SUSE SAP automation solution

SUSE SAP automation solution

Peter Schinagl

Publication Date: 2021-01-28

SUSE LLC
1800 South Novell Place
Provo, UT 84606
USA
https://documentation.suse.com

*

Contents

I SUSE SAP automation solution

*

1 Preface

This reference document contains best practices and planning considerations when using SUSE's Automation templates for SAP Landscapes.

It is targeted at consultants and end-customers deploying SAP Landscapes in the public cloud and provides guidance on how Terraform, SALT, and other components work together to provide a consistent and validated architecture.

The document can also be used as a guide for a partner enablement workshop covering the proper use of these tools.

The following, layered [1] aspects will be covered:

- ***Why*** one should consider this strategy
- ***Who*** to engage with, inform and collaborate with
- ***What*** key factors are important and ***When*** to consider them
- ***What*** software and applications this is relevant to accomplish
- ***How*** various technology components can facilitate this
- ***Where*** the resulting solution may physically or virtually reside

1 link: Archimate Enterprise Architecture (https://pubs.opengroup.org/architecture/archimate3-doc)

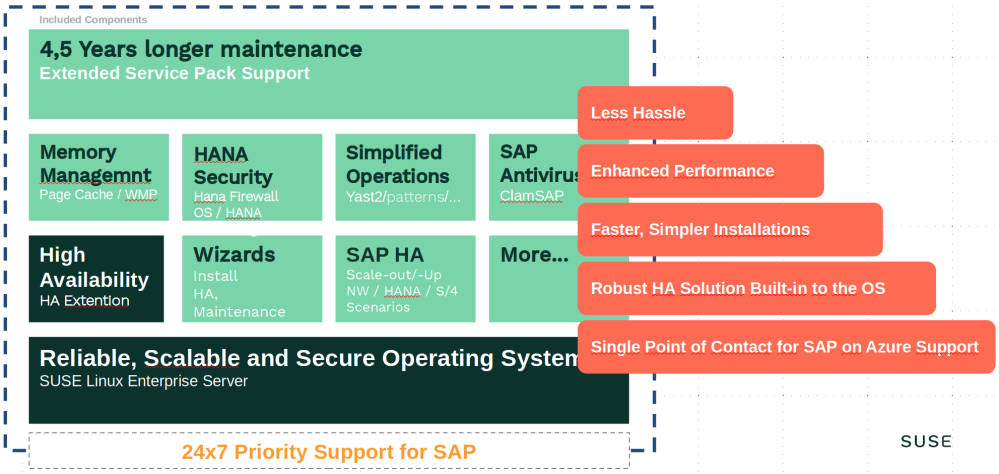
*

2 Introduction

SUSE's Vision is to Simplify, Modernize, Accelerate the business of our customers.

Maintaining a competitive advantage often depends on how quickly new services can be delivered into a business. SAP applications are designed to help analyze data to anticipate new requirements, and rapidly deliver new products and services.

When SUSE first released SUSE Linux Enterprise Server for SAP Applications, it already included automated installation features for the SAP software stack. Over the last 10 years, the SUSE SAP LinuxLab and development engineers have introduced several additional features to automate routine system administration. Based on this experience, SUSE worked on reimagining the deployment wizard capability onto a modern framework.



Simplify

the deployment of an SAP Landscape in the public cloud for dev, test, and production.

Modernize

customer environments by taking advantage of the benefits of the public cloud.

Accelerate

customer migrations to the public cloud.

Building the infrastructure to run SAP Applications can be complex and demands significant effort, especially if a manual deployment method is used. When delivering multiple environments, for multiple engagements, reproducing the deployment can be tedious and error-prone.

One additional challenge is ensuring the infrastructure is highly available, as this will add more complexity and steps to the deployment.

When deploying and managing a large number of systems in an SAP Landscape, there is often a secondary need, getting an overview of what is happening in the environment after the install is complete.

To help with this, SUSE has added the ability to gain insight into your SAP Landscape with a comprehensive monitoring solution, providing dashboards, realtime and historic views and active alerts and reporting.

The major motivation was to improve, simplify and unify the installation of SAP Landscape on SUSE Linux Enterprise Server for SAP Applications and clearly standardize deployments and allow customers to use one level of tooling in various ways – from a Command Line interface, through some GUI driven process and SUSE Manager or other automation frameworks.

To achieve this, SUSE has adopted a more modern approach, infrastructure-as-code which helps customers reduce the effort and errors during deployments.

In recent years, SUSE Linux Enterprise Server and many other SUSE products shipped with a universal configuration management solution, this is used as the foundation for the new automation capability.

