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# Using SUSE Automation to Deploy an SAP HANA Cluster on AWS

SUSE Linux Enterprise Server for SAP Applications  
SUSE Linux Enterprise Server  
AWS

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# Using SUSE Automation to Deploy an SAP HANA Cluster on AWS

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The document at hand walks you through the deployment of a two-node SAP HANA High Availability Cluster using the SUSE Automation Project into a sandbox environment, operated on AWS.

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# 1 About the guide

This document will walk you through the deployment of a simple two-node SAP HANA HA Cluster using the SUSE Automation Project for SAP Solutions Project and operating on AWS.

This project uses Terraform and Salt to deploy and configure the operating system (SUSE Linux Enterprise Server for SAP Applications), SAP software (SAP HANA), and a SUSE Linux Enterprise High Availability (HA) cluster. If extensive configuration and customization are required, refer to the project documentation at <https://github.com/SUSE/ha-sap-terraform-deployments>.

For simplicity, this guide uses the Cloud Shell to perform the deployment, as it provides easy access to most of the required tooling.

It is possible to use a local Linux or macOS computer, but some commands may need modification or omission.

The architecture for the deployment is similar to the one shown below:

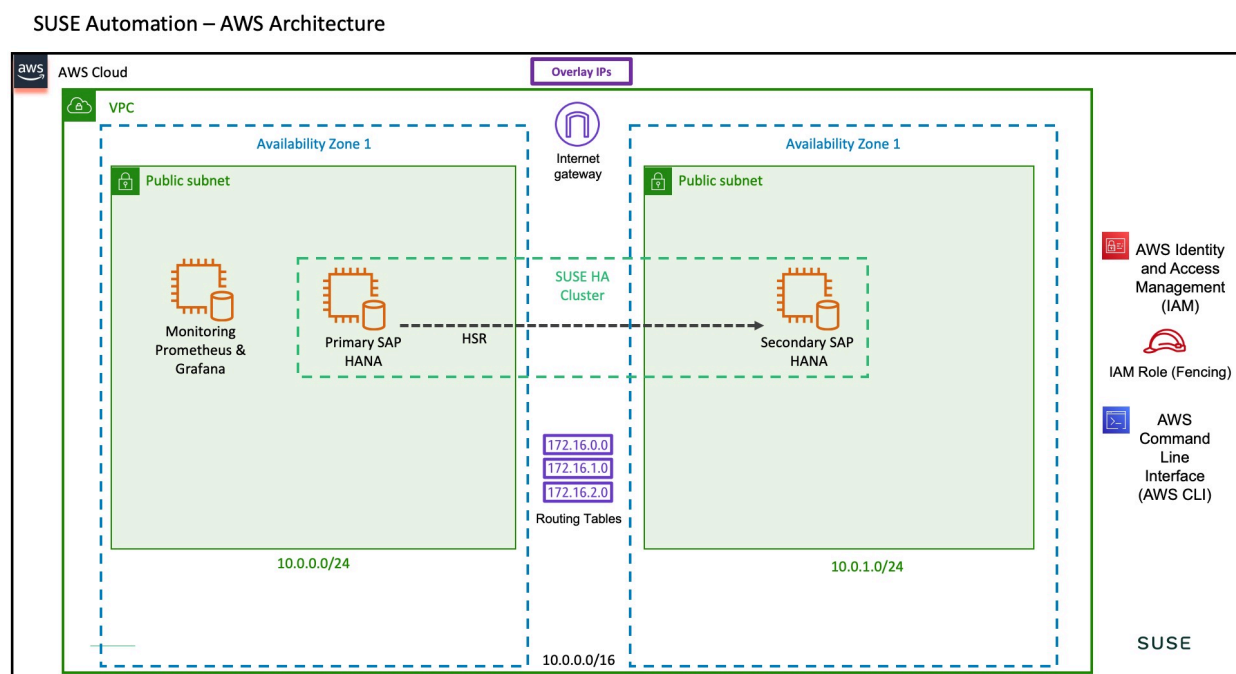


FIGURE 1: AWS AUTOMATION ARCHITECTURE

The project will perform the following actions:

- Deploying infrastructure - including Virtual Network, subnet, firewall rules etc.
- Deploying instances - 2x SAP HANA Instances
- Configuring the operating system for SAP workload

- Running the SAP HANA installation
- Configuring SAP HANA System Replication (HSR)
- Configuring SUSE Linux Enterprise High Availability cluster components and resources

## 2 Configuring the Cloud Shell

Start an AWS Cloud Shell from the AWS Services menu.

