.

- Copy the HANA Client installation bits on ascsvm2
- Install the client. Before installing, create a folder hdbclient under /usr/sap/SGH. And change the ownership from root to sghadm using command

```
ascsvm2:~ # chown sghadm /usr/sap/SGH/hdbclient/
```

```
sghadm@ascsvm2:/usr/sap/HANAClientBits/SAP_HANA_CLIENT> ./hdbinst
SAP HANA Database Client installation kit detected.

SAP HANA Lifecycle Management - Client Installation 2.4.126.1551801496
*****
Enter Installation Path [/home/sghadm/sap/hdbclient]: /usr/sap/SGH/hdbclient
```

7. Update the hdbuserstore to update the user store entries

```
# on node1
ascsvm1:sghadm 66> hdbuserstore List
DATA FILE    : /home/sghadm/.hdb/ascsvm1/SSFS_HDB.DAT
KEY FILE    : /home/sghadm/.hdb/ascsvm1/SSFS_HDB.KEY

KEY DEFAULT
ENV : hanavm1:30013
USER: SAPHANADB
DATABASE: SGH
```

Change it on node1

```
ascsvm1:sghadm 68> hdbuserstore SET DEFAULT hanadb-ilb30013@SGH SAPHANADB
<Password>
ascsvm1:sghadm 69> hdbuserstore List
DATA FILE    : /home/sghadm/.hdb/ascsvm1/SSFS_HDB.DAT
```

```

KEY FILE    : /home/sghadm/.hdb/ascsvm1/SSFS_HDB.KEY

KEY DEFAULT
ENV : hanadb-ilb30013
USER: SAPHANADB
DATABASE: SGH

```

8. Create userstore entries on ascsvm node2

```

ascsvm2:sghadm 64> hdbuserstore list
DATA FILE    : /home/sghadm/.hdb/ascsvm2/SSFS_HDB.DAT

```

Add an entry

```

ascsvm2:sghadm 65> hdbuserstore SET DEFAULT hanadb-ilb30013@SGH SAPHANADB
<Password>

ascsvm2:sghadm 66> hdbuserstore list
DATA FILE    : /home/sghadm/.hdb/ascsvm2/SSFS_HDB.DAT
KEY FILE    : /home/sghadm/.hdb/ascsvm2/SSFS_HDB.KEY

KEY DEFAULT
ENV : hanadb-ilb30013
USER: SAPHANADB
DATABASE: SGH

```

## 15. Primary Application Server Installation (PAS)

9. Partition the disk (256GB we added to the VM) with mount point name /usr/sap using yast. Use Ext4 file system.
10. Update the OS.

```
#Zypper update
```

11. Copy the SWPM to the PAS application server (pasvm1) from ascsvm1 server

```
scp -r /usr/sap/SWPM pasvm1:/usr/sap/SWPM
```

12. Prepare the PAS server for application server installation

- Configure operating system to reduce dirty cache size.

```

sudo vi /etc/sysctl.conf

# Change/set the following settings
vm.dirty_bytes = 629145600
vm.dirty_background_bytes = 314572800

```

- Setup hostname resolution

```

# load balancers
10.15.1.5      ascs-lb
10.15.1.50     ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1

```

c. Create sapmnt directory

```

sudo mkdir -p /sapmnt/SGH
sudo mkdir -p /usr/sap/trans

sudo chattr +i /sapmnt/SGH
sudo chattr +i /usr/sap/trans

```

d. Configure autofs

```

sudo vi /etc/auto.master

# Add the following line to the file, save and exit
+auto.master
/- /etc/auto.direct

```

Create a file auto.direct

```

sudo vi /etc/auto.direct

# Add the following lines to the file, save and exit
/sapmnt/SGH -nfsvers=3,nobind,sync 10.15.3.4:/sapmntSGH
/usr/sap/trans -nfsvers=3,nobind,sync 10.15.3.5:/transSGH

```

Restart autofs to mount the new shares

```

sudo systemctl enable autofs
sudo service autofs restart

```

e. Configure SWAP file

```
sudo vi /etc/waagent.conf

# Set the property ResourceDisk.EnableSwap to y
# Create and use swapfile on resource disk.
ResourceDisk.EnableSwap=y

# Set the size of the SWAP file with property ResourceDisk.SwapSizeMB
# The free space of resource disk varies by virtual machine size. Make sure that you
do not set a value that is too big. You can check the SWAP space with command
swapon
# Size of the swapfile.
ResourceDisk.SwapSizeMB=2000
```

Restart the agent

```
sudo service waagent restart
```

13. Install the SAP PAS Instance

Ensure that user sapadmin is already created on pasvm1 server.

```
pasvm1:~ # useradd -m sapadmin
pasvm1:~ # passwd sapadmin
New password:
Retype new password:
passwd: password updated successfully
```

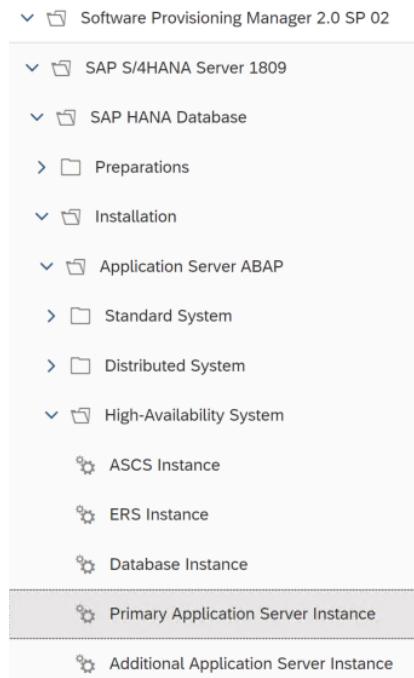
```
#pasvm1:/usr/sap/SWPM # ./sapinst SAPINST_REMOTE_ACCESS_USER=sapadmin
```

Open your browser and paste the following URL address to access the GUI

<https://pasvm1:4237/sapinst/docs/index.html>

Logon users: [sapadmin]

Select SAP S/4HANA Server 1809 > SAP HANA Database > Installation > High Availability > Primary application server Instance



### Parameter Settings

Choose whether you want to run the installation in a typical or a custom mode.

#### Parameter Settings

Parameter Mode

- Typical
- Custom

#### General SAP System Parameters

Enter the profile directory of the SAP system.

#### SAP System Identification

Profile Directory

/sapmnt/SGH/profile

#### ABAP Message Server

Provide the ABAP message server port

#### Connection to Message Server

Message Server Port

3600

**Master Password**

Enter the master password for all users.

**Master Password**

The master password is used for all users that are created. Check the tool help for restrictions and dependencies.