This configuration management system is called Salt from SaltStack and provides a highly scalable, powerful and fast infrastructure automation and management, built on a dynamic communication bus. Salt can be used for data-driven orchestration, remote execution for any infrastructure, configuration management for any app stack and much more.

Combining this configuration management system with an infrastructure deployment solution such as Terraform from Hashicorp makes it possible to do a hands-free and error-free setup of an SAP Landscape. Once the deployment is complete, administrators can login to start customizing the SAP System.

As part of the deployment, SUSE added the ability provide insights into your SAP Landscape with comprehensive dashboards, realtime and historic views, and active alerts and reporting based on flexible and powerful open-source projects Prometheus and Grafana.

The deployment automation can also be configured to setup a monitoring environment for the SAP HANA and SAP NetWeaver clusters.

*

3 Strategy

Most SAP services are deployed on-premises with well-established procedures, but it is important to plan and size the required hardware several years ahead and estimate the maximum workload e.g. for the next 5 years.

It is difficult to predict the future, so when considering requirements such as capacity, as there are many factors which may affect this over the system lifespan, the values selected for this often ends up being a 'best guess'.

Today, with quickly changing environments, many businesses need to accelerate innovation and increase agility across their business. This allows them to achieve a faster time-to-market in addition to lowering costs.

One key example here is that you no longer need to plan the hardware sizing for the next 5 years, as a larger, faster, or even smaller infrastructure is only one reboot away.

"Rightsizing" or infrastructure optimization remains an important task and should be front of mind when managing an SAP Landscape in the cloud. Not taking care of this cloud benefit could have large cost implications, companies that “rightsize” their workloads are often able to cut costs by of 30-60%.

3.1 Context

There are many benefits gained when moving your SAP workloads to the cloud:

Quick deployment

If you need fast application implementation and deployment, the cloud is the best choice. You can set up a cloud environment within a few hours, whereas, in-house IT infrastructure set-up takes days and sometimes months to order it and set up. With the cloud, IT teams can easily configure and manage the setup remotely.
This is the area where SUSE’s automation solution for SAP can help.

Reduce Costs

Many businesses spent a lot of their capital on maintaining their IT Infrastructure. With help of the cloud, they can transform their CapEx (Capital Expenditure) to stable OpEx (Operating Expenditure). Costs can be controlled as the cloud model is a ‘pay as you use’ scenario and many cloud vendors provide several consumption options to provide more choice to their customers.

This is an area where SUSE can help together with the cloud providers to offer the right options, but this also means you need to adapt to how you use the resources and the SAP software.

Scalability & Flexibility

With the cloud, you can scale up your system as and when required, add or remove resources when the business demands it and as mentioned above, "rightsizing" and instance optimization to provide an efficient solution.

Maintenance

With the public cloud, IT departments no longer have to worry about managing and maintaining the hardware and underlying infrastructure, the cloud service provider handles this for your organization and frees up company resources to focus on other business activities.

Resiliency

For businesses these days, uptime is of prime importance to ensure day-to-day business operations run smoothly. Moving to the cloud maximizes uptime and reduces downtime. The cloud improves disaster recovery and business continuity without the need to spend a huge amount of capital on robust disaster recovery tools. Cloud providers offer a variety of services to help protect businesses from any security threat or outage.

SUSE's SAP HA Automation can add to these services to provide less downtime of your SAP application.

Remote access

With the cloud, your employees can access data from anywhere, and at any time via the internet making business more flexible and increase the productivity of the employees.

SUSE products natively provide many options for remote access and control.

So overall, public clouds offer significant benefits for all customers regardless of size. The use of public cloud resources can lower infrastructure costs and improve the scalability, agility, flexibility and availability of applications.

*

4 Business

This document is targeted at consultants and end-customers who are deploying SAP Landscapes in the public cloud. Within cloud environments there is no strict separation of responsibility (e.g. Networking, DB, OS, Application), as most operations can be performed from a central control plane. However, this should not mean that this specialized knowledge is no longer needed. Functional teams still exist and will need to work together, this is often best achieved with a DevOps approach utilizing Infrastructure-as-Code.

This means that when implementing SAP in the cloud, knowledge will be required of the cloud infrastructure and the various possibilities that affords along with a good understanding of the operating system and the tooling surrounding it, e.g. High Availability (HA). Finally an understanding around planning for the application usage and sizing is needed.

SAP architectures needs to be fine-tuned based on customer requirements around system availability i.e 99.99%, 99.95% or 99.9%. Single Point of Failures (SPOF) in the components and services will need to be identified and protected against, this is normally achieved with an HA Cluster. Other SPOFs within the infrastructure will need to be protected using some form of redundancy.