When the shell has launched, the next step is to configure the CLI and provide API access keys to allow the creation of AWS resources and infrastructure. The API Keys are created from the AWS console. For more details, refer to <https://docs.aws.amazon.com/cli/latest/userguide/cli-configure-quickstart.html> ↗

The quickest way to configure the AWS CLI is by running the command:

```
aws configure
```

This is described in the documentation linked above.

The command generates a file in `$HOME/.aws/credentials` which is referenced later.



### Important

The user specified in this step needs certain AWS permissions to ensure the deployment is successful.

## 3 Ensuring Terraform is installed

Terraform is not currently deployed as part of the AWS Cloud Shell, in this step Terraform is downloaded and installed to the `~/bin` directory. Update the command below with the latest version of Terraform as needed. As Terraform is updated on a regular basis, it may be necessary to update after installation, or specify a different version to download.

From the `~` directory, run:

```
mkdir ~/bin
cd ~/bin
wget https://releases.hashicorp.com/terraform/0.14.7/terraform_0.14.7_linux_amd64.zip
unzip terraform_0.14.7_linux_amd64.zip
```

```
cd ~
```

Check Terraform is working by running:

```
terraform --version
```

## 4 Preparing the SAP HANA media

With the correct entitlement, SAP HANA media can be downloaded from the SAP Web site at <https://support.sap.com/en/my-support/software-downloads.html>. The SAP Media needs to be made available so it can be accessed during the deployment.

The SUSE Automation for SAP Applications project allows for three methods for presenting the SAP media:

1. SAR file and SAPCAR executable (SAP HANA Database only)
2. Multipart exe/RAR files
3. Extracted media

The different formats come with some benefits and drawbacks:

1. The compressed archives (SAR and RAR) provide a simple copy to the cloud but a longer install time because of extracting it during the process.
2. The uncompressed/extracted media are the fastest install, but more files are copied to the cloud share, which also takes time in forehand as preparation.

In the example at hand, we use the compressed archives for the install (exe/RAR) as it is the easiest way to download and upload to the cloud share.

This guide uses the most recent SAP HANA media, SAP HANA 2.0 SPS05. The SAP HANA media file name downloaded at the time of creating this guide is 51054623. Follow the SAP instructions to download the SAP HANA media.



### Tip

It is a good practice to have the SAP Media versioned on the cloud share to build a library for automatic installs and (re)deployments. Thus you should think about your SAP media structure first.

As an **example**, see below how a full SAP Application media tree (in a compressed format) for a S/4HANA version 1809 install would look like:

```
<FS>/s4hana1809
  |SWPM_CD
  |  |SWPM20SP07_5-80003424.SAR
  |  |SAPCAR_721-20010450.EXE
  |
  |EXP_CD
  |  |S4CORE104_INST_EXPORT_1.zip
  |  |S4CORE104_INST_EXPORT_2.zip
  |  |...
  |DBCLIENT_CD
  |  |IMDB_CLIENT20_005_111-80002082.SAR
  |BASKET_CD
  |  |SAPHOSTAGENT24_24-20009394.SAR
  |  |igshe1per_4-10010245.sar
  |  |igsexex_1-80001746.sar
  |  |SAPEXEDB_400-80000698.SAR
  |  |SAPEXE_400-80000699.SAR
  |HANA
  |  |51053061_part1.exe
  |  |51053061_part2.rar
  |  |51053061_part3.rar
  |  |51053061_part4.rar
```