\*Password for All Users

\*\*\*\*\*

\*Confirm

\*\*\*\*\*

**Operating System Users**

Enter the account parameters.

**SAP System Administrator**

Account: *sghadm*

\*Password of SAP System Administrator

\*\*\*\*\*

\*Confirm

\*\*\*\*\*

User ID

1002

Group ID of sapsys

1001

Login Shell

/bin/csh

Home Directory

**DNS Domain Name**

Enter the DNS domain name for the SAP system to calculate the fully qualified domain name (FQDN).

**SAP System Domain Name**

Set FQDN for SAP system

DNS Domain Name for SAP System

**Software Package Browser**

Specify the path to a download folder containing all software packages, or the paths to media locations or to several individual download locations of software packages.

**Search Location**

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path

/usr/sap/S4H18094APPInst



**Detected Packages**

|   | Package Name                                     | Individual Package Location                        | Status    |
|---|--|--|-----------|
| 1 | SAPEXE.SAR (any version supporting your release) | /usr/sap/S4H18094APPInst/SAPEXE_28-80003386.SAR    | Available |
| 2 | SAPEXEDB.SAR (matching SAPEXE Version and Patch) | /usr/sap/S4H18094APPInst/SAPEXEDB_28-80003385.SAR  | Available |
| 3 | IGSEXE.SAR                                       | /usr/sap/S4H18094APPInst/igsexe_8-80003187.sar     | Available |
| 4 | IGSHELPER.SAR                                    | /usr/sap/S4H18094APPInst/igshelper_17-10010245.sar | Available |

**Software Package Browser**

Specify the path to a download folder containing all software packages, or the paths to media locations or to several individual download locations of software packages.

**Search Location**

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path

/usr/sap/S4H18094APPInst

**Detected Packages**

|   | Package Name                        | Individual Package Location | Status        |
|---|-------------------------------------|-----------------------------|---------------|
| 1 | SAPHOSTAGENT.SAR 721 (Latest Patch) |                             | Still missing |

**Detected Packages**

|   | Package Name                        | Individual Package Location                             | Status    |
|---|-------------------------------------|---|-----------|
| 1 | SAPHOSTAGENT.SAR 721 (Latest Patch) | /usr/sap/S4H18094APPInst/SAPHOSTAGENT41_41-20009394.SAF | Available |

**SAP System Administrator**

Enter the password of the SAP system administrator.

**SAP System Administrator**Account: *sapadm*

\*Password of SAP System Administrator

\*\*\*\*\*

\*Confirm

\*\*\*\*\*

User ID

Group ID of sapsys

1001

**SAP HANA Client Software Installation Path**

Decide on the client path strategy.

**Client Path Strategy**

Client Software Path

 Local Client Directory

 Central Client Directory

**SAP HANA Database System Administrator Password**

|  |  |
|--|--|
| Database ID  | <input type="text" value="SGH"/>       |
| Database Host  | <input type="text" value="db-lb"/>     |
| *Instance Number of the SAP HANA Database                        | <input type="text" value="00"/>        |
| *Password of the Database System Administrator<br>(User: SYSTEM) | <input type="password" value="*****"/> |
| <input type="checkbox"/> Initialize Database Tenant              |  |

**System Database**

|   |  |
|---|--|
| Database ID (DBSID)                               | <input type="text" value="SYSTEMDB"/>  |
| *Database Host                                    | <input type="text" value="db-lb"/>     |
| *Instance Number of the SAP HANA Database         | <input type="text" value="00"/>        |
| *Password of the SAP HANA Database Superuser      | <input type="password" value="*****"/> |
| <b>Tenant Database</b>                            |  |
| Tenant ID   | <input type="text" value="SGH"/>       |
| <input type="checkbox"/> Recreate Database Tenant |  |

**Database Schema**

|   |   |
|---|---|
| Database ID                                   | <input type="text" value="SGH"/>        |
| Database Host                                 | <input type="text" value="db-lb"/>      |
| Instance Number of the SAP HANA Database      | <input type="text" value="00"/>         |
| Schema  | <input type="text" value="DBACOCKPIT"/> |
| <input type="checkbox"/> Drop Existing Schema |   |
| *Schema Password                              | <input type="password" value="*****"/>  |
| *Confirm                                      | <input type="password" value="*****"/>  |

**Database Schema**

|   |           |
|---|-----------|
| Database ID                                   | SGH       |
| Database Host                                 | db-lb     |
| Instance Number of the SAP HANA Database      | 00        |
| Schema  | SAPHANADB |
| <input type="checkbox"/> Drop Existing Schema |           |
| *Schema Password                              | *****     |
| *Confirm                                      | *****     |

**Software Package Browser**

Specify the path to a download folder containing all software packages, or the paths to media locations or to several individual download locations of software packages.

**Search Location**

Specify the path to an archive, a download folder or a media location as *Package Path*.

|                   |                          |                                    |
|-------------------|--------------------------|------------------------------------|
| Package Path      | /usr/sap/S4H18094APPInst | <input type="button" value="..."/> |
| Archive Locations |                          |                                    |

**Detected Packages**

|   | Package Name    | Individual Package Location | Status        |
|---|-----------------|-----------------------------|---------------|
| 1 | SAP HANA CLIENT |                             | Still missing |

**Detected Packages**

|   | Package Name    | Individual Package Location                              | Status    |
|---|-----------------|--|-----------|
| 1 | SAP HANA CLIENT | /usr/sap/S4H18094APPInst/IMDB_CLIENT20_004_126-80002082. | Available |

**Primary Application Server Instance**

Enter the instance parameters for the primary application server (PAS) instance.

**Primary Application Server Instance**

The following SAP system instances already exist on this host:

|                         |               |
|-------------------------|---------------|
| SAP System ID (SAPSID)  | Instance Name |
|                         |               |
| *PAS Instance Number    | 10            |
| *PAS Instance Host Name | pasvm1        |

**ABAP Message Server Ports**

Enter the required message server ports.

**ABAP Message Server Ports**

\*ABAP Message Server Port

3600

\*Internal ABAP Message Server Port

3900

**ICM User Management for the SAP Web Dispatcher**

Enter the password for the web administration user'webadm'used by the SAP Web Dispatcher.

**Internet Communication Manager (ICM) User Management**

\*Password of 'webadm'

.....

\*Confirm

.....

**SLD Destination for the SAP System OS Level**

Enter the destination of the System Landscape Directory (SLD).

**Register in System Landscape Directory**

SLD Destination

- Use existing SLD for registration
- No SLD destination

**Message Server Access Control List**

Specify if you want to have a message server Access Control List (ACL) created.