If you look at a typical SAP implementation you will find:

1. SAP Central Services (ASCS/ERS)
2. a Database (e.g. SAP HANA)
3. a Primary Application Server (PAS)
4. shared storage (NFS)

In the above list, points 1, 2 and 4 are potential SPOF.

SUSE's SAP Automation will try to eliminate all of these single-point-of-failures by providing HA cluster implementations to ensure automated failover, data protection and higher system availability.

SAP Central Services (ASCS/ERS)

You need at least 2 nodes to configure an ASCS/ERS HA cluster. Depending on the SAP versions, you can configure the ASCS/ERS cluster in either ENSA 1 or ENSA 2 architecture which could be automated with the SUSE HA Extension (HAE).

Database layer

*

You need at least 2 nodes to configure SAP HANA HA/DR cluster in a scale-up deployment. The SUSE HA Extension is used to detect system failures and facilitate automatic failover.

Depending on the services used or what services are available from the cloud provider it could be that you need a third cluster providing a Highly Available NFS service.

This is one of the main benefits of the SUSE SAP Automation project, all the required infrastructure and configuration can be created in order to maximize the SAP System availablity.

4.1 SUSE SAP Automation Coverage

SAP HANA and Netweaver applications can be deployed in many different scenarios and combinations between them. The automation is constructed from 'building blocks' which are modular and reusable and can be used to deploy a single install through to full cluster deployment.

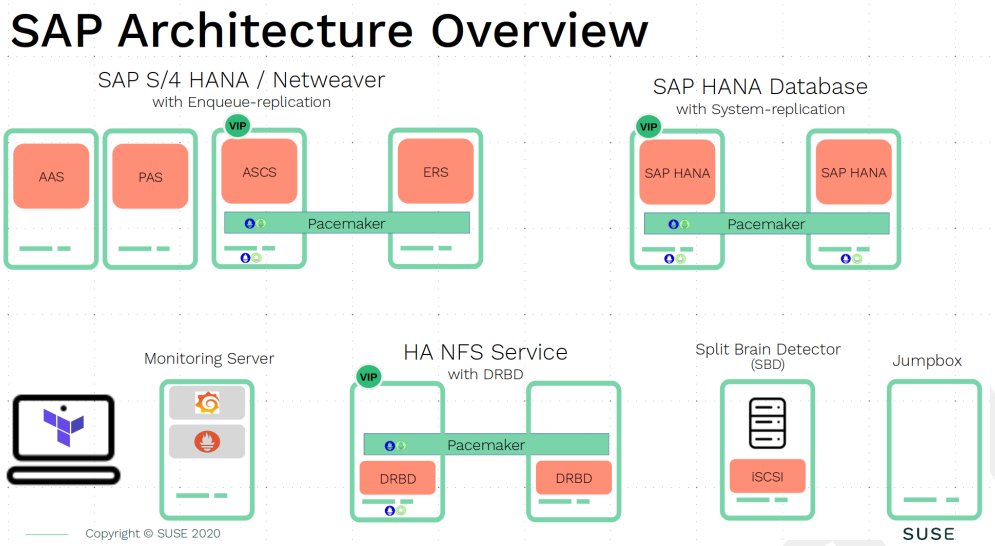
The following scenarios are supported:

- HANA single node
- HANA HA Scale-up System Replication
  - Performance Optimized Scenario
    - active/passive
    - active/readonly
  - Cost Optimized Scenario
- Netweaver
- Netweaver HA with Enqueue Replication Version (ENSA1)
- S/4 HANA

SUSE Engineering continue to develop new scenarios based on the demands of customers and partners.

*

The overall deployment using SUSE SAP Automation looks as follows:



4.2 Prerequisites for SAP workloads in public clouds

There are a few general prerequisites to ensure a supported SAP Landscape in public cloud environments:

1. An SAP license for the SAP software to be deployed is required.
2. A understanding of the resource requirements of the SAP workloads (via an SAP System Sizing exercise).
3. Certified instance types must be used based on the capacity required by SAP software.
4. Ensure suitable network connectivity is provided (bandwidth, latency, and package loss) within the cloud environment for your SAP workloads.
5. Only deploy certified operating systems on which the SAP workloads will run.
6. A good operational knowledge of the Linux OS, SAP systems operations and the cloud infrastructure is needed.
7. Where highly available solutions are deployed, a deep understanding of the HA concepts and tooling along with how this functions within along side the resiliency capability of the cloud infrastructure is required.