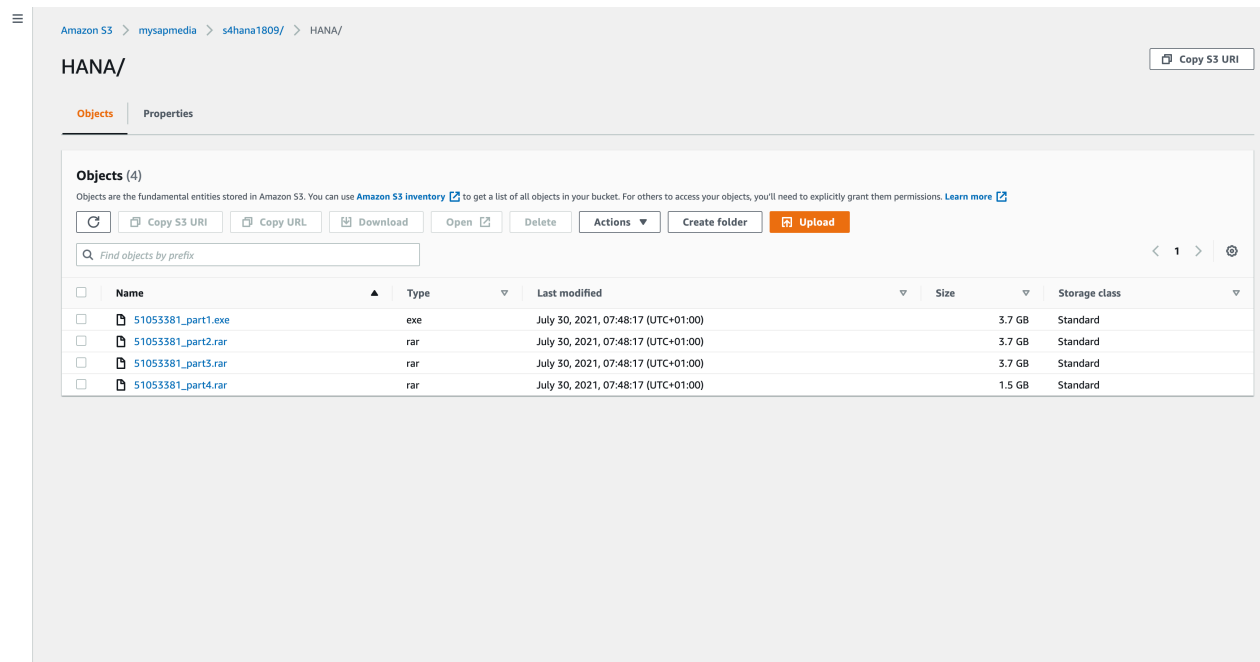
```
HANA      : contains the HANA Database install
BASKET_CD : contains SAP kernel, patch + more like hostagent.
DBCLIENT_CD: contains the package corresponding to DB CLIENT, e.g HANA
EXP_CD    : contains the package corresponding to EXPORT files
SWPM_CD   : must contain the .exe file corresponding to SAPCAR and the
            .sar file corresponding to SWPM.
            The file suffix must be .exe and .sar.
```

In the next steps, we use a simple HANA install download.

For AWS, an S3 bucket is used.

Using the AWS Console, perform the following actions:

- Create an S3 bucket. (The example shows a bucket called mysapmedia, but a unique name should be used.)
- Create a folder within the bucket.
- Upload the SAP media to the folder in the S3 bucket.



## 5 Downloading and configuring the SUSE Automation code

The SUSE SAP Automation code is published in GitHub.

The following command will clone the project to the Cloud Shell ready for configuration:

```
$ git clone --depth 1 --branch 7.2.0 https://github.com/SUSE/ha-sap-terraform-deployments.git
```



### Note

If the following SSH keys already exist, the next step can be skipped.