**Message Server Access Control List**

- Create Message Server Access Control List
- Do not create Message Server Access Control List

## SAP System DDIC Users

Enter the password of DDIC user.

### DDIC User

DDIC User Has a Password Different From Default

### DDIC Password

Account: *DDIC*, client *000*

Password of DDIC in Client 000

## Secure Storage Key Generation

Decide whether you want to generate an individual key for the secure storage of the SAP system.

### Secure Storage Individual Key Information

Individual Key (Recommended for Productive Systems)

Default Key

### Cleanup of Operating System Users

Specify whether operating system users are to be removed from group `sapinst` on UNIX (the group `SAPINST` is to be removed from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

#### Limit Installation Directory Access

The `sapinst_instdir` directory belongs to a group named `sapinst`. If this group is not available, it is created automatically as a local group. For security reasons, SAP recommends that you remove operating system users from group `sapinst` on UNIX (respectively remove group `SAPINST` from the operating system users on IBM i) after the execution of Software Provisioning Manager has completed.

Yes, clean up operating system users

#### Operating System Users to be Cleaned Up:

|   | OS User |
|---|---------|
| 1 | sghadm  |

### Parameter Summary

Choose 'Next' to start with the values shown. Otherwise, select the parameters through other screens that have so far been processed.

#### Parameter List

Parameter Settings

##### Parameter Mode

Typical

Custom

General SAP System Parameters

##### Profile Directory

/sapmnt/SGH/profile

ABAP Message Server

##### Message Server Port

3600



Define Parameters



Review Parameters



Execute Service



Service Completed

23%



Define Parameters



Review Parameters



Execute Service



Service Completed

100%

Execution of Service has been completed successfully.

It takes about 15minutes

#### 14. Create the hdbuserstore on PAS VM pasvm1

```
# current status
pasvm1:sghadm 61> hdbuserstore List
DATA FILE    : /home/sghadm/.hdb/pasvm1/SSFS_HDB.DAT
KEY FILE    : /home/sghadm/.hdb/pasvm1/SSFS_HDB.KEY
```

KEY DEFAULT  
**ENV : hanavm1:30013**  
 USER: SAPHANADB  
 DATABASE: SGH

```
# execute the following

pasvm1:sghadm 66> hdbuserstore SET DEFAULT hanadb-ilb:30013@SGH SAPHANADB
<Password>

pasvm1:sghadm 67> hdbuserstore List
DATA FILE    : /home/sghadm/.hdb/pasvm1/SSFS_HDB.DAT
KEY FILE     : /home/sghadm/.hdb/pasvm1/SSFS_HDB.KEY

KEY DEFAULT
ENV : hanadb-ilb:30013
USER: SAPHANADB
DATABASE: SGH
```

## 16. Additional Application Server Installation (AAS)

1. Partition the disk (256GB we added to the VM) with mount point name /usr/sap using yast. Use Ext4 file system.
2. Update the OS.

```
#Zypper update
```

3. Copy the SWPM to the AAS application server (aasvm1) from ascsvm1 server

```
scp -r /usr/sap/SWPM pasvm1:/usr/sap/SWPM
```

4. Prepare the AAS server for application server installation
  - a. Configure operating system to reduce dirty cache size.

```
sudo vi /etc/sysctl.conf

# Change/set the following settings
vm.dirty_bytes = 629145600
vm.dirty_background_bytes = 314572800
```

- b. Setup hostname resolution

```
#update /etc/hosts
vi /etc/hosts

# load balancers
10.15.1.5      ascsv-lb
```

```

10.15.1.50      ers-lb
10.15.2.5      db-lb
# ascs nodes
10.15.1.6      ascsvm1
10.15.1.7      ascsvm2
# database nodes
10.15.2.6      hanavm1
10.15.2.7      hanavm2
# iscsi nodes
10.15.1.11     iscsivm1
10.15.1.12     iscsivm2
10.15.1.13     iscsivm3
# jump box
10.15.1.20     jbvm1
# application nodes
10.15.1.8      pasvm1
10.15.1.9      aasvm1

```

c. Create sapmnt directory

```

sudo mkdir -p /sapmnt/SGH
sudo mkdir -p /usr/sap/trans

sudo chattr +i /sapmnt/SGH
sudo chattr +i /usr/sap/trans

```

d. Configure autofs

```

sudo vi /etc/auto.master

# Add the following line to the file, save and exit
+auto.master
/- /etc/auto.direct

```

Create a file auto.direct

```

sudo vi /etc/auto.direct

# Add the following lines to the file, save and exit
/sapmnt/SGH -nfsvers=3,nobind,sync 10.15.3.4:/sapmntSGH
/usr/sap/trans -nfsvers=3,nobind,sync 10.15.3.5:/transSGH

```

Restart autofs to mount the new shares

```

sudo systemctl enable autofs
sudo service autofs restart

```

e. Configure SWAP file

```

sudo vi /etc/waagent.conf

# Set the property ResourceDisk.EnableSwap to y
# Create and use swapfile on resource disk.
ResourceDisk.EnableSwap=y

# Set the size of the SWAP file with property ResourceDisk.SwapSizeMB
# The free space of resource disk varies by virtual machine size. Make sure that you
do not set a value that is too big. You can check the SWAP space with command
swapon
# Size of the swapfile.
ResourceDisk.SwapSizeMB=2000

```

Restart the agent

```
sudo service waagent restart
```

## 5. Install the SAP AAS Instance

Ensure that user sapadmin is already created on aasvm1 server.

```

aasvm1:~ # useradd -m sapadmin
aasvm1:~ # passwd sapadmin
New password:
Retype new password:
aasswd: password updated successfully

```

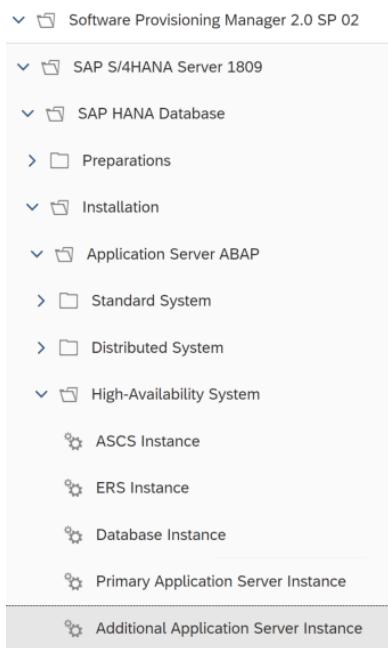
```
#aasvm1:/usr/sap/SWPM # ./sapinst SAPINST_REMOTE_ACCESS_USER=sapadmin
```

Open your browser and paste the following URL address to access the GUI

<https://aasvm1:4237/sapinst/docs/index.html>

Logon users: [sapadmin]

Select SAP S/4HANA Server 1809 > SAP HANA Database > Installation > High Availability > Additional application server Instance



## General SAP System Parameters

Enter the profile directory of the SAP system.