5 Application

5.1 SUSE Linux Enterprise Server for SAP Applications

SUSE Linux Enterprise Server for SAP Applicatinos is a product formed from a bundle of software and services. It is targeted specifically at customers running SAP workloads. At it's foundation is SUSE Linux Enterprise Server and the High Availablity Extension with many additional components and benefits for running SAP Applications.

5.2 SAP Application

In order to use the automation project, there are preliminary steps which need to be taken. One of these is to prepare the SAP installation software. The SAP software can be downloaded from https://launchpad.support.sap.com/#/softwarecenter, this will need to be performed manually before you start the automated deployment.

5.3 Presenting the SAP Media

After downloading the required SAP software, the files must be presented via cloud storage so it is accessible from the new installed virtual machines / instances.

Azure offers shared storage (Azure Files) for applications using the Server Message Block (SMB) protocol which is a simple way to upload the SAP Media to it an use it from the installed machines for the SAP installation.

To use Azure Storage, you need to create first a storage account.

https://docs.microsoft.com/en-us/azure/storage/files/storage-files-introduction

5.4 Terraform

Terraform is an open source tool created by HashiCorp for building, changing and versioning infrastructure.

*

As a infrastructure provisioning tool, it is responsible for creating the servers, but also load balancers, queues, monitoring, subnet configurations, firewall settings, routing rules, SSL certificates, and many other infrastructure components.

Terraform is seen as cloud-agnostic and allows a single configuration to be used to manage multiple providers. This simplifies management and orchestration, helping operators build large-scale multi-cloud infrastructures.

It is important to note that Terraform can not simply create a landscape with a press of a button in another cloud. The cloud providers use different types of infrastructure. For example the VMs, load balancers and other services offered by AWS are very different to those in Azure and Google Cloud.

Terraform's approach is that code is written specific to a (cloud)provider and will take advantage of the provider's unique functionality, whilst the code will need to be modified when used on a different cloud provider, being able to use the same language and toolset for all providers makes this effortless.

The name Terraform uses for these cloud specific modules is "provider". So for example the *Azure Provider* can be used to configure infrastructure in Microsoft Azure using the Azure Resource Manager API's.

Configuration files describe to Terraform which components need to deploy in order to support the application. One of the first steps is to run the terraform command, this will generate an execution plan which describes the actions Terraform will perform to get to the planned desired state. The plan is in the form of a list of cloud infrastructure to create, delete and modify, if this looks correct, the final step is to execute the plan to create the described infrastructure.

SUSE provides Terraform configuration files for AWS, Azure, GCE and libvirt.

An open source version of Terraform is shipped within the Public Cloud Module of SUSE Linux Enterprise Server for SAP Applications

In addition Azure provide an easy to access web based commandline (cloudshell) where Terraform is already pre-installed.

https://shell.azure.com

You will find documentation for it at https://docs.microsoft.com/en-us/azure/cloud-shell/overview

Azure provides different types of storage suitable for supporting SAP workloads, so it is important to fully understand the SAP requirements for Azure.

*

The storage configuration included in the Terraform files are provided as an initial suggestion, based on best practices. It is still important to continue analyzing the storage utilization patterns during runtime of the application, it may be that the SAP workload is not utilizing all the storage bandwidth or IOPS provided. Therefore, downsizing storage may be an option.

The suggestions from the Terraform files for the storage configurations are meant as good directions to start with. But you still should analyze the storage utilization patterns during runtime of the application. It could be the case that you realize that you are not utilizing all the storage bandwidth or IOPS provided. Therefore you might consider downsizing on storage or you will see the opposite way and your workload might need more storage throughput than suggested with these configurations. As a result, you might need to change the capacity, IOPS or throughput. Independent what you needs between storage capacity required, storage latency needed, storage throughput and IOPS required and least expensive configuration, Azure offers enough different storage types with different capabilities and different price points to find and adjust to the right compromise for you and your SAP workload.

5.5 SALT

SaltStack's configuration management system lets you define the applications, files, and other settings required on a specific system. The running system is continuously evaluated against the defined configuration, and changes are made as necessary.

- Salt works with "States" which express the required state a host should be in, using small, easy to read, easy to understand configuration files.
- The automation is written as "formulas" which are a collection of pre-written Salt States and Salt Pillar files.
- The Pillar files are the variables and data used to build the system.

SLES-for-SAP Applications ships with all the Salt tools as part of the distribution and are available to use as needed.

Salt formulas can be applied in two ways:

Salt Master with Salt Client. All steps are executed on the Salt Master machine which sends instructions to the client to perform the required configuration actions.

Salt Client (Minion) only. All steps in must be executed on each individual Salt client where the formulas need to be executed. This is the approach used by the SUSE Automation framework as it removes the need for a central master system.