Then, generate SSH key pairs to allow for accessing the SAP HANA instances:

```
#optional if ssh-keys already exist
$ cd ~
$ ssh-keygen -q -t rsa -N '' -f ~/.ssh/id_rsa
```

## 5.1 Configuring the deployment options and modifying the Terraform variables

The files that need to be configured are contained in a subdirectory of the project. Use that as the working directory:

```
cd ~/ha-sap-terraform-deployments/aws
```

A Terraform example template is provided. For a demo environment consisting of a simple HANA cluster, only a handful of parameters will need changing.

Copy the Terraform example file to `terraform.tfvars`:

```
$ cp terraform.tfvars.example terraform.tfvars
```

Edit the `terraform.tfvars` file and modify it as explained below. If you are duplicating the lines before modification, ensure the original is commented out, or the deployment will fail.

With this parameter, Terraform will use the AWS credentials file created above. It is the simplest way to provide credentials for the deployment.

```
aws_credentials = "~/.aws/credentials"
```

If not used, ensure the following lines are commented out or the deployment will fail.

```
#aws_access_key_id = my-access-key-id
#aws_secret_access_key = my-secret-access-key
```

Choose the region for the deployment, for example:

```
# Region where to deploy the configuration
aws_region = "eu-central-1"
```

The following parameters select the version of SUSE Linux Enterprise Server for SAP Applications to deploy:



## Note

The values shown equal the default values. All defaults point to PAYG images for an easy start. Thus you only need to enable or change the variables if you want to work with different values.

```
// this is also the default
For simplicity, the 'os_owner' is set to use PAYG instances from the AWS Marketplace. If
an existing SUSE subscription needs to be used, this section can be changed to use BYOS
images. Refer to the project documentation.
```

```
#os_image = "suse-sles-sap-15-sp2"
#os_owner = "67959333241"
```

Next, enter the path for the public and private SSH keys that were generated earlier. Below is an example using the default created SSH keys:

```
# SSH Public key location to configure access to the remote instances
public_key = "~/ssh/id_rsa.pub"

# Private SSH Key location
private_key = "~/ssh/id_rsa"
```

To keep the cluster architecture and deployment simple and to provide additional packages needed to deploy, uncomment and set the following parameters:

```
ha_sap_deployment_repo = "https://download.opensuse.org/repositories/network:/ha-
clustering:/sap-deployments:/v7/"
```

Then, enable the `pre_deployment` parameter:

```
pre_deployment = true
```

Next, set which SAP HANA instance machine type should be selected: The default is set to some standard types, and you only need to enable and change the variable if you want other sizes.

```
#hana_instancetype = "r3.xlarge"
```

Next set the hostname for the instances, without the domain part

```
name = "hana"
```

Modify the following parameter to point to SAP media that was uploaded to the storage location:

```
hana_inst_master = "s3://mysapmedia/s4hana1809/HANA"  
hana_archive_file = "{hana_archive_version}.exe"
```

To create the cluster, we need to set this parameter to **true**, otherwise only a single system is created.

```
# Enable system replication and HA cluster  
hana_ha_enabled = true
```

Finally, to ensure a fully automated deployment, it is possible to set passwords within the `terraform.tfvars` file. Uncomment and set the following parameters to your own value:

```
hana_master_password = "SAP_Pass123"
```



### Note

If the parameters are not set in the `terraform.tfvars` file, they must be entered when running the deployment.



### Important

All passwords must conform to SAP password policies or the deployment will fail.

Optional: If a monitoring instance should be as part of the deployment, find and uncomment the following:

```
monitoring_enabled = true
```

## 6 Finalizing the automation configuration

### 6.1 Subscribing to the AWS Marketplace offer

To automatically deploy instances from the AWS Marketplace, ensure to **Subscribe** to the offering.

A link for SUSE Linux Enterprise Server for SAP Applications 15 SP2 can be found at <https://aws.amazon.com/marketplace/server/procurement?productId=e9701ac9-43ee-4dda-b944-17c6c231c8db>.

If a different version of SUSE Linux Enterprise Server for SAP Applications is required, subscribe to the relevant version on the marketplace.