### SAP System Identification

Profile Directory

/sapmnt/SGH/profile

If you get error that directory does not exist, please ensure that mount from autofs is available on the server. Most common reason is format error when you copy from word to the vi editor. To correct, type manually to the vi editor.

## ABAP Message Server

Provide the ABAP message server port

### Connection to Message Server

Message Server Port

3600

**Master Password**

Enter the master password for all users.

**Master Password**

The master password is used for all users that are created. Check the tool help for restrictions and dependencies.

\*Password for All Users

\*Confirm

**SAP System Administrator**

Enter the password of the SAP system administrator.

**SAP System Administrator**

Account: *sghadm*

\*Password of SAP System Administrator

\*Confirm

User ID

Group ID of sapsys

**Search Location**

Specify the path to an archive, a download folder or a media location as *Package Path*.

Package Path

**Archive Locations**

You can download the archives from the following locations on SAP Software Download Center:

[SAPHOSTAGENT.SAR 721 \(Latest Patch\)](#)

**SAP System Administrator**

Enter the password of the SAP system administrator.

**SAP System Administrator**

Account: *sapadm*

\*Password of SAP System Administrator

\*Confirm

User ID

Group ID of sapsys

| Detected Packages |                 |  |
|-------------------|-----------------|--|
|                   | Package Name    | Individual Package Location                            |
| 1                 | SAP HANA CLIENT | /usr/sap/HANAClient/IMDB_CLIENT20_004_126-80002082.SAR |
|                   |                 | Status   |
|                   |                 | Available  |

**Additional Application Server Instance**

Enter the required parameters for the additional application server (AAS) instance.

**Additional Application Server Instance**

The following SAP system instances already exist on this host:

|                         |        |
|-------------------------|--------|
| SAP System ID (SAPSID)  |        |
| *AAS Instance Number    | 11     |
| *AAS Instance Host Name | aasvm1 |

**Message Server Access Control List**

Specify if you want to have a message server Access Control List (ACL) created.

**Message Server Access Control List**

- Create Message Server Access Control List
- Do not create Message Server Access Control List

**Cleanup of Operating System Users**

Specify whether operating system users are to be removed from group'sapinst' on UNIX (the group'SAPINST' is to be removed if it exists).

**Limit Installation Directory Access**

The `sapinst_instdir` directory belongs to a group named `sapinst`. If this group is not available, it is created automatically as a result of execution of Software Provisioning Manager has completed.

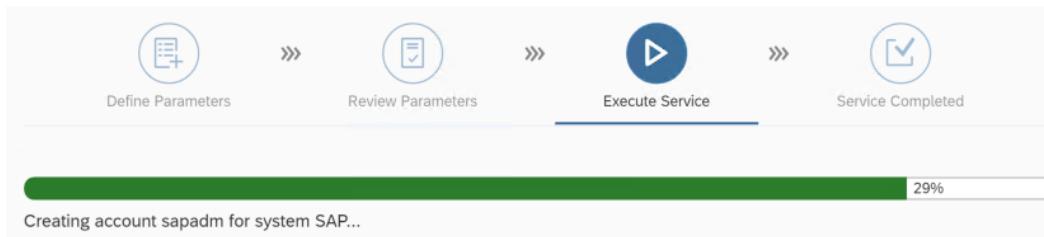
- Yes, clean up operating system users

**Operating System Users to be Cleaned Up:**

|   | OS User |
|---|---------|
| 1 | sghadm  |

**Parameter Summary**  
Choose 'Next' to start with the values shown. Otherwise, select the parameters to be changed and choose 'Revise'. You are then taken to the screen where you can change

| Parameter List  |   |
|---|---|
| <input type="checkbox"/> General SAP System Parameters            |   |
| Profile Directory   | /sapmnt/SGH/profile                             |
| <input type="checkbox"/> ABAP Message Server                      |   |
| Message Server Port   | 3600  |
| <input type="checkbox"/> Master Password                          |   |
| Password for All Users  | *****   |
| <input type="checkbox"/> SAP System Administrator                 |   |
| Password of SAP System Administrator                              | *****   |
| <input type="checkbox"/> Software Package Browser                 |   |
| Detected Packages   |   |
| Package Name  | Individual Package Location                     |
| 1 SAPHOSTAGENT.SAR 721 (Latest Patch)                             | /usr/sap/S4H1809/SAPHOSTAGENT41_41-20009394.SAR |
| <input type="checkbox"/> SAP System Administrator                 |   |
| Password of SAP System Administrator                              | *****   |
| User ID   |   |
| <input type="checkbox"/> SAP HANA Database System Administrator   |   |
| Instance Number of the SAP HANA Database                          | 00  |
| Password of the Database System Administrator (User: SYSTEM)      | *****   |
| <input type="checkbox"/> SAP HANA Multitenant Database Containers |   |
| Database Host   | hanadb-ib                                       |



This takes about 5minutes to install.

## 17. Test cases

### Validate the HA config

```
ascsvm1:sghadm 99> sapcontrol -nr 00 -function HAGetFailoverConfig
```

14.05.2019 20:53:23

HAGetFailoverConfig

OK

HAActive: TRUE

HAProductVersion: SUSE Linux Enterprise Server for SAP Applications 12 SP3

HASAPInterfaceVersion: SUSE Linux Enterprise Server for SAP Applications 12 SP3  
 (sap\_suse\_cluster\_connector 3.1.0)  
 HA Documentation: <https://www.suse.com/products/sles-for-sap/resource-library/sap-best-practices/>  
 HAAActiveNode: ascsvm1  
 HANodes: ascsvm1, ascsvm2

```
ascsvm2:sghadm 13> sapcontrol -nr 00 -function HACheckConfig
```

06.06.2019 17:16:01  
 HACheckConfig  
 OK  
 state, category, description, comment  
 SUCCESS, SAP CONFIGURATION, Redundant ABAP instance configuration, 2 ABAP instances detected  
 SUCCESS, SAP CONFIGURATION, Enqueue separation, All Enqueue server separated from application server  
 SUCCESS, SAP CONFIGURATION, MessageServer separation, All MessageServer separated from application server  
 SUCCESS, SAP CONFIGURATION, ABAP instances on multiple hosts, ABAP instances on multiple hosts detected  
 SUCCESS, SAP CONFIGURATION, Redundant ABAP SPOOL service configuration, 2 ABAP instances with SPOOL service detected  
 SUCCESS, SAP STATE, Redundant ABAP SPOOL service state, 2 ABAP instances with active SPOOL service detected  
 SUCCESS, SAP STATE, ABAP instances with ABAP SPOOL service on multiple hosts, ABAP instances with active ABAP SPOOL service on multiple hosts detected  
 SUCCESS, SAP CONFIGURATION, Redundant ABAP BATCH service configuration, 2 ABAP instances with BATCH service detected  
 SUCCESS, SAP STATE, Redundant ABAP BATCH service state, 2 ABAP instances with active BATCH service detected  
 SUCCESS, SAP STATE, ABAP instances with ABAP BATCH service on multiple hosts, ABAP instances with active ABAP BATCH service on multiple hosts detected  
 SUCCESS, SAP CONFIGURATION, Redundant ABAP DIALOG service configuration, 2 ABAP instances with DIALOG service detected  
 SUCCESS, SAP STATE, Redundant ABAP DIALOG service state, 2 ABAP instances with active DIALOG service detected  
 SUCCESS, SAP STATE, ABAP instances with ABAP DIALOG service on multiple hosts, ABAP instances with active ABAP DIALOG service on multiple hosts detected  
 SUCCESS, SAP CONFIGURATION, Redundant ABAP UPDATE service configuration, 2 ABAP instances with UPDATE service detected  
 SUCCESS, SAP STATE, Redundant ABAP UPDATE service state, 2 ABAP instances with active UPDATE service detected  
 SUCCESS, SAP STATE, ABAP instances with ABAP UPDATE service on multiple hosts, ABAP instances with active ABAP UPDATE service on multiple hosts detected  
 SUCCESS, SAP STATE, SCS instance running, SCS instance status ok  
 SUCCESS, SAP CONFIGURATION, SAPInstance RA sufficient version (ascsv-lb\_SGH\_00), SAPInstance includes is-ers patch  
 SUCCESS, SAP CONFIGURATION, Enqueue replication (ascsv-lb\_SGH\_00), Enqueue replication enabled  
 SUCCESS, SAP STATE, Enqueue replication state (ascsv-lb\_SGH\_00), Enqueue replication active

SUCCESS, SAP CONFIGURATION, SAPInstance RA sufficient version (ers-lb\_SGH\_02), SAPInstance includes is-ers patch

```
ascsvm2:sghadm 13> sapcontrol -nr 00 -function HACheckFailoverConfig
```

06.06.2019 17:16:54

HACheckFailoverConfig

OK

state, category, description, comment

SUCCESS, SAP CONFIGURATION, SAPInstance RA sufficient version, SAPInstance includes is-ers patch  
ascsvm2:sghadm 14>

### Test: Failover ASCS manually

Takes about 1 minute 4 seconds to bring ASCS online on other node and ERS on to the other node,

```
#crm resource migrate rsc_sap_SGH_ASCS00 force
```

## Before failover

Stack: corosync

Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum

Last updated: Thu Jun 6 17:18:52 2019

Last change: Wed Jun 5 23:58:10 2019 by hacluster via crm\_resource on ascsvm1

2 nodes configured

9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm2

Resource Group: g-SGH\_ASCS

fs\_SGH\_ASCS (ocf::heartbeat:Filesystem): Started ascsvm2

nc\_SGH\_ASCS (ocf::heartbeat:anything): Started ascsvm2

vip\_SGH\_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm2

rsc\_sap\_SGH\_ASCS00 (ocf::heartbeat:SAPInstance): Started ascsvm2

Resource Group: g-SGH\_ERS

fs\_SGH\_ERS (ocf::heartbeat:Filesystem): Started ascsvm1

nc\_SGH\_ERS (ocf::heartbeat:anything): Started ascsvm1

vip\_SGH\_ERS (ocf::heartbeat:IPaddr2): Started ascsvm1

rsc\_sap\_SGH\_ERS02 (ocf::heartbeat:SAPInstance): Started ascsvm1

## After the failover

Stack: corosync

Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum

Last updated: Thu Jun 6 17:20:53 2019

```
Last change: Thu Jun 6 17:19:53 2019 by root via crm_resource on ascsvm1
```

2 nodes configured

9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

```
stonith-sbd (stonith:external/sbd): Started ascsvm2
```

Resource Group: g-SGH\_ASCS

```
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm1
```

Resource Group: g-SGH\_ERS

```
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIInstance): Started ascsvm2
```

Perform unmigrate and clean up of the resources.

```
#crm resource unmigrate rsc_sap_SGH_ASCS00
#crm resource cleanup rsc_sap_SGH_ERS02
```

Note: You may need to “unmigrate” and/or “cleanup” the resource/resourcegroup if instance does not come up.

Test: ASCS Node crash

Run the command where ASCS is currently running. This test takes about 3 minutes

**# Before the crash of node1**

Stack: corosync

Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum

Last updated: Thu Jun 6 18:05:48 2019

Last change: Thu Jun 6 18:05:45 2019 by hacluster via crmd on ascsvm2

2 nodes configured

9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

```

stonith-sbd (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm2

```

Crash the node1 thru crashkernel

```
ascsvm1:/ # echo b > /proc/sysrq-trigger
```

```

#After the node1 crash, crm_mon status
Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun  6 18:14:12 2019
Last change: Thu Jun  6 18:05:45 2019 by hacluster via crmd on ascsvm2

2 nodes configured
9 resources configured

Online: [ ascsvm2 ]
OFFLINE: [ ascsvm1 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm2
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm2

```

At this time, pacemaker service on node1 is disabled

```
ascsvm1:~ # systemctl status pacemaker
```

- pacemaker.service - Pacemaker High Availability Cluster Manager  
Loaded: loaded (/usr/lib/systemd/system/pacemaker.service; enabled; vendor preset: disabled)

Let's start the pacemaker service on node1 to bring both the nodes to cluster.

```
ascsvm1:~ # systemctl start pacemaker
```

Now, both the nodes are online; and ASCS and ERS resources are already split between them.

```
ascsvm1:~ # crm_mon
Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun  6 18:20:23 2019
Last change: Thu Jun  6 18:05:45 2019 by hacluster via crmd on ascsvm2

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd  (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS  (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ASCS  (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ASCS  (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm2
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ERS  (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm1
```

Test: Manual restart of ASCS instance

```
## Before the test
Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun  6 19:04:02 2019
Last change: Thu Jun  6 18:05:45 2019 by hacluster via crmd on ascsvm2

2 nodes configured
```

```
9 resources configured
```

```
Online: [ ascsvm1 ascsvm2 ]
```

Active resources:

```
stonith-sbd  (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS    (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ASCS    (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ASCS   (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPInstance): Started ascsvm2
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPInstance): Started ascsvm1
```

Shutdown the ASCS instance. It takes about 1 minute.

```
ascsvm2:sghadm 52> sapcontrol -nr 00 -function Stop
```

Now start the ASCS instance, and SM12 lock should stay intact. This proves that ERS is working.

```
ascsvm2:sghadm 52> sapcontrol -nr 00 -function Start
```

Test: Reboot Primary Server (ASCS running)

```
## Before the test
ascsvm1:~ # crm_mon
Stack: corosync
Current DC: ascsvm2 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun  6 19:17:03 2019
Last change: Thu Jun  6 19:10:54 2019 by sghadm via cibadmin on ascsvm2
```

2 nodes configured

9 resources configured

```
Online: [ ascsvm1 ascsvm2 ]
```

Active resources:

```
stonith-sbd  (stonith:external/sbd): Started ascsvm2
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS    (ocf::heartbeat:Filesystem): Started ascsvm2
```

```

nc_SGH_ASCS    (ocf::heartbeat:anything): Started ascsvm2
vip_SGH_ASCS   (ocf::heartbeat:IPaddr2): Started ascsvm2
rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm2
Resource Group: g-SGH_ERS
fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
vip_SGH_ERS   (ocf::heartbeat:IPaddr2): Started ascsvm1
rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm1

```

Rebooting the node where ASCS is running. i.e. ascsvm2

```
# shutdown -r now
```

After node (previous asc node ascsvm2) comes online, here is the status of cluster

```

Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 19:21:29 2019
Last change: Thu Jun 6 19:10:54 2019 by sghadm via cibadmin on ascsvm2

2 nodes configured
9 resources configured

Online: [ ascsvm1 ]
OFFLINE: [ ascsvm2 ]

Active resources:
```

```

stonith-sbd  (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
fs_SGH_ASCS    (ocf::heartbeat:Filesystem): Started ascsvm1
nc_SGH_ASCS   (ocf::heartbeat:anything): Started ascsvm1
vip_SGH_ASCS   (ocf::heartbeat:IPaddr2): Started ascsvm1
rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm1
Resource Group: g-SGH_ERS
fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
vip_SGH_ERS   (ocf::heartbeat:IPaddr2): Started ascsvm1
rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm1

```

Note: With the new version of ENSA2, the ASCS instance can be started on the same host. There is no longer a need to follow the ERS instance. The ASCS instance receives the enqueue lock table over the network from the ERS instance. If no other node is available, the ASCS instance will be started on the same host where the ERS instance is running. Refer more: [https://www.suse.com/documentation/suse-best-practices/singlehtml/SAP\\_S4HA10\\_SetupGuide/SAP\\_S4HA10\\_SetupGuide.html](https://www.suse.com/documentation/suse-best-practices/singlehtml/SAP_S4HA10_SetupGuide/SAP_S4HA10_SetupGuide.html)

Pacemaker on ascsvm2 was down

```
ascsvm2:~ # systemctl status pacemaker
● pacemaker.service - Pacemaker High Availability Cluster Manager
  Loaded: loaded (/usr/lib/systemd/system/pacemaker.service; enabled; vendor preset: disabled)
```

Start the pacemaker on ascsvm2

```
# systemctl start pacemaker
```

After pacemaker service is started on ascsvm2, ERS instance fails over to ascsvm2.

```
## After pacemaker service was started on ascsvm2
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 21:01:11 2019
Last change: Thu Jun 6 19:10:54 2019 by sghadm via cibadmin on ascsvm2

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIInstance): Started ascsvm2
```

Test: Reboot ERS node

```
## Before the test
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 21:01:11 2019
Last change: Thu Jun 6 19:10:54 2019 by sghadm via cibadmin on ascsvm2
```

2 nodes configured  
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

```
stonith-sbd  (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS  (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS  (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS  (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS  (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIInstance): Started ascsvm2
```

Reboot the ERS node (ascsvm2)

ascsvm2:~ # shutdown -r now

Cluster status

```
ascsvm1:~ # crm_mon
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 21:09:43 2019
Last change: Thu Jun 6 19:10:54 2019 by sghadm via cibadmin on ascsvm2
```

2 nodes configured  
9 resources configured

Online: [ ascsvm1 ]

**OFFLINE: [ ascsvm2 ]**

Active resources:

```
stonith-sbd  (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS  (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS  (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS  (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
```

```
nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm1
rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm1
```

Start the pacemaker on ascsvm2

```
ascsvm2:~ # systemctl start pacemaker
```

As soon as you start pacemaker service, ERS group fails over to that node.

```
## After pacemaker is up on ascsvm2
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 21:42:42 2019
Last change: Thu Jun 6 19:10:54 2019 by sghadm via cibadmin on ascsvm2
```

2 nodes configured

9 resources configured

```
Online: [ ascsvm1 ascsvm2 ]
```

Active resources:

```
stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm2
```

Test: Reboot both the ASCS nodes (ascsvm1, ascsvm2)

Rebooted both the nodes at the same time

```
ascsvm1#shutdown -r now
ascsvm2#shutdown -r now
```

When both the nodes came online

Node1 (ascsvm1) had pacemaker service started, but node2 (ascsvm2) had pacemaker service inactive.

```
#cluster status on node1
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition WITHOUT quorum
Last updated: Thu Jun 6 21:51:07 2019
Last change: Thu Jun 6 21:45:04 2019 by sghadm via cibadmin on ascsvm2

2 nodes configured
9 resources configured

Node ascsvm2: UNCLEAN (offline)
Online: [ ascsvm1 ]

No active resources
```

Cleaned the node 2 and then started the pacemaker service there. ACSC and ERS came online automatically.

```
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 21:58:17 2019
Last change: Thu Jun 6 21:57:32 2019 by hacluster via crm_resource on ascsvm1

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm2
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIInstance): Started ascsvm1
```

## Test: Kill message server

```
## Before the test
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 22:02:19 2019
Last change: Thu Jun 6 21:57:48 2019 by hacluster via crmd on ascsvm1

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIstance): Started ascsvm2
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm1
```

In few seconds, process is started again. Killed the process 3-4 times, and eventually, cluster triggered the failover of ASCS to another node.

```
## After the test
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 22:12:23 2019
Last change: Thu Jun 6 22:12:20 2019 by hacluster via crmd on ascsvm1

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
```

```
rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm1
Resource Group: g-SGH_ERS
fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIInstance): Started ascsvm2
```

#### Test: Kill enqueue server process

```
## Before the test
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 22:12:23 2019
Last change: Thu Jun 6 22:12:20 2019 by hacluster via crmd on ascsvm1

2 nodes configured
9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPIInstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIInstance): Started ascsvm2
```

Killed the enqueue server process on node2 (ascsvm2).

```
ascsvm2:~ # ps -eaf | grep sapSGH
sghadm 20533 20524 0 22:11 ? 00:00:02 enqr.sapSGH_ERS02
pf=/usr/sap/SGH/SYS/profile/SGH_ERS02_ers-lb
```

```
## Cluster status
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 22:16:10 2019
Last change: Thu Jun 6 22:12:20 2019 by hacluster via crmd on ascsvm1

2 nodes configured
```

9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

```
stonith-sbd  (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS    (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS    (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS   (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPInstance): Started ascsvm1
Resource Group: g-SGH_ERS
  fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
  nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
  vip_SGH_ERS  (ocf::heartbeat:IPaddr2): Started ascsvm2
  rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPInstance): Stopped
```

Failed Actions:

```
* rsc_sap_SGH_ERS02_start_0 on ascsvm2 'not running' (7): call=90, status=complete,
  exitreason="",
  last-rc-change='Thu Jun 6 22:15:36 2019', queued=0ms, exec=30859ms
```

Clean up the ERS resource

```
ascsvm2:~ # crm resource cleanup rsc_sap_SGH_ERS02
```

After the resource rsc\_sap\_SGH\_ERS02 was cleaned

```
Stack: corosync
Current DC: ascsvm1 (version 1.1.16-6.14.1-77ea74d) - partition with quorum
Last updated: Thu Jun 6 22:21:51 2019
Last change: Thu Jun 6 22:21:25 2019 by hacluster via crmd on ascsvm1
```

2 nodes configured

9 resources configured

Online: [ ascsvm1 ascsvm2 ]

Active resources:

```
stonith-sbd  (stonith:external/sbd): Started ascsvm1
Resource Group: g-SGH_ASCS
  fs_SGH_ASCS    (ocf::heartbeat:Filesystem): Started ascsvm1
  nc_SGH_ASCS    (ocf::heartbeat:anything): Started ascsvm1
  vip_SGH_ASCS   (ocf::heartbeat:IPaddr2): Started ascsvm1
  rsc_sap_SGH_ASCS00 (ocf::heartbeat:SAPInstance): Started ascsvm1
```

```
Resource Group: g-SGH_ERS
fs_SGH_ERS (ocf::heartbeat:Filesystem): Started ascsvm2
nc_SGH_ERS (ocf::heartbeat:anything): Started ascsvm2
vip_SGH_ERS (ocf::heartbeat:IPaddr2): Started ascsvm2
rsc_sap_SGH_ERS02 (ocf::heartbeat:SAPIstance): Started ascsvm2
```

### Test: HANA stopped on node1

```
# Status before
Stack: corosync
Current DC: hanavm1 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Wed May 15 16:09:27 2019
Last change: Wed May 15 16:09:17 2019 by root via crm_attribute on hanavm1
```

2 nodes configured  
7 resources configured

Online: [ hanavm1 hanavm2 ]

Active resources:

```
stonith-sbd (stonith:external/sbd): Started hanavm1
Clone Set: cln_SAPHanaTopology_SGH_HDB00 [rsc_SAPHanaTopology_SGH_HDB00]
  Started: [ hanavm1 hanavm2 ]
Master/Slave Set: msl_SAPHana_SGH_HDB00 [rsc_SAPHana_SGH_HDB00]
  Masters: [ hanavm1 ]
  Slaves: [ hanavm2 ]
Resource Group: g_ip_SGH_HDB00
  rsc_ip_SGH_HDB00 (ocf::heartbeat:IPaddr2): Started hanavm1
  rsc_nc_SGH_HDB00 (ocf::heartbeat:anything): Started hanavm1
```

Stopped the HANA instance on node1

```
hanavm1:~ # su - sghadm
sghadm@hanavm1:/usr/sap/SGH/HDB00> HDB stop
hdbdaemon will wait maximal 300 seconds for NewDB services finishing.
Stopping instance using: /usr/sap/SGH/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -function Stop
400

15.05.2019 17:42:46
Stop
OK
Waiting for stopped instance using: /usr/sap/SGH/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -
function WaitforStopped 600 2

15.05.2019 17:44:10
```

WaitforStopped  
OK  
hdbdaemon is stopped.

```
sghadm@hanavm1:/usr/sap/SGH/HDB00> /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function
GetProcessList

15.05.2019 17:44:28
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GRAY, Stopped, , , 118269
sghadm@hanavm1:/usr/sap/SGH/HDB00>
```

At this time, HANA is stopped on node1. Cluster status shows below on node2.

```
Stack: corosync
Current DC: hanavm1 (version 1.1.16-6.11.1-77ea74d) - partition with quorum
Last updated: Wed May 15 17:53:52 2019
Last change: Wed May 15 17:52:48 2019 by root via crm_attribute on hanavm2

2 nodes configured
7 resources configured

Online: [ hanavm1 hanavm2 ]

Active resources:

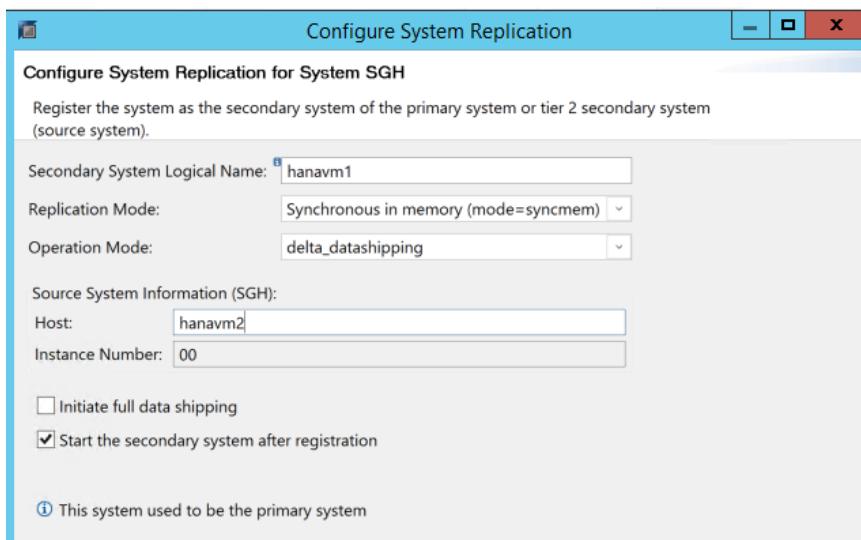
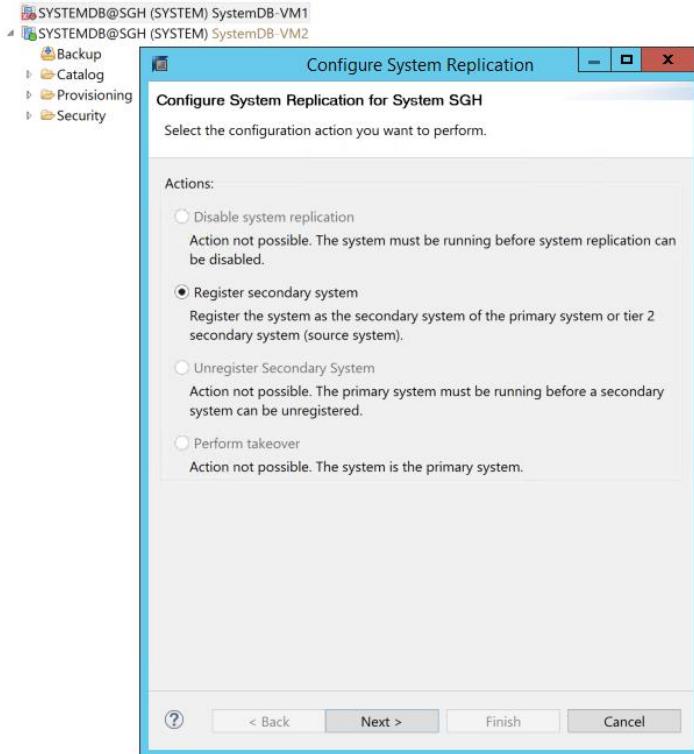
stonith-sbd (stonith:external/sbd): Started hanavm1
Clone Set: cln_SAPHanaTopology_SGH_HDB00 [rsc_SAPHanaTopology_SGH_HDB00]
    Started: [ hanavm1 hanavm2 ]
Master/Slave Set: msl_SAPHana_SGH_HDB00 [rsc_SAPHana_SGH_HDB00]
    Masters: [ hanavm2 ]
Resource Group: g_ip_SGH_HDB00
    rsc_ip_SGH_HDB00 (ocf::heartbeat:IPaddr2):     Started hanavm2
    rsc_nc_SGH_HDB00 (ocf::heartbeat:anything):     Started hanavm2

Failed Actions:
* rsc_SAPHana_SGH_HDB00_start_0 on hanavm1 'not running' (7): call=91, status=co
mplete, exitreason="",
    last-rc-change='Wed May 15 17:44:51 2019', queued=0ms, exec=2394ms
```

HANA Instance is up on the node2.

Register the previous primary (hanavm1) to the new primary (hanavm2).

In studio, select hanavm1 instance, right click, Configuration and Monitoring, and configure system replication.



Now, HSR is in sync from node 2 to node1

| SYSTEMDB@SGH (SYSTEM) SystemDB-VM2 hanavm2 00  |                |                   |                    |                            |        |    |  |
|--|----------------|-------------------|--------------------|----------------------------|--------|----|--|
| <a href="#">Overview</a> <a href="#">Landscape</a> <a href="#">Alerts</a> <a href="#">Performance</a> <a href="#">Volumes</a> <a href="#">Configuration</a> <a href="#">System Information</a> <a href="#">Diagnosis Files</a> <a href="#">Trace Configuration</a> |                |                   |                    |                            |        |    |  |
| <a href="#">Services</a> <a href="#">Hosts</a> <a href="#">Redistribution</a> <a href="#">System Replication</a>   |                |                   |                    |                            |        |    |  |
| Enter your filter  |                | Visible rows: 5/5 |                    |                            |        |    |  |
| HOST   | SECONDARY_HOST | REPLICATION_MODE  | REPLICATION_STATUS | REPLICATION_STATUS_DETAILS | PORT   | 12 |  |
| hanavm2 hanavm1  |                | SYNCMEM           | ACTIVE             |                            | 30,007 |    |  |
| hanavm2 hanavm1  |                | SYNCMEM           | ACTIVE             |                            | 30,040 |    |  |
| hanavm2 hanavm1  |                | SYNCMEM           | ACTIVE             |                            | 30,003 |    |  |
| hanavm2 hanavm1  |                | SYNCMEM           | ACTIVE             |                            | 30,011 |    |  |
| hanavm2 hanavm1  |                | SYNCMEM           | ACTIVE             |                            | 30,001 |    |  |

Cluster status shows below.

Stack: corosync  
 Current DC: hanavm1 (version 1.1.16-6.11.1-77ea74d) - partition with quorum  
 Last updated: Wed May 15 18:00:22 2019  
 Last change: Wed May 15 18:00:17 2019 by root via crm\_attribute on hanavm1

2 nodes configured  
 7 resources configured

Online: [ hanavm1 hanavm2 ]

Active resources:

stonith-sbd (stonith:external/sbd): Started hanavm1  
 Clone Set: cln\_SAPHanaTopology\_SGH\_HDB00 [rsc\_SAPHanaTopology\_SGH\_HDB00]  
 Started: [ hanavm1 hanavm2 ]  
 Master/Slave Set: msl\_SAPHana\_SGH\_HDB00 [rsc\_SAPHana\_SGH\_HDB00]  
 Masters: [ hanavm2 ]  
 Slaves: [ hanavm1 ]  
 Resource Group: g\_ip\_SGH\_HDB00  
 rsc\_ip\_SGH\_HDB00 (ocf::heartbeat:IPaddr2): Started hanavm2  
 rsc\_nc\_SGH\_HDB00 (ocf::heartbeat:anything): Started hanavm2

Ensure you are able to connect from SAP application (use SAPGUI).

## 18. Important commands

# Enable/disable the maintenance mode

crm configure property maintenance-mode=true

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

# Delete a cluster resource

```
crm configure delete fs_SGH_ASCS
```

# To remove a node from the cluster

```
ha-cluster-remove ascsvm2 --force
```

# To start a cluster resource

```
crm resource start vip_SGH_ERS
```

# To view cluster resource list

```
crm resource list
```

# To start/stop/status of SAP instance

```
./sapcontrol -nr 02 -function Stop
```

```
./sapcontrol -nr 02 -function GetProcessList
```

```
./sapcontrol -nr 02 -function Start
```

# To copy whole directory with its contents

```
scp -r /usr/sap/SWPM pasvm1:/usr/sap/SWPM
```

## 19. Appendix

<https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/high-availability-guide-suse-netapp-files#test-the-cluster-setup>

<https://docs.microsoft.com/en-us/azure/azure-netapp-files/>

<https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/high-availability-guide-suse-pacemaker>

<https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/sap-hana-high-availability>