5.5.1 Netweaver

The Netweaver formula for bootstrapping and managing the SAP Netweaver platform takes care of:

- Extracting the required SAP files for SAP Media (.tar,.sar,.exe)
- and setting up
    - ASCS instance
    - ERS instance
    - PAS instance
    - AAS instance
    - Database instance (currently only HANA)

Besides that, the formula sets up all of the prerequisites as:

- Hostnames
- Virtual addresses
- NFS mounts
- Shared disks
- SWAP partition space

The Salt formula follows the best practices defined in the official SUSE documentation http://documentation.suse.com/sbp

5.5.2 HANA

The HANA formula takes care of the following:

- Extract the required SAP files for SAP Media (.tar,.sar,.exe)
- Install SAP HANA.
- Apply "saptune" for HANA to configure and tune the OS for HANA usage

- Configure SAP System Replication.
- Preconfigure the High Availability cluster requirements.
- Configure the SAP HANA Prometheus exporter

5.5.3 HA

The HA bootstrap formula takes care of creating and managing a high availability cluster:

- Create and configure the High Availability cluster, pacemaker, corosync, SBD and SAP resource agents.
- Adjustments for the Azure Infrastructure
- Handle Netweaver, HANA and DRBD

The formula provides the capability to create and configure a multi node HA cluster. Here are some of the features:

- Initialize a cluster
- Join a node to an existing cluster
- Remove a node from an existing cluster
- Configure the pre-requirements (install required packages, configure ntp/chrony, create ssh-keys, etc)
- Auto detect if the cluster is running in a cloud provider (Azure, AWS, or GCP)
- Configure SBD (if needed)
- Configure Corosync
- Configure the resource agents
- Install and configure the monitoring ha_cluster_exporter

Depending on the cloud requirements it may need an iSCSI server to be able to provide a shared disk for fencing where we use the iscsi-formula from SaltStack

5.5.3.1 Other dependent services

5.5.3.1.1 HA NFS Service

To build a HA NFS Service if there is none available, we can create one with help of 3 Linux services and the following

- DRBD formula
- HA formula
- NFS formula from SaltStack

5.5.3.1.2 iSCSI Service

The iSCSI-formula from SaltStack is able to deploy iSNS, iSCSI initiator, and iSCSI target packages, manage configuration files and then starts the associated iSCSI services.

5.5.3.1.3 NFS formula

A SaltStack formula to install and configure nfs server and client.

5.6 Monitoring

SUSE continually try to improve user experience, one of the developments is how to provide a modern solution to monitor the several High Availability clusters that manage SAP HANA and SAP Netweaver. The Monitoring components use the Prometheus toolkit and the Grafana project to visualize the data. In order to be able to monitor the clusters on either HANA or Netweaver SUSE have written Prometheus exporters which ship as part of SLES for SAP.

5.6.1 SAP HANA Database Exporter

The exporter provide metrics from more than one database or tenant. It provides

- Memory metrics
- CPU metrics

*

- Disk usage metrics
- I/O metrics
- Network metrics
- Top queries consuming time and memory

5.6.2 High Availability Cluster Exporter

Enables monitoring of Pacemaker, Corosync, SBD, DRBD and other components of High Availability clusters. This provides the ability to easily monitor cluster status and health.

- Pacemaker cluster summary, nodes, and resource status
- Corosync ring errors and quorum votes. Currently, only Corosync version 2 is supported.
- Health status of SBD devices.
- DRBD resources and connections status. Currently, only DRBD version 9 is supported.

5.6.3 SAP Host Exporter

Enables the monitoring of SAP Netweaver, SAP HANA, and other applications. Gathered metrics are the data that can be obtained by running the sapcontrol command.

- SAP start service process list
- SAP enqueue server metrics
- SAP application server dispatcher metrics
- SAP internal alerts

The Technology Layer elements are typically used to model the Technology Architecture of the enterprise, describing the structure and behavior of the technology infrastructure of the enterprise.

- ***How*** various technology components can facilitate this

Technology components utilized as a part of this solution: CSP Specific, Networking, Instance Types, etc.

*

6 Technology (attributes)

#ADOC_ATTRIBUTES+="--attribute Azure=1" #ADOC_ATTRIBUTES+="--attribute instances-Azure=1" #ADOC_ATTRIBUTES+="--attribute SBD-Storage-Azure=1"

The physical elements are included as an extension to the Technology Layer for modeling the physical world. Could here be Networking, Landscape considerations

- ***Where*** the resulting solution may physically or virtually reside
- FixMe - Deployment Type(s)::
- Factor(s)
- Flavor(s)

*