## 7 Configuring IAM policies

If the deployment is being run from the root user of the AWS account, or if the user specified when configuring the AWS CLI has Admin privileges in your AWS account, you can skip this step. If using an IAM user with limited permissions, additional IAM rights may be required as IAM policies are created and attached during deployment, for example to access and manage EC2 instances, S3 buckets, IAM (to create roles and policies) and EFS storage.

There are two options available to achieve this:

- a. Attach the **IAMFullAccess** policy to the user executing the project. However, this is not recommended.
- b. The recommended method is to create a new IAM policy and attach it to the desired user.



### Tip

Depending on your own IAM rights, you may need to reach out to an AWS administrator for your account to set this up for you.

Create the following policy and attach it to the IAM user running the deployment:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "iam:CreateServiceLinkedRole",
        "iam:PassRole",
        "iam:CreateRole",
        "iam:TagRole",
        "iam:GetRole",
        "iam>DeleteRole",

```

```

        "iam:GetRolePolicy",
        "iam:PutRolePolicy",
        "iam:DeleteRolePolicy",
        "iam:ListInstanceProfilesForRole",
        "iam:CreateInstanceProfile",
        "iam:GetInstanceProfile",
        "iam:RemoveRoleFromInstanceProfile",
        "iam:DeleteInstanceProfile",
        "iam:AddRoleToInstanceProfile"
    ],
    "Resource": "*"
}
]
}

```

## 8 Deploying the project

Terraform will create and name resources when running the deployment based on the "workspace" in use. It is highly recommended to create a unique workspace from which to run the deployment.

```

$ terraform init
$ terraform workspace new demo
$ terraform workspace select demo
$ terraform plan
$ terraform apply

```



### Tip

The Cloud Shell has a timeout of around 20 minutes and the shell will close if left unattended, resulting in a failed deployment. It is strongly advised to retain focus on the Cloud Shell window to ensure the timeout does not occur.

If successful, the output will be the public IP addresses for the cluster nodes similar to the output below.

```

module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
-----
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  method:
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  update

```

```

module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  url:
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  /tmp/cluster.config
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec): Summary
  for local
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  -----
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  Succeeded: 34 (changed=26)
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec): Failed:
  0
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec):
  -----
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec): Total
  states run:    34
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec): Total
  run time: 1384.111 s
module.hana_node.module.hana_provision.null_resource.provision[1] (remote-exec): Thu Aug
  26 11:18:58 UTC 2021::hana02::[INFO] deployment done
module.hana_node.module.hana_provision.null_resource.provision[1]: Creation complete
  after 43m28s [id=xxxxxxxxxxxxxx]

```

Apply complete! Resources: 33 added, 0 changed, 0 destroyed.

Outputs:

```

cluster_nodes_ip = [
  "10.0.1.10",
  "10.0.2.11",
]
cluster_nodes_name = [
  "i-0a553e68e157ed667",
  "i-00887a206e454b0ab",
]
cluster_nodes_public_ip = [
  "18.192.212.32",
  "3.66.190.173",
]
cluster_nodes_public_name = [
  "ec2-18-192-212-32.eu-central-1.compute.amazonaws.com",
  "ec2-3-66-190-173.eu-central-1.compute.amazonaws.com",
]
drbd_ip = []
drbd_name = []
drbd_public_ip = []

```

```
drbd_public_name = []
iscsisrv_ip = ""
iscsisrv_name = ""
iscsisrv_public_ip = ""
iscsisrv_public_name = ""
monitoring_ip = ""
monitoring_name = ""
monitoring_public_ip = ""
monitoring_public_name = ""
netweaver_ip = []
netweaver_name = []
netweaver_public_ip = []
netweaver_public_name = []
```

## 9 Tearing down

When finished with the deployment, or even if the deployment has failed, ensure that Terraform is used to tear down the environment.

```
$ terraform destroy
```

This method will ensure all AWS resource, such as instances, volumes, VPCs, and IAM roles, are cleaned up.